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Liste des abréviations

ACC	American College of Cardiology
ACT	Angioplastie coronaire transcutanée
AHA	American Heart Association
AI	Angor instable
ANOVA	Analyse des variances
AP	Activité physique
AVC	Accident vasculaire cérébral
BDS-22	Beirut Distress Scale
CK-MB	Créatine kinase-MB
CRP	Protéine C réactive
CV	Cardiovasculaire
DSAC	Dissection spontanée des artères coronaires
EAS	European Atherosclerosis Society
ESC	European Society of cardiology
FDR	Facteur de risque
FdRCVs	Facteurs de risque cardiovasculaire
HbA1c	Hémoglobine glyquée
HDL	Cholestérol à liprotéines de haute densité
HR	Rapport de risque (Hazard ratio)
HTA	Hypertension artérielle
IC 95%	Intervalle de confiance à 95%
IDM	Infarctus du myocarde
IMC	Indice de masse corporelle
INOCA	Ischemia with Non-Obstructive Coronary Artery disease
IPAQ	International Physical Activity Questionnaire
IVA	Interventriculaire antérieure
LDL	Cholestérol à lipoprotéines de basse densité
LMAS	Lebanese Medication Adherence Scale
LMDS	Lebanese Mediterranean Diet Score
Lp(a)	Lipoprotéine (a)
MC	Maladies coronariennes
MCS	Mental Component Summary
MCV	Maladies cardiovasculaires
MENA	Moyen-Orient et Afrique du Nord
MET	Équivalent métabolique
NSTEMI	Infarctus du myocarde sans élévation du segment ST
OMS	Organisation mondiale de la Santé
OR	Odds ratio
PA	Pression artérielle
PAS	Pression artérielle systolique
PCS	Physical Component Summary

PM	Matières particulaires
$PM_{2.5}$	Matières particulaires de 2.5 μm ou moins de diamètre
QVLS	Qualité de vie liée à la santé
RR	Risque relative
SAOS	Syndrome d'apnées obstructives du sommeil
SCA	Syndrome coronarien aigu
SF-12	Short Form 12
SOPK	Syndrome des ovaires polykystiques
STEMI	Infarctus du myocarde avec élévation du segment ST
THS	Traitement hormonal substitutif

Publications et communications en lien avec ce travail

1- Publications directement issues du travail de thèse

Articles originaux

Ghaddar F, Zeidan RK, Salameh P, Tatari S, Achkouty G, Maupas-Schwalm F. Risk factors for coronary heart disease among Lebanese women: A case-control study. Vasc Health Risk Manag. 2022 Apr 16; 18:297-311.....Page 53
https://pubmed.ncbi.nlm.nih.gov/35464735/

Ghaddar F, Zeidan RK, Salameh P, Maupas-Schwalm F. Physical activity and odds of coronary heart disease among Lebanese women. *Soumis* .....Page 73

Revue

Ghaddar F, Zeidan RK, Salameh P, Maupas-Schwalm F. Physical Activity and Coronary Heart Disease Prevention in Women: Epidemiological Reality and Practical Limitations (review). *Soumis* ..... Page 100

2- Communications scientifiques

Ghaddar F, Zeidan RK, Salameh P, Tatari S, Achkouty G, Maupas-Schwalm F. Risk factors for coronary heart disease among Lebanese women: A case-control study.
Communication affichée
European Journal of Preventive Cardiology 28, Supplement_1 (ESC Preventive Cardiology 2021 congress, 15-17 avril, 2021).....Page 69
https://doi.org/10.1093/eurjpc/zwab061.173

Ghaddar F, Zeidan RK, Salameh P, Tatari S, Achkouty G, Maupas-Schwalm F. Physical activity and odds of coronary heart disease among Lebanese women.
Communication affichée
Atherosclerosis 331:e157 (89th European Atherosclerosis Society Congress, 30 mai-2 juin, 2021). .....Page 121
https://doi.org/10.1016/j.atherosclerosis.2021.06.476
Récipiandaire d'une Bourse jeune chercheur EAS 2021

Ghaddar F, Zeidan RK, Salameh P, Maupas-Schwalm F. Quality of life and coronary heart disease risk factors among Lebanese hospitalized women. 16ème congrès de la nouvelle société francophone d'athérosclérose. 23-24 juin, 2021.
Communication affichée animée (F. Ghaddar orateur) .....Page 127

3- Publication préalable au travail de thèse

Article original issu du travail de Master 2

Ghaddar F, Salameh P, Saleh N, Farhat F, Chahine R, Lahoud N, Hleyhel M, Zeidan RK. Noncardiac Lebanese hospitalized adult patients' awareness of their coronary artery disease risk factors. Vasc Health Risk Manag. 2018; 14:371-382. https://pubmed.ncbi.nlm.nih.gov/30510428/ [ANNEXE 1]

Chapitre 1. Introduction et revue de la littérature

Introduction

La maladie coronarienne (MC), la forme la plus répandue des maladies cardiovasculaires (MCV), constitue la principale cause de décès chez les femmes. (1,2) L'Europe de l'Est, le Moyen-Orient et l'Afrique du Nord (MENA) et l'Europe centrale représentent les régions avec la prévalence la plus élevée de la MC. (3–5) En 2018, près de 400,000 décès féminins étaient attribuables à des maladies cardiaques et des accidents vasculaires cérébraux (AVC), qui représentaient 28% de tous les décès. (6) Malgré ces proportions, la plupart des femmes paraissent sous-estimer l'impact du risque de MCV sur leur santé et semblent s'inquiéter davantage du cancer du sein. De même, pour les jeunes femmes qui se perçoivent protégées par leur âge. (7,8)

Alors que les MC diminuent dans certains pays les projections ont révélé que la mortalité par coronaropathie et la prévalence des facteurs de risque cardiovasculaire (FdRCVs) continueront d'augmenter d'une façon plus importante dans les pays en développement, en particulier dans les régions du Moyen-Orient. (9–12) Les femmes arabes paraissent plus susceptibles de développer un syndrome métabolique et semblent physiquement plus inactives que les hommes, (13,14) ce qui double leur risque futur de développer une MC. Néanmoins, d'un point de vue épidémiologique, une quantification de l'effet des facteurs de risque (FDR) des MC, spécifiques aux femmes ainsi qu'une analyse des modes de vie malsains mérite une évaluation plus approfondie. En effet, à ce jour, les études épidémiologiques sur la MC chez les femmes libanaises font défaut, malgré les dernières statistiques de la charge mondiale de morbidité (GBD, Global Burden of Disease) en 2019, classant les cardiopathies ischémiques au premier rang des principales causes de mortalité, représentant ainsi la principale menace de santé publique. (15) Tant en prévention primaire que secondaire, il est prouvé que les femmes sont sous-représentées, sous-diagnostiquées et sous-traitées par rapport aux hommes. Les femmes souffrent souvent des maladies cardiaques d'une manière différente de celle des hommes, et le manque de reconnaissance de cela pourrait avoir des conséquences néfastes. (8) Les femmes subissent des modifications hormonales importantes, ce qui peut avoir un impact sur le risque de MC. Par ailleurs, bien que les FdRCVs traditionnels dominent à un âge avancé, il existe plusieurs FDRs plus spécifiques aux femmes, notamment en rapport avec l'inflammation qui modulent le risque cardiovasculaire (CV) des femmes plus jeunes. (16) La conscience des femmes à leurs propres FDRs pourrait se traduire par une meilleure prévention des événements CVs.

Le but de notre travail de thèse était d'étudier les principaux prédicteurs de MC chez les femmes Libanaises, en lien avec l'athérosclérose. Nous nous sommes intéressées à évaluer les FDRs classiques, mais aussi à évaluer certains éléments pouvant être plus particulierement présents chez les femmes vieillissantes, ainsi qu'à évaluer certaines pratiques en rapport avec leur mode de vie, et leur qualité de vie.

Nous présenterons dans un premier chapitre une revue de la littérature centrée sur la MC et ses FDRs chez la femme. Après avoir détaillé les objectifs de l'étude réalisée dans le cadre de cette thèse, nous décrirons la méthodologie utilisée, puis aborderons les résultats avant de les discuter. Nous évoquerons enfin les conclusions que nous pouvons tirer de notre travail, ouvrant des perspectives de recherche qui permettront d'approfondir ce sujet concernant la santé CV des femmes, actuellement toujours en nécessité de travaux dédiés.

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I. Maladies coronariennes

I.1 Définition

La MC, est une affection cardiaque courante en général due à la formation de plaques athéroscléreuses dans la lumière du vaisseau artériel coronaire. Cela conduit à un apport insuffisant de sang et d'oxygène au myocarde. (17) L'athérome dans les artères coronaires peut conduire à une symptomatologie chronique avec angine de poitrine ou dans le cas d'une obstruction totale par thrombose à un infarctus du myocarde (IDM). (18) C'est la cause la plus fréquente de morbidité et de mortalité aux États-Unis et dans le monde. (17)

La MC peut également entraîner d'autres problèmes de santé, mort subite, troubles du rythme cardiaque et une insuffisance cardiaque. (19)

I.2 Épidémiologie

Le rapport 2016 de l'American Heart Association (AHA) sur les statistiques des maladies cardiaques et des AVC a montré qu'environ toutes les 34 secondes, 1 Américain subit un événement coronarien, et qu'environ toutes les 1 minute 24 secondes, 1 Américain en mourra. (20) La dernière mise à jour de 2019 indique que la mortalité par MCV a diminué chez les femmes âgées, mais que la mortalité par coronaropathie a relativement stagné chez les femmes plus jeunes au cours de la dernière décennie. (21) La notion que la coronaropathie est une « maladie masculine » se dissipe lentement car elle est devenue une cause majeure de morbidité et de mortalité chez les femmes. (22) En outre, le risque de complications induites par les MC est plus important chez les femmes d'âge moyen que chez les hommes. (23) D'après les données de l'AHA, la prévalence de la coronaropathie totale était de 6.7% chez les adultes âgés de plus de 20 ans (7.4% chez les hommes et 6.2% chez les femmes). (2) En revanche, les femmes présentent un retard d'environ 10 ans, par rapport aux hommes, concernant l'incidence des événements coronariens totaux, et 20 ans pour les manifestations plus graves de la MC, telles que l'IDM et la mort subite. Cependant, une augmentation de 10 fois des MCV se produit chez les femmes après la ménopause par rapport une augmentation de seulement 4,6 fois chez les hommes dans les mêmes groupes d'âge; (24) avec un sex-ratio pour la mortalité par coronaropathie qui diminue progressivement avec l'âge. (25) (cf revue générale, chapitre II.3.3 « Ménopause, thérapie hormonale substitutive »)

L'incidence aux âges de 65 à 94 ans est doublée pour les hommes et triplée pour les femmes par rapport à 35 à 64 ans. Les projections de prévalence fondées sur des modèles prédictifs

indiquent que d'ici 2030, la prévalence de la MC pourrait passer de 1,655 à plus de 1,845 pour 100,000 habitants. De même, concernant l'impact financier de la MC, le coût mondial des MCV devrait atteindre plus d'un billion de dollars américains d'ici 2030, contre 863 milliards de dollars américains en 2010, selon la Fédération mondiale du cœur (World Heart Federation). (26)

La coronaropathie est très courante dans les pays développés et en développement, alors que la mortalité y est en baisse (27) Dans le cadre du projet de la « charge mondiale de morbidité », les cardiopathies ischémiques ont augmenté et atteint le premier rang des principales causes de décès prématuré en 2017 et persisteront jusqu'en 2040, bien qu'avec des variations considérables entre les régions; (28) ce qui en fait la principale cause de mortalité au monde. De plus, la charge mondiale de morbidité a signalé que les cardiopathies ischémiques étaient responsables d'environ neuf millions de décès en 2019 (9,137,791.14 pour les 2 genres, 16.17% du décès global) dont 4,169,539.80 étaient des femmes. (15) De même, la charge totale de l'incapacité physique a augmenté de 52% entre 1990 et 2017, à l'échelle mondiale; et les femmes continuaient de connaître des taux plus élevés d'incapacité physique (28) que les hommes, malgré le décalage avec une apparition plus tardive de la maladie.

Entre 1990 et 2017, une diminution plus rapide du taux d'incidence des MCV a été montrée dans les pays développés par rapport aux pays en développement (14.4% vs 2.7%). De même, pour la réduction de la mortalité CV, qui a atteint 23.8% et 18.5%, respectivement, au cours de la période considérée. (29) En revanche, les augmentations les plus spectaculaires du pourcentage d'événements coronariens sont attendues dans la région du Moyen-Orient et de l'Amérique latine. (30) Dans les pays développés, cette baisse de la mortalité au cours des dernières décennies pourrait mettre l'accent sur la prévention primaire et l'amélioration du diagnostic et du traitement des coronaropathies. (27) Néanmoins, en 2018, selon l'AHA, 16,5 millions de personnes âgées de plus de 20 ans aux États-Unis avaient une MC, et 55% d'entre elles étaient des hommes. (31) Cependant, dans les pays en développement, le taux de mortalité continue d'augmenter, avec l'adoption de modes de vie occidentaux qui peuvent conduire à une prévalence plus élevée des FdRCVs, posant ainsi de nouveaux défis pour la santé publique. (27)

I.3 Athérosclérose

L'athérosclérose, avec ses manifestations cliniques telles que les maladies coronaires, les AVC et les maladies artérielles périphériques, représente une maladie vasculaire majeure dans

le monde. (32) C'est la cause sous-jacente d'environ 50% de tous les décès dans les sociétés occidentalisées. (33) Des études épidémiologiques ont révélé plusieurs FDRs environnementaux et génétiques importants associés à l'athérosclérose. Cependant, les progrès dans la définition des interactions cellulaires et moléculaires impliquées ont été entravés par la complexité étiologique de la maladie. Au cours de la dernière décennie, la disponibilité de nouveaux outils d'enquête, y compris des modèles murins de maladie génétiquement modifiés, a permis de mieux comprendre les mécanismes moléculaires qui relient le métabolisme altéré du cholestérol et d'autres FDRs au développement de la plaque athéroscléreuse. Il est maintenant clair que l'athérosclérose n'est pas simplement une conséquence dégénérative inévitable du vieillissement, mais plutôt un état inflammatoire chronique qui peut être transformé en un événement clinique aigu par rupture de plaque et thrombose. (34)

I.3.1 Définition

L'athérosclérose est un processus évolutif caractérisé par une accumulation de dépots à prédominance lipidique et de plaques fibreuses graisseuses dans la paroi des artères de gros et moyen calibre qui peuvent se rompre ou s'éroder et compromettre le flux sanguin artériel, pouvant entraîner une cardiopathie ischémique. (35) Ces plaques contiennent des lipides, des cellules inflammatoires, des cellules musculaires lisses et du tissu conjonctif. La pathologie progresse en général silencieusement pendant de nombreuses années ou décennies avant que la maladie clinique ne devienne apparente. (35) Les événements CVs ischémiques cliniques apparaissent plus fréquemment après la cinquième décennie de la vie chez l'homme et la sixième décennie de la vie chez la femme. Sa progression est liée à une interaction entre les facteurs environnementaux et génétiques. (36)

I.3.2 Physiopathologie

Le processus commence par la pénétration de lipoprotéines, les lipoprotéines de basse densité (LDL), dans l'espace sous-endothélial, qui sont ensuite modifiées et oxydées. (37) Ces LDL oxydées/modifiées sont des molécules chimiotactiques puissantes qui induisent l'expression d'une molécule d'adhésion cellulaire vasculaire (VCAM) et d'une molécule d'adhésion intercellulaire (ICAM) à la surface endothéliale et favorisent l'adhésion et la migration des monocytes dans l'intima, où ils prolifèrent, se différencient en macrophages et absorbent les lipoprotéines oxydées par l'intermédiaire de récepteurs (SR-A, CD36), formant ainsi des cellules spumeuses. (37) Ces macrophages relâchent également des cytokines pro-

inflammatoires, telles que les interleukines, le facteur de nécrose tumorale (TNF-α) et le facteur colonie-stimulant de macrophage (M-CSF). Le résultat final de ce processus est la formation de la première lésion athéromateuse, la strie graisseuse. (33)

D'autres types de leucocytes, tels que les lymphocytes et les mastocytes, s'accumulent également dans l'espace sous-endothélial, entraînant des réponses immunitaires cellulaires et humorales, avec la production de plusieurs molécules pro-inflammatoires. Ce processus se poursuit avec l'accumulation dans certaines stries graisseuses, des cellules musculaires lisses, qui migrent de la couche médiale vers l'intima. (33) Avec la sécrétion d'éléments fibreux par les cellules musculaires lisses, des plaques fibreuses occlusives se développent et grossissent. Les cellules spumeuses à l'intérieur de la chape fibreuse entrent progressivement en apoptose, relarguant les lipides dans la matrice extracellulaire, formant un amas riche en lipides connu sous le nom de « noyau nécrotique ». Ceci constitue la plaque d'athérome (33,38) (**Figure 1**).

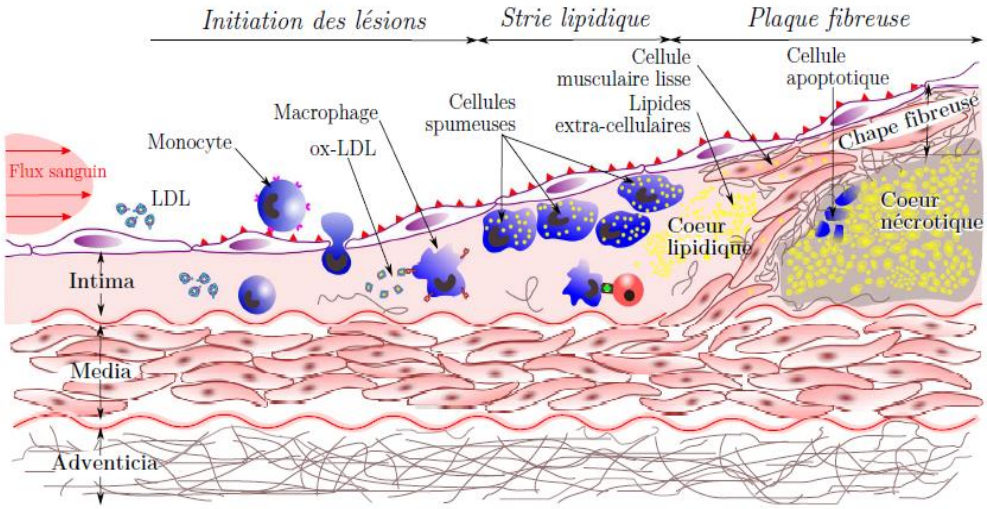

Figure 1. Etapes conduisant à la formation d'une plaque d'athérome. (39)

L'épaisseur de la chape fibreuse est essentielle au maintien de l'intégrité de la plaque athérosclérotique, (40) et le profil de la plaque peut être caractérisé en fonction de l'équilibre entre la formation et la dégradation de cette chape, en plaque stable ou instable et vulnérable. Les plaques stables se stabilisent et peuvent évoluer lentement avant d'entraîner une maladie. (41) La protrusion de ce type de plaque dans la lumière de l'artère produit une sténose limitant le débit sanguin artériel, conduisant à une ischémie tissulaire et à un angor. Les plaques instables sont sujettes à l'érosion ou à la rupture, exposant les constituants sous-endothéliaux aux protéines de la coagulation circulantes, ce qui entraîne des mécanismes d'adhésion puis

d'agrégation plaquettaire, provoquant une thrombose, responsable d'une occlusion soudaine de la lumière de l'artère, (40) pouvant générer un syndrome coronarien aigu (SCA) (**Figure 2**). La majorité des occlusions par thrombi coronaires sont causés par une rupture de plaque (55–65%), ou d'érosions (30–35%), et moins fréquemment par des plaques calcifiées (2–7%). (40)

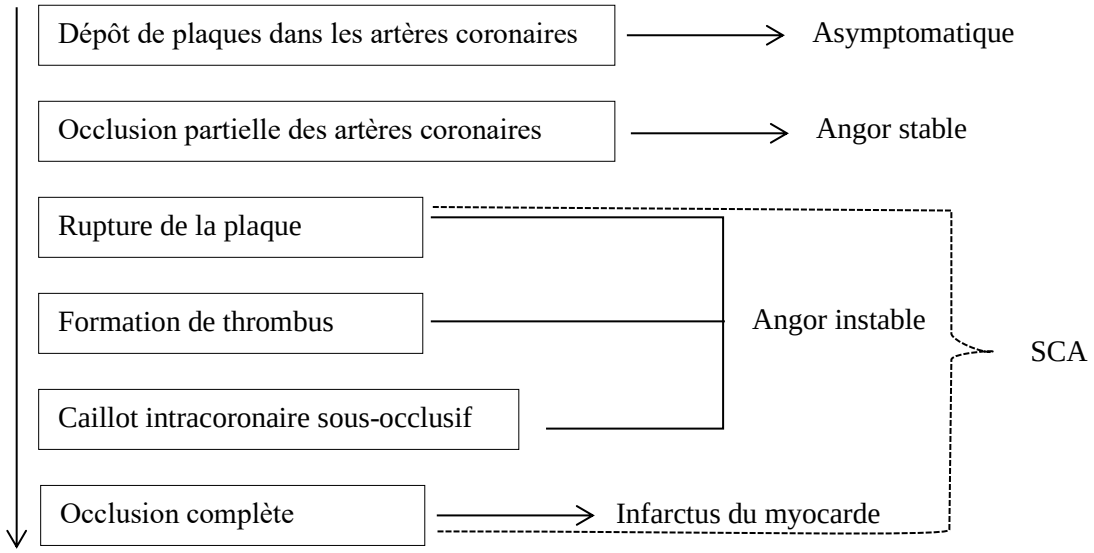

Figure 2. Pathogénie de la maladie coronarienne.
L'occlusion de l'artère coronaire est un processus dynamique allant du dépôt de la plaque athéroscléreuse à l'occlusion partielle ou l'occlusion complète de l'artère (selon le National Program for Prevention and Control of Diabetes, Cardiovascular Disease and Stroke. (d'après 42)

I.3.3 Particularités de la physiopathologie de l'athérosclérose chez la femme

L'athérosclérose se manifeste différemment chez les femmes par rapport aux hommes en termes de taille, de composition et de risque de rupture de la plaque d'athérosclérose. (43) En général, les femmes présentent des artères carotides plus petites, avec moins de plaques mais plus de sténoses apparentes qui peuvent être liées à des différences de remodelage. (44) En outre, les femmes présentent plus souvent une maladie coronaire non obstructive, qui est associée à des anomalies de la microvascularisation coronaire. (45) Le débit sanguin coronaire paraît plus élevé dans les artères coronaires des femmes, avec un stress de cisaillement endothélial plus important, ce qui a des effets sur la fonction endothéliale et le développement de l'athérosclérose. (46)

Avant la ménopause, les œstrogènes ayant des effets sur les médiateurs endothéliaux, (47) ils exercent un effet protecteur sur le développement de la plaque, passant par une diminution de l'oxydation et de la fixation des LDL ainsi qu'une augmentation de la prolifération des cellules endothéliales. (47) De faibles taux de LDL et des taux élevés de lipoprotéines de haute densité (HDL) chez les femmes jusqu'à la ménopause peuvent également expliquer certaines des différences observées. (24) Les femmes, en particulier les femmes préménopausées, pourraient avoir plus d'érosion de la plaque comparativement à la rupture de plaque observée chez les hommes. (47)

I.3.4 Particularités de l'expression clinique de l'athérosclérose chez la femme

L'athérosclérose peut être à l'origine d'une MC pouvant se présenter chez les femmes sous la forme d'une cardiopathie ischémique stable, d'un SCA (angor instable (AI), IDM sans élévation du segment ST (NSTEMI) et IDM avec élévation du segment ST (STEMI)) ou d'une mort subite (19) (**Figure 3**).

Toutefois, les femmes diffèrent des hommes dans les symptômes, les procédures de diagnostic et le pronostic de la MC. (8) En cardiologie clinique, le modèle obstructif masculin de la MC domine dans l'évaluation des risques, l'évaluation des symptômes, les tests diagnostiques et la thérapie. (48) Les femmes ont tendance à avoir une prévalence plus élevée de coronaropathie non obstructive, avec une plus grande variabilité des symptômes, une cardiopathie ischémique et des résultats indésirables probablement liés à une réponse vasomotrice coronarienne anormale, un dysfonctionnement microvasculaire et une érosion / embolisation coronarienne distale. (48,49)

Les femmes semblent plus susceptibles de signaler une douleur thoracique atypique ou non caractéristique (jusqu'à 30% (50)) accompagnée d'une augmentation de la transpiration, d'une dyspnée, de nausées et de vomissements, ce qui peut ne pas conduire à envisager une MC. (51) En outre, il a été montré que les femmes de plus de 75 ans prédominaient parmi les patientes asymptomatiques, ce qui peut être associé à leur faible activité physique (AP) ou à la présence de diabète. Mais avec l'âge, les douleurs thoraciques semblent plus typiques et comparables aux symptômes rapportés par les hommes. (52) La prévalence de l'angine a augmenté de 5-7% chez les femmes âgées de 45 à 64 ans à 10-12% chez celles âgées de 65 à 84 ans et de 4-7% chez les hommes âgés de 45 à 64 ans à 12-14% chez ceux âgés de 65 à 84 ans. (53) Les femmes souffrant d'angor stable ont souvent des artères coronaires normales à

la coronarographie, mais des tests supplémentaires peuvent indiquer qu'elles souffrent d'une coronaropathie microvasculaire. (47)

Dans le SCA, l'âge moyen du premier IDM est de 65.6 ans chez les hommes et de 72 ans chez les femmes, (2) le risque étant plus élevé chez les hommes. (54) L'incidence de l'IDM augmente progressivement chez les femmes après 45 ans, (30) et semblent présenter plus souvent un AI/NSTEMI que les hommes (82% des femmes contre 77% des hommes, p <0.0001). Bien qu'elles paraissent présenter moins de caractéristiques angiographiques à haut risque par rapport aux hommes avec des niveaux inférieurs de biomarqueurs cardiaques et des résultats d'électrocardiogramme (ECG) moins classiques (55)), elles continuent d'avoir des taux plus élevés de complications hospitalières, notamment des saignements et des complications vasculaires. (47,56) Néanmoins, le pronostic paraît meilleur chez les femmes présentant un NSTEMI par rapport à celles atteintes de STEMI, en ce qui concerne la mortalité post-hospitalière. (57) Dans une étude récente, les femmes souffrant de STEMI avaient un risque significativement plus élevé de mortalité à 1 an que chez les hommes (odds ratio (OR) ajusté : 1.31 (1.09-1.57), p<0,003), alors qu'aucune différence significative n'a été observée dans le cas d'AI/NSTEMI. (56)

L'âge plus avancé, le profil de risque CV accru, les différences dans le délai de reperfusion et de traitement, les complications hémorragiques et les différences dans la physiopathologie des STEMI chez les femmes pourraient expliquer leur taux de mortalité plus élevés que chez les hommes. (58)

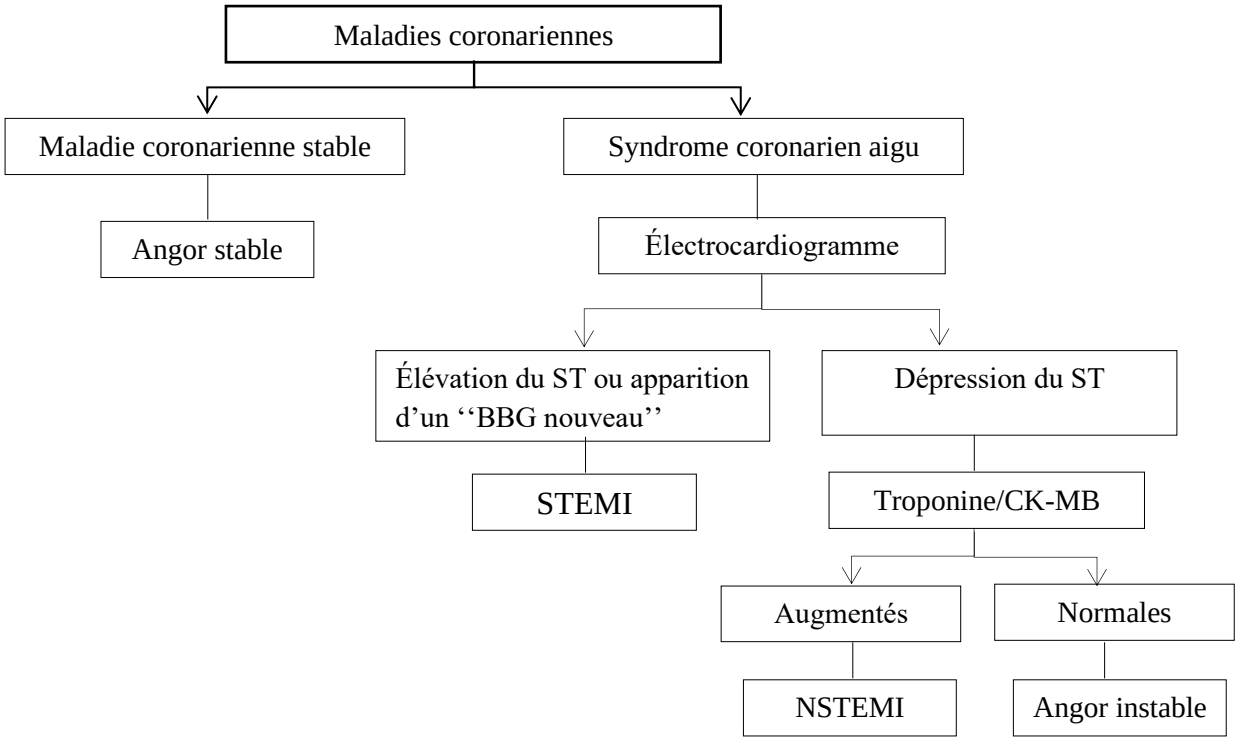

Figure 3. Classification des maladies coronariennes.
Les maladies coronariennes regroupent l'angine de poitrine chronique et stable et le Syndrome Coronaire Aigu pouvant conduire à un IDM et caractérisé par des modifications du segment ST sur l'électrocardiogramme. (d'après 42)
Abréviations : BBG, bloc de branche gauche ; STEMI, infarctus du myocarde avec élévation du segment ST ; CK-MB, la créatine kinase-MB ; NSTEMI, infarctus du myocarde sans élévation du segment ST.

Une meilleure compréhension des symptômes féminins typiques et atypiques de l'angine de poitrine conduira à une reconnaissance plus précoce, un traitement optimal et de meilleurs résultats dans la prise en charge médicale de la cardiopathie ischémique chez les femmes. (48)

Les femmes semblent plus susceptibles de subir des délais préhospitaliers plus longs que les hommes. (59) Des études antérieures ont montré que le retard à la prise en charge des femmes présentant un SCA a différentes origines en lien avec les patientes et les prestataires de soins de santé. (59,60)

Réduire le délai entre l'apparition des symptômes ischémiques et la présentation à l'hôpital est de la plus haute importance, en particulier pour les femmes, qui semblent plus vulnérables à une ischémie prolongée non traitée. (61)

I.4 Diagnostic différentiel des maladies coronaires par athérosclérose

La cardiomyopathie de Takotsubo est caractérisée par un dysfonctionnement ventriculaire gauche transitoire résultant d'un stress émotionnel sévère et se résout généralement avec un pronostic favorable. Le syndrome de Takotsubo ne représente qu'environ 1 à 3% de tous et 5 à 6% des patientes atteintes de STEMI, parmi lesquels les femmes ménopausées sont le plus souvent touchées. En effet, les femmes de plus de 55 ans ont un risque cinq fois plus élevé de développer le syndrome de Takotsubo par rapport à celles de moins de 55 ans. (62)

La dissection spontanée des artères coronaires (DSAC) se caractérise par une séparation spontanée des couches artérielles coronaires conduisant finalement à un hématome intra-mural et à une obstruction des artères coronaires. (63) Des séries épidémiologiques récentes suggèrent que la DSAC survient dans 1 à 4% des cas de SCA dans l'ensemble et peut être la cause de SCA dans environ 35% des IDM chez les femmes de ≤50 ans et dans 43% des IDM liés à la grossesse. (63) Bien que les taux de mortalité hospitalière par DSAC soient faibles, jusqu'à 14% des patients nécessitent une revascularisation urgente à l'hôpital, généralement en raison de l'étendue de la dissection. Les complications reconnues de la DSAC dépendent de la stratégie thérapeutique initiale. Des taux élevés de récurrence de DSAC ; son association avec le sexe féminin, la grossesse et les déclencheurs de stress physique et émotionnel ; et les artériopathies systémiques concomitantes, en particulier la dysplasie fibromusculaire, mettent en évidence les différences dans les caractéristiques cliniques de la DSAC par rapport à la maladie athéroscléreuse. (63)

Les ischémies sans coronaropathie obstructive à la coronarographie, connues sous le nom d'INOCA, sont de plus en plus reconnues, (64) avec une prévalence relativement plus élevée chez les femmes (65% chez les femmes contre 32% chez les hommes) (65). Le taux d'événements CVs majeurs est 3 fois plus élevé chez les femmes atteintes de coronaropathie non obstructive que chez les hommes et 2.55 fois plus élevé que chez les femmes ayant des artères coronaires normales au cours de la première année. (66) Les données de suivi à plus long terme du projet Women's Ischemia Syndrome Evaluation (WISE) ont confirmé le pronostic défavorable des femmes présentant un INOCA stable ; dont les taux de décès à 10 ans, toutes causes confondues et cardiaques, étaient respectivement de 17% et 11% chez les femmes présentant une coronaropathie non obstructive et de 10% et 6% chez les femmes présentant des artères coronaires normales. (67)

I.5 Prise en charge thérapeutique de la MC chez la femme

Le but du traitement de la MC est de réduire les symptômes de l'angine de poitrine et d'améliorer le pronostic grâce à la pharmacothérapie ou à la revascularisation. L'efficacité des différents moyens de traitement est comparable chez les hommes et les femmes. (68) Selon les directives actuelles de l'ESC (European Society of cardiology) pour la prise en charge du SCA, les indications des procédures de diagnostic invasives/non invasives et les stratégies de traitement doivent être mises en œuvre de la même manière pour les hommes et les femmes, en tenant compte du poids et/ou des posologies à ajuster pour les anti-aggrégants plaquettaires et anticoagulants, de manière à réduire le risque de saignement qui est plus élevé chez les femmes. (69)

Les mesures hygiéno-diététiques et le contrôle des FDRs sont essentiels dans la prise en charge de la MC chez les femmes. (22). Les femmes semblent présenter des résultats plus favorables lorsqu'elles sont traitées par angioplastie coronaire transcutanée (ACT) par rapport à un traitement thrombolytique. (59) Selon les directrives de l'ACC/AHA (American College of Cardiology / American Heart Association) pour le NSTEMI, une stratégie invasive précoce est une recommandation de classe I, chez les femmes présentant une élévation des biomarqueurs sanguins de nécrose cardiomyocytaire. (69,70) L'étude COURAGE (Clinical Outcomes Utilizing Revascularization and Aggressive drug Evaluation) a révélé que les femmes assignées à l'ACT présentaient un avantage plus important que les hommes, avec une diminution des hospitalisations pour insuffisance cardiaque et la nécessité d'une revascularisation future. (71)

En raison d'un retard dans la présentation de leurs symptômes, les traitements médicamenteux sont fréquemment retardés et utilisés de manière moins intensive chez les femmes. (22) Les données de l'étude de surveillance du risque d'athérosclérose dans les communautés (ARIC) ont révélé que les femmes avaient une probabilité inférieure de 13% de recevoir des hypolipidémiants (risque relatif (RR) =0.87, Intervalle de confiance à 95% (IC 95%) : 0.80-0.94), de 17% de recevoir des antiplaquettaires (RR=0.83, IC 95% : 0.75-0.91), de 7% de bénéficier une angiographie (RR=0.93, IC 95% : 0.86-0.99) et de 21% de bénéficier une revascularisation (RR=0.79, IC 95% : 0.71-0.87) que les hommes. (72) Par ailleurs, le traitement hormonal substitutif (THS) ne doit pas être instauré en tant que nouveau médicament pour la prévention secondaire des événements coronariens chez les femmes ménopausées après un SCA ou angor stable, et ne doit pas être poursuivi chez les utilisatrices précédentes à moins que les avantages ne l'emportent sur les risques estimés. (70,73)

La prévention secondaire et la réadaptation cardiaque font partie intégrante de la prise en charge après revascularisation, car de telles mesures réduisent la morbidité et la mortalité futures de manière rentable et peuvent encore améliorer les symptômes. (74) Or, les femmes bénéficient moins de la réadaptation cardiaque et semblent moins susceptibles d'augmenter leurs capacités d'exercice physique après une revascularisation myocardique. (75,76) (76)

En général, les femmes sont traitées de manière significativement moins invasive et sont davantage orientées vers un traitement pharmacologique, car l'angioplastie et le pontage sont plus fréquemment utilisés dans le traitement des hommes que des femmes. (77)

II. Facteurs de risque des maladies coronaires

Il est essentiel de prêter attention aux principaux FDRs de MCV, en particulier chez les femmes, qui augmentent directement l'incidence des complications CVs. (78) Différents facteurs ont été identifiés comme étant liés à l'étiologie de l'athérosclérose. La plupart de ces FdRCVs sont le résultat des modes de vie et des comportements des individus, par conséquent, ils pourraient être modifiables et évitables. (59) Bien que les hommes et les femmes partagent des FDRs traditionnels et non traditionnels similaires de MC, l'importance relative de chaque FDR peut être spécifique au sexe, dont certains sont propres aux femmes (exemple, les complications liées à la grossesse). De nombreux FDRs sont impliqués dans la coronaropathie chez les femmes ; alors que certains FDRs sont causaux (l'hypertension, le tabagisme, la dyslipidémie), de nombreux FDRs sont associatifs (la dépression) et il est souvent difficile de déterminer la contribution exacte des FDRs non traditionnels de manière isolée. L'impact des FDRs non traditionnels sur la MC chez les femmes peut être plus important que chez les hommes en raison de la prévalence accrue de certains FDRs chez les femmes. (79)

II.1 Facteurs de risque CV traditionnels

II.1.1 Facteurs de risque CV non modifiables

II.1.1.a Vieillissement

Le vieillissement est associé à un déclin progressif de nombreux processus physiologiques, avec une modification de la fonction cardiaque et vasculaire, entraînant un risque accru de complications de santé et de maladies. (80) Le vieillissement a un effet remarquable sur le

cœur et le système artériel, entraînant une augmentation des MCV. (81) Ces changements progressifs liés à l'âge, collectivement appelés « vieillissement cardiovasculaire », interagissent avec l'exposition cumulative aux FDRs traditionnels pour avoir un impact croissant sur le développement de l'athérosclérose, de l'hypertension, des AVC et de fibrillation atriale. (82) De plus, le vieillissement des tissus CVs est illustré par des altérations pathologiques, y compris une hypertrophie, une altération de la fonction diastolique ventriculaire gauche, et une diminution de la capacité de réserve systolique ventriculaire gauche, une augmentation de la rigidité artérielle et une altération de la fonction endothéliale. (81,82)

Les schémas de vieillissement vasculaire diffèrent entre les sexes tout au long de la vie ce qui paraît avoir une implication sur le risque de développement de la maladie (**Figure 4**). (83) Avec l'âge, on note une augmentation du dysfonctionnement endothélial et de l'épaississement et de la rigidité des artères, accompagnées d'une augmentation de la pression artérielle systolique (PAS) et de la pression d'impulsion. (81) Les hommes présentent un dysfonctionnement endothélial et une rigidité artérielle plus importants que les femmes de tous âges jusqu'à la sixième décennie, puis le dysfonctionnement artériel lié à l'âge progresse plus rapidement chez les femmes. (83) Ces différences vasculaires se reflètent cliniquement dans les schémas de prévalence de l'hypertension tout au long de la vie : avant 45 ans, plus d'hommes que de femmes souffrent d'hypertension ; entre 45 et 64 ans, les taux d'hypertension sont similaires entre les sexes ; et à 65 ans et plus, plus de femmes que d'hommes sont hypertendues. (84)

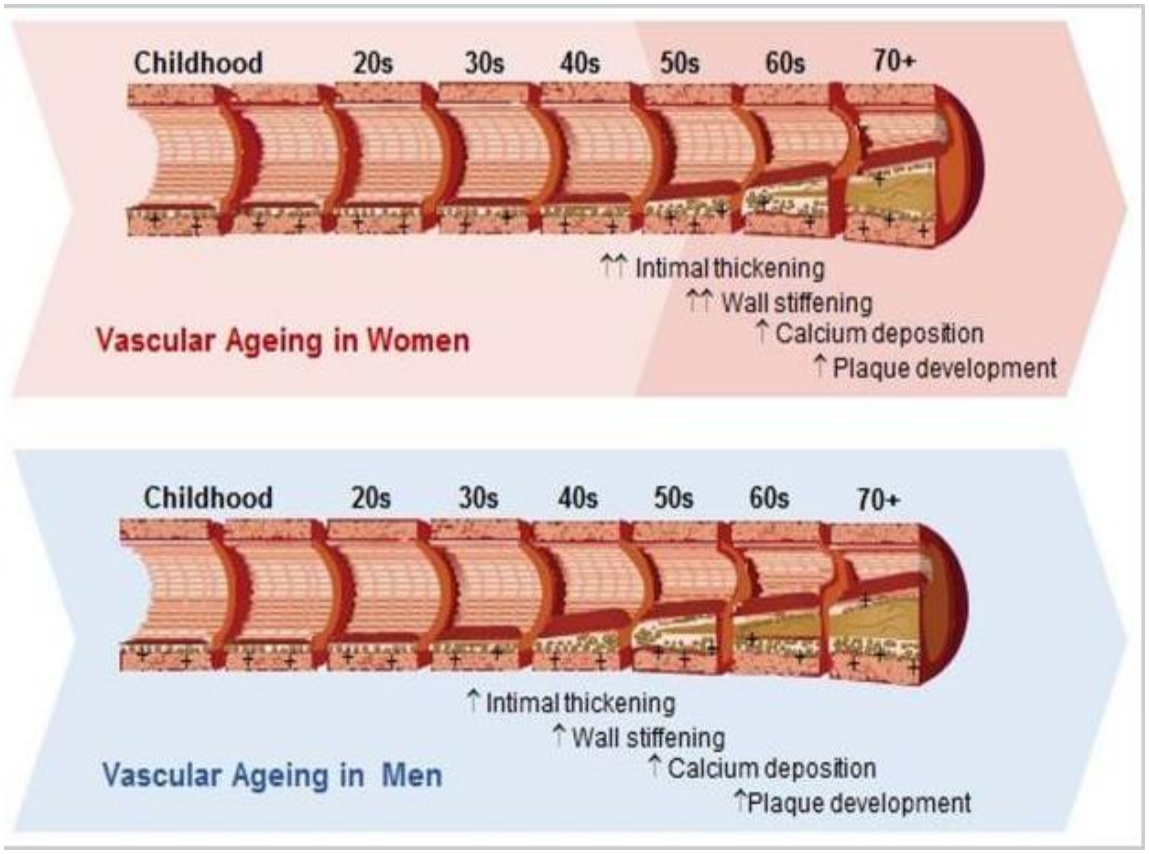

Figure 4. Modèles de vieillissement vasculaire chez les hommes et les femmes.
Les symboles « + » indiquent la présence de récepteurs d'œstrogènes dans le système vasculaire artériel (y compris l'endothélium, les cellules musculaires lisses et la matrice extracellulaire). (83)

II.1.1.b Antécédants cardiovasculaires familiaux

Les antécédents familiaux sont un élément important des antécédents médicaux CVs et correspondent à des comportements, un environnement et un patrimoine génétique partagés. Une histoire familiale de MC est présente chez la majorité des patients atteints de MC prématurée. (85) Les antécédents familiaux de MC prématurés ont été définis par la survenue de MC chez les parents au premier degré (parent ou frère ou sœur) avant l'âge de 55 ans chez les hommes et 65 chez les femmes. (86) Plusieurs loci génétiques ont été associés à une susceptibilité à la coronaropathie. (87) Des analyses prospectives décrivent un risque relatif jusqu'à deux fois supérieur chez les descendants et les frères et sœurs de patient atteint de coronaropathie. (87,88) De plus, les rapports de taux d'incidence de l'IDM par antécédents d'IDM chez 1, 2 ou ≥3 parents au premier degré étaient respectivement de 1.46, 2.38 et 3.58. (89) Les différences entre les sexes dans l'impact des antécédents familiaux sur le risque de MC sont controversées. (90,91)

Bien qu'une partie du risque associé aux antécédents familiaux soit médiée par des mécanismes génétiques, il convient de noter que les habitudes de vie semblent tout aussi impactantes, voire plus, chez les personnes présentant un risque génétique élevé de développer une MC. (92) Étant donné que même le risque génétique est atténué par un mode de vie favorable, la stratégie visant à cibler les personnes ayant des antécédents familiaux de MC pour atténuer à la fois le risque génétique et comportemental au début de la vie est appropriée et essentielle pour la prévention des événements cardiovasculaires prématurés. (85)

II.1.2 Facteurs de risque modifiables

II.1.2.a Dyslipidémie

La dyslipidémie est l'un des principaux FDRs causal pour le développement de l'athérosclérose et des MCV et l'un des sept indicateurs que l'AHA utilise pour déterminer la santé CV des enfants et des adultes. (2) Le rapport cholestérol total/HDL paraît être un puissant prédicteur pour l'identification précoce des femmes à risque d'IDM. (54) Une dyslipidémie se caractérise par des profils lipidiques problématiques, isolés ou quelquefois associés entre eux tels qu'une hypertriglycéridémie, une hypoHDLémie ou des taux élevés de LDL. (93) Chez les femmes, le plus grand risque de MC n'est généralement pas observé avant la ménopause, même si les concentrations de cholestérol sont assez élevées. (94) Pendant la transition ménopausique, des modifications du profil lipidique peuvent se produisent, avec des taux de LDL et de triglycérides 10 à 15% plus élevés et des taux de HDL légèrement diminués. (16)
Les lipoparticules Lp(a), estimées être élevées chez environ 20% de la population mondiale (95), sont également associées au risque de maladie athéroscléreuse, mais ne sont pas mesurées régulièrement dans les soins cliniques de routine. (96) Le dépistage d'une élévation de Lp(a) chez les personnes à haut risque CV et présentant des élévations modérées de LDL peut permettre de mieux stratifier leur risque CV. (97) Des concentrations élevées de Lp(a) sont associées à un risque 3 à 4 fois plus élevé d'IDM, 5 fois plus élevé pour la sténose des artères coronaires et 1.2 fois plus élevé pour la mortalité toutes causes. (95) Des réductions absolues de Lp(a) d'environ 100 mg/dL semblent produire une réduction cliniquement significative du risque de MC d'une ampleur similaire à une baisse du taux de LDL de 1 mmol/L. (98) Toutefois, chez les femmes, le surrisque de MCV lié à une élévation de Lp(a) pourrait n'apparaître que chez celles qui présentent des dyslipidémies. (99)

Les nouvelles lignes directrices de l'ACC/AHA sur le traitement des dyslipidémies préconisent un traitement par statines pour toutes personnes présentant un risque modéré ou élevé de MCV athéroscléreuse. (2) Cependant, les centres pour le contrôle et la prévention des maladies (Centers for Disease Control and Prevention) ont rapporté que les femmes sont moins susceptibles de se voir prescrire ce traitement que les hommes de même risque de MCV. (100) Il a été discuté d'un risque augmenté de développer un diabète sucré pour les femmes sous statines (101,102), mais cela n'est, à ce jour, pas confirmé.

De toute évidence, le non-respect des directives de traitement et l'incapacité d'atteindre les objectifs de traitement recommandés contribuent à une moins bonne prise en charge pour les femmes.

II.1.2.b Hypertension artérielle

L'hypertension artérielle (HTA) reste un FDR majeur de MC chez les femmes. (79) La prévalence de l'HTA augmente régulièrement avec l'âge pour les deux sexes. La probabilité de présenter une HTA est plus élevée chez les hommes que chez les femmes jusqu'à l'âge de 64 ans, puis la tendance s'inverse. (2) Au total, 30 à 50% des femmes développent une HTA avant l'âge de 60 ans. (16) La pression artérielle (PA) est liée de façon continue, constante et indépendante au risque d'événements CVs, en augmentant de 2 à 3 fois le poids des maladies athéroscléreuses. (103) En outre, plus la PA est élevée, plus le risque de complications est important (IDM, insuffisance cardiaque, AVC, maladies rénales). (103,104) La prévalence de l'HTA dans le monde continue d'augmenter et on estime que le nombre d'hypertendus augmentera de 15 à 20% d'ici 2025, pour atteindre près de 1,5 milliard. (105)

Les femmes présentant des valeurs limites de PA semblent avoir un risque accru de MC. (106) De plus, les femmes préménopausées présentent un risque plus élevé de lésions hypertensives des organes cibles par rapport aux hommes du même âge, notamment la microalbuminurie et l'hypertrophie ventriculaire gauche. (107) L'augmentation de la PA pendant la transition ménopausique peut être liée à la baisse des taux d'œstrogènes, ce qui entraîne une régulation à la hausse du système rénine-angiotensine, une augmentation relative des taux d'androgènes, une production de facteurs vasoconstricteurs tels que l'endothéline, une sensibilité accrue au sel, et une augmentation de l'activité de la rénine plasmatique. (108) L'HTA semble plus fortement associée à l'IDM chez les femmes que chez les hommes. (109) Chaque augmentation de 10 mmHg de la PAS semble associée à un risque accru (RR ou rapport de risque [HR]) de 1.25 (IC 95 % : 1.18–1.32) pour les événements CVs chez les femmes. (2) De

même, une réduction de 10 mmHg de la PAS ou de 5 mmHg de la pression artérielle diastolique (PAD) était associée à des réductions significatives de tous les événements CV majeurs environ 20%, de mortalité toutes causes confondues de 10−15%, d'AVC de 35%, d'événements coronariens de 20% et d'insuffisance cardiaque de 4%. (105) Les femmes avec une PAS >185 mmHg ont un risque de décès cardiaque triplé par rapport aux femmes avec une PAS ≤135 mmHg. (59)

Des données récentes indiquent à la fois une prévalence croissante de l'HTA, en particulier chez les femmes ménopausées, et des taux significativement plus faibles de contrôle adéquat de la PA par rapport aux hommes.(16) Environ les deux tiers des femmes hypertendues traitées ont une PA non contrôlée. (110) Chez les femmes, l'âge avancé et le diabète étaient chacun associés à un moins bon contrôle de l'HTA. (111) Cela suggère que les femmes peuvent ne pas être traitées aussi efficacement que les hommes pour leur HTA, mais peut-être aussi que les mécanismes responsables de l'HTA chez les femmes vieillissantes peuvent différer des mécanismes chez les hommes. (112)

Le pronostic des sujets présentant une HTA par « effet blouse blanche » (définie par une PA élevée uniquement dans le cadre d'une consultation médicale) doit également être pris en compte. Bien que la prévalence varie d'une étude à l'autre, l'HTA par « effet blouse blanche » peut représenter jusqu'à 30 à 40% des personnes (et >50% chez les personnes très âgées). (105) Les changements physiopathologiques induits par le vieillissement, notamment une rigidité artérielle accrue et une sensibilité diminuée des barorécepteurs, entraînent des augmentations plus importantes de la PA en réponse au stress psychologique. (113) Il a été montré que l'HTA par « effet blouse blanche » pouvait être associée à un risque accru de MCV, or la surveillance ambulatoire de la PA a montré que plus de femmes, en particulier les femmes plus âgées ou enceintes, présentent un risque accru d'HTA par « effet blouse blanche » que d'hommes. (114) La prévalence accrue de ce profil chez les femmes plus âgées a été attribuée à une augmentation de l'anxiété et du syndrome métabolique dans cette population, en plus des changements hormonaux. (115,116) La notion que l'HTA par « effet blouse blanche peut évoluer vers une HTA soutenue à long terme remet en question sa nature bénigne putative. Mais d'autres études sont nécessaires pour évaluer la signification pronostique de l'HTA par « effet blouse blanche » chez les femmes, en particulier les femmes plus âgées à haut risque de MCV. (114)

II.1.2.c Diabète sucré

Le diabète de type 2 est le plus courant des diabètes sucrés et représente environ 90 à 95% de tous les cas diagnostiqués de diabète. Le nombre de personnes atteintes de diabète de type 2 augmente rapidement dans le monde. (117) Selon l'Organisation mondiale de la Santé (OMS), le diabète (défini comme une hémoglobine A1c (HbA1c) ≥6.5%, une glycémie à jeun ≥126 mg/dL ou une glycémie aléatoire ≥200 mg/dL (118)) est la principale cause de décès dans le monde avec une tendance similaire dans le monde arabe. (119) Les données de la Fédération internationale du diabète estiment que 415 millions des adultes âgés de 20 à 79 ans sont atteints de diabète sucré en 2015 et ce nombre atteindra 642 millions en 2040 avec une augmentation de la prévalence de 8.8 à 10.4%. Cette prévalence est de 3.8% en Afrique, 7.3% en Europe, et 10.7% au MENA. La Chine, l'Inde et les États-Unis restent les trois premiers pays avec le plus grand nombre de personnes atteintes de diabète sucré. (120) L'obésité et le syndrome métabolique sont des FDRs importants du diabète de type 2. (59)

Une femme diabétique présente un risque 44% plus élevé qu'un homme diabétique de développer une MC, (121) et un risque 58% et 13% plus élevé de mortalité par coronaropathie et toutes causes confondues, respectivement. (122) Dans une récente étude de cohorte, le diabète est apparu comme le FDR le plus important dans le développement prématuré de la MC allant d'un RR ajusté de 10.71 au début de la MC chez les moins de 55 ans à 3.47 au début de la MC chez les 75 ans ou plus. (123) Le risque de MC fatale est trois fois plus élevé chez les femmes atteintes de diabète de type 2 que chez les femmes non diabétiques. (120) De même, chez les jeunes femmes, le diabète représente un FDR particulièrement puissant, augmentant leur risque de MC, y compris le SCA, de 4 à 5 fois. (124) De plus, les personnes diabétiques plus âgés présenteraient un risque beaucoup plus élevé de complications vasculaires, en raison de leur durée potentiellement plus longue de la maladie. (125) Les femmes diabétiques présentaient un risque d'IDM plus élevé que les hommes diabétiques (rapport de taux d'incidence : 2.58, IC 95% 2.22-3.00 et 1.78, IC 95% 1.60-2.00, respectivement). (126) La mortalité après un STEMI ou AI/NSTEMI est significativement plus élevée chez les femmes diabétiques de moins de 60 ans que chez les hommes diabétiques du même âge (RR ajusté : 1.44, 1.14-1.84). (127) Les femmes atteintes de diabète de type 2 ont un risque plus précoce d'événements CVs majeurs de 20 à 30 ans et les hommes de 15 à 20 ans par rapport aux personnes non diabétiques. (126)

L'impact plus important du diabète sur les femmes peut être en partie dû à une augmentation plus importante de l'adiposité et de la résistance à l'insuline chez les femmes diabétiques. (128) L'incidence du diabète sucré chez les femmes augmente après la ménopause. (122)

Le diabète peut également exacerber les effets des FDRs coronariens connus chez les femmes. La résistance à l'insuline et l'hyperglycémie agissent comme des déclencheurs négatifs continus altérant l'activité des canaux ioniques, le programme épigénétique et la fonction cellulaire de plusieurs organes. (129) Curieusement, le diabète type 2 pourrait également provoquer des altérations fonctionnelles de la vascularisation coronaire en l'absence de sténose coronarienne obstructive. (130) L'AHA considère le diabète comme l'un des sept principaux FDRs contrôlables de MCV. Le diabète est fréquamment associé à d'autres FDRs (HTA, dyslipidémie, alimentation malsaine, obésité, tabagisme et sédentarité) qui contribuent à aggraver le pronostic des diabétiques même correctement traités et à l'équilibre glycémique. (131)

II.1.2.d Surcharge pondérale, obésité

L'indice de masse corporelle (IMC =poids corporel en kilogramme divisé par la taille en mètres carrés), le périmètre abdominal (plus grande circonférence de l'abdomen lorsqu'un sujet est debout) et le rapport taille/hanche aident à définir la surcharge pondérale. Ainsi, le surpoids, l'obésité et l'obésité sévère chez les adultes sont actuellement définis par des seuils d'IMC de 25, 30 et 40 kg/m^2, respectivement. (132) L'obésité androïde correspond à une augmentation du périmètre abdominal et du rapport taille/hanche au-delà de certaines valeurs définies pour chaque pays ou régions géographiques.

La surcharge pondérale se caractérise par une inflammation chronique avec une augmentation permanente du stress oxydatif et une dérégulation du milieu endocrinien et immunitaire du tissu adipeux. Une production aberrante d'adipokines et de molécules inflammatoires peut entraîner une augmentation de l'athérosclérose et une genèse des MCV. (133) Des altérations du profil métabolique et diverses adaptations de la structure et de la fonction cardiaques se produisent avec l'accumulation de tissu adipeux en excès. (134)

De multiples facteurs tels que les conditions génétiques, comportementales, environnementales, physiologiques, sociales et culturelles sont des causes possibles de l'obésité, qui augmentent tant dans les pays développés que dans les pays en développement. (135) La pandémie actuelle de la surcharge pondérale est un problème majeur de santé

publique, touchant les enfants et les adultes, les hommes et les femmes, et signale une augmentation exponentielle attendue de la charge de morbidité. (136)

Plus de 42% des femmes américaines de 40 à 59 ans ont un IMC ≥30 kg/m^2. (21) Les femmes ont montré une augmentation ininterrompue de la prévalence de l'obésité/surpoids depuis 1999, atteignant 41.5% (obésité) et 68.9% (surpoids) en 2015-2016. L'obésité sévère s'est stabilisée en 2013-2016 (hommes : 5.5 à 5.6% ; femmes : 9.7 à 9.5%), après des augmentations annuelles de 0.2% entre 1999 et 2012. D'ici 2030, si la tendance n'est pas freinée, il est estimé que la plupart des Américains seront obèses ou en surpoids et près de 50% des adultes seront obèses. Il en va de même pour l'adiposité péri-viscérale, qui n'a cessé d'augmenter depuis 1999 et devrait atteindre 55.6% chez les hommes et 80% chez les femmes d'ici 2030. (137) La prévalence plus élevée de l'obésité chez les femmes ne se manifeste qu'à l'âge adulte, avec un pic de prévalence survenant entre 60 et 64 ans. (138) Cette prévalence, peut atteindre 37.5% chez les hommes et 39.4% chez les femmes de plus de 60 ans. (139)

Ainsi, un IMC élevé avec une surcharge pondérale de type androïde présente un risque important de MCV dans la population vieillissante. (80) Un gain d'IMC était associé à un plus grand risque d'IDM et de coronaropathie pour les 2 sexes, (140) en augmentant le risque chez les femmes d'environ 3 fois. (59) Une étude récente a rapporté qu'un IMC plus élevé dans l'enfance serait associé à un risque accru de MC à l'âge adulte. (136) De plus, le risque de mortalité par MCV associée à l'IMC semble plus élevé chez les femmes que chez les hommes. (80)

Les femmes accumulent principalement de la graisse sous-cutanée, tandis que les hommes accumulent beaucoup plus de graisse viscérale. Mais, les femmes ménopausées ont une augmentation de l'accumulation de graisse péri-viscérale, ce qui favorise la résistance à l'insuline, l'inflammation ; (141) en plus, des modifications hormonales, telles qu'une diminution des œstrogènes, qui entraînent un risque accru de syndrome métabolique et de complications CVs chez les femmes ménopausées obèses. (80) L'incidence de l'obésité peut s'élever de 40% chez les femmes ménopausées. (112) De plus, les femmes ménopausées qui ont un IMC normal mais avec une adiposité péri-viscérale élevée semblent plus à risque de mortalité que celles avec un IMC normal et aucune adiposité centrale. (142) Par ailleurs, un IMC plus élevé est également associé à un risque plus important de mort subite et semble être un FDR plus important chez les femmes d'âge moyen que chez les femmes plus âgées. (143)

II.1.2.e Tabagisme

Le tabagisme joue un rôle crucial dans la MCV athérosclérotique. Il déclenche des processus oxydatifs, affecte négativement la fonction plaquettaire, la fibrinolyse, l'inflammation et la fonction vasomotrice ; tous ces effets proathérogènes doublent le risque à 10 ans d'événements mortels chez les fumeurs par rapport aux non-fumeurs. (144) L'usage du tabac est en augmentation chez les adolescents et les jeunes adultes, les femmes semblent utiliser le tabagisme comme stratégie de gestion du poids. (79) Dans plusieurs études, une relation dose-réponse a été observée chez les fumeurs actuels entre le nombre de cigarettes fumées par jour et l'incidence des MC. (2) Le tabagisme est associé à une apparition plus précoce des MCV de 5.1 et 3.8 ans chez les hommes et les femmes, respectivement. (145) Par rapport aux femmes qui n'ont jamais fumé, les fumeuses ont un risque accru d'incidence de MC et d'AVC, ainsi que de mortalité par MC et toutes causes confondues. (86) avec un risque de MC 25% plus élevé que les fumeurs. (146) De plus, le risque d'IDM semble plus élevé chez les fumeuses que chez les non-fumeuses, voire même plus élevé que chez les fumeurs (RR : 2.89, IC 95% (2.44–3.42) vs 2.26 (1.99–2.56)). (147) Les femmes fumeuses semblent plus susceptibles de subir une ménopause naturelle plus précoce que les non-fumeuses, ce qui augmente le risque de coronaropathie. Une intensité plus élevée, une durée plus longue, une dose cumulative plus élevée, un âge plus précoce au début du tabagisme et un délai plus court depuis l'arrêt du tabac étaient associés à un risque accru de ménopause prématurée et précoce chez les fumeuses actuelles et anciennes. (148)

Les preuves scientifiques soutiennent que le tabagisme reste la principale cause de décès évitable dans le monde aujourd'hui. (149) Si aucune mesure sérieuse n'est prise, les décès annuels liés au tabac devraient passer à 8 millions d'ici 2030, ce qui représente 10% de tous les décès. (150) Le sevrage tabagique réduit le risque de morbidité et de mortalité CVs chez les fumeurs avec et sans coronaropathie, et le risque diminue d'autant plus que le temps écoulé depuis l'arrêt du tabac est long. (2) Malheureusement, les données suggèrent que les femmes semblent moins susceptibles de s'arrêter de fumer que les hommes. (151)

Les fumeuses passives sont également à risque de dommages CVs. Les non-fumeuses exposées à la fumée secondaire augmentent de plus de 40% leur risque de développer une MC. (152,153)

II.1.2.f Inactivité physique, sédentarité

L'inactivité physique est le quatrième FDR de mortalité. (154) Selon les estimations mondiales, un adulte sur quatre (27.5%) (155) et plus des trois quarts (81%) des adolescents (156) ne respectent pas les recommandations de l'OMS concernant l'AP. (157) Les niveaux d'AP insuffisante sont particulièrement élevés et continuent d'augmenter dans les pays à revenu élevé, et dans le monde entier. Les femmes paraissent moins actives physiquement que les hommes (31.7% contre 23.4%). (155) Pourtant, une AP régulière réduit le risque CV, par la décélération de la progression de l'athérosclérose, l'amélioration de la dysfonction endothéliale, la diminution de l'inflammation systémique et le contrôle de divers FdRCVs connus tels que l'hypertension, le diabète et l'obésité. (158) La marche et la position debout semblent significativement associées à une réduction des réponses glycémiques et insuliniques postprandiales par rapport à la position assise prolongée chez les femmes ménopausées présentant un risque élevé de diabète de type 2. (159) Les femmes qui participent au moins à une AP liée au transport (marche ou vélo) réduisent de manière significative l'incidence des MCV [MC, AVC et insuffisance cardiaque] (RR : 0.91, IC 95% : 0.83-0.99) par rapport à celles qui n'y participent pas. (160) La danse est une activité multidimensionnelle de nature psychosociale, qui s'est avérée efficace, comme la marche, pour améliorer les FdRCVs et le risque de chute chez les femmes âgées en bonne santé. (161) Tous les mouvements sont importants pour la prévention des MC chez les femmes âgées. Chaque augmentation d'une heure par jour de l'AP d'intensité légère était associée à une diminution du risque de MC chez les femmes (RR : 0.86, IC 95% : 0.73-1.00). De même, une AP d'intensité modérée à vigoureuse peut réduire jusqu'à 46% le risque d'événements coronariens par rapport aux femmes moins actives. (162) En outre, les femmes plus âgées (63-99 ans), avec une plus grande quantité d'AP totale, légère et modérée à vigoureuse, bénéficient de meilleurs niveaux de LDL et HDL, de triglycérides, de glucose, d'IMC, de Protéine C réactive (CRP) et de score de risque de Reynolds. (163) Un niveau élevé d'AP peut non seulement améliorer l'espérance de vie, mais aussi augmenter le nombre d'années vécues sans MCV (2,4 ans chez les femmes et 3,1 ans chez les hommes). (164) Les récentes directives de l'ESC recommandent aux adultes de tous âges de s'efforcer de pratiquer au moins 150 à 300 minutes d'AP d'intensité modérée par semaine.(165)

Le comportement sédentaire est un FDR indépendant de MC, qui peut être défini comme « tout comportement éveillé caractérisé par une dépense énergétique ≤1.5 MET (équivalent métabolique) en position assise ». (166) Le comportement sédentaire n'est pas synonyme

d'inactivité physique, ce sont deux FDRs distincts et indépendants de maladie chronique. (167) Sur la base d'études épidémiologiques récentes, il a été suggéré que le temps sédentaire et son accumulation peuvent avoir un impact sur la santé CV des femmes âgées. Ils ont été associés dans une relation dose-réponse à un risque accru de MCV, avec des rapports de risque jusqu'à 2 fois plus élevés pour la MC que pour les MCV. En moyenne, chaque heure supplémentaire de sédentarité chez les femmes âgées était associée à une augmentation de 12% du risque ajusté de MCV. De même, chaque augmentation d'une minute de la durée des épisodes sédentaires était associée à un risque de 4%. (168) L'interruption de périodes sédentaires prolongées de 5 minutes toutes les 30 minutes par une activité debout ou une marche d'intensité légère pourrait réduire le métabolisme postprandial du glucose, les réponses de l'insuline et des acides gras non estérifiés chez les femmes ménopausées et dysglycémiques. (159)

II.1.2.g Déséquilibre nutritionnel

Une alimentation déséquilibrée est un FDR modifiable qui favorise l'athérogenèse et l'inflammation. (79) Le manque d'attention aux recommandations nutritionnelles et le choix d'aliments riches en graisses, en sucres ajoutés et en aliments transformés sont en augmentation dans le monde entier. (169) Les glucides de mauvaise qualité ou hautement transformés sont associés à une prise de poids à long terme, au diabète et aux MC. Ces effets indésirables semblent être plus importants chez les femmes que chez les hommes. (170,171) De même, les acides gras trans pourraient entraîner un risque accru de MC et d'AVC. (172) De plus, l'adhésion à un modèle alimentaire occidental ou à une surconsommation de sucres rapides et de « fast-food » semble être associée à un risque plus élevé de coronaropathie chez les femmes (OR ajusté : 1.38, IC 95% : 1.03-1.83 et 3.91, IC 95% : 2.42-6.63, respectivement) que chez les hommes (OR ajusté : 1.35, IC 95% : 0.99-1.83 et 3.64, IC 95% : 2.25-5.89, respectivement). Les décès par coronaropathie attribuables aux acides gras trans concernent principalement le groupe d'âge des 75 ans et plus, mais davantage les femmes (82%) que les hommes (62%). (173)

En revanche, le régime alimentaire dit modèle « méditerranéen » réduit significativement de 30% le risque de coronaropathie chez les femmes (OR ajusté : 0.7, IC 95% : 0.55-0.89). (174)

D'autres régimes alimentaires, bénéfiques pour la santé, existent tels que les approches diététiques pour lutter contre l'HTA (DASH). (175) En moyenne, les femmes semblent présenter de meilleures habitudes alimentaires que les hommes. (176) Les études orientent sur

les priorités alimentaires essentielles pour la santé cardiométabolique. Il s'agit notamment des priorités alimentaires suivantes : plus de fruits, de légumes non amylacés, de noix, de légumineuses, de poisson, d'huiles végétales, de yaourts et de céréales complètes, et moins de viandes rouges, de viandes transformées et d'aliments riches en glucides raffinés et en sel. (177)

II.1.2.h Syndrome métabolique

Le syndrome métabolique est un regroupement de FDRs qui augmente le risque de MC. (79) Selon la définition de National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III), le syndrome métabolique est présent si au moins trois des cinq critères suivants sont présents : profil de répartition des graisses de type androïde ; HTA ou utilisation de médicaments antihypertenseurs ; hypertriglycéridémie (triglycérides à jeun ≥1.7 mmol/L) ; hypoHDLémie (HDL à jeun < 1.03 mmol/L chez les hommes ou 1.30 mmol/L chez les femmes), diabète sucré (glycémie à jeun ≥5.6 mmol/L) ou utilisation de traitement antidiabétique. (178) La définition du syndrome métabolique selon la Fédération internationale du diabète comporte quelques modifications car elle exige l'obésité androïde comme critère obligatoire, et deux ou plus des autres critères ci-dessus. (178)

La prévalence du syndrome métabolique, est associée au risque de coronaropathie. (178) Le syndrome métabolique augmente le risque de décès toutes causes confondues [RR : 1.220, IC 95% (1.103-1,349)], de décès CV [RR : 1.360, IC 95% (1.152-1.606)], d'IDM [RR : 1.460, IC 95% (1.242-1.716)]. (179,180) Le risque de syndrome métabolique augmente avec l'âge, et chez les femmes, sa prévalence semble augmenter avec la ménopause, au-delà des effets du vieillissement chronologique. (181) En outre, un rapport de la cohorte Atherosclerosis Risk in Communities a révélé que la progression et l'augmentation de la gravité du syndrome métabolique étaient plus importantes à la fin de la période préménopausique et périménopausique qu'après la ménopause. (182) L'une des études a montré que les femmes présentaient des associations linéaires plus fortes entre le nombre de composants du syndrome métabolique et la vitesse de l'onde de pouls brachial-cheville que les hommes, suggérant des effets plus prononcés du syndrome métabolique sur la rigidité artérielle chez les femmes que chez les hommes. Une rigidité artérielle accrue a été préconisée comme FDR indépendant de mortalité et de morbidité CVs. (183) Certaines preuves suggèrent que le syndrome métabolique est en effet « plus que la somme de ses parties », et exige la nécessité d'explorer sa base pathogène et ses implications thérapeutiques. (184)

II.1.2.i Syndrome d'apnées obstructives du sommeil

Le syndrome d'apnées obstructives du sommeil (SAOS) est un trouble courant avec près d'un milliard de personnes touchées dans le monde, et est étroitement liée à l'épidémie d'obésité. (185) De plus, le SAOS contribue au risque de MCV, en particulier en augmentant la PA. (186) Les différences de risque attribuable aux troubles du sommeil diffèrent entre les hommes, les femmes pré- et post-ménopausées. (187,188) Le SAOS a été classiquement considérée comme affectant principalement les hommes, et peut être sous-diagnostiquée chez les femmes dans les essais cliniques, malgré une prévalence accrue d'apnées du sommeil après la ménopause. (186) Selon certaines études, 46% des personnes (59% d'hommes, 33% de femmes) présenteraient un score d'apnées-hypopnées ≥5 par heure de sommeil (la valeur seuil indicative de la maladie), tandis que 21% des personnes (30% d'hommes, 13% des femmes) présenteraient un score d'apnées-hypopnées ≥15 par heure de sommeil. (189) La prévalence du SAOS varie avec l'âge, l de 3% chez les femmes et 10% chez les hommes entre 30 et 49 ans, et de 9% et 17% entre 50 et 70 ans, respectivement. (190) Le SAOS sévère non traité est fortement associé à la morbidité et à la mortalité CVs chez les 2 sexes, (186), et en particulier, les femmes non traitées ont un risque d'incidence de la MC 77% plus élevé que celles qui sont traitées. (191) Bien que la ventilation en pression positive continue (PPC) soit une thérapie efficace pour le traitement du SAOS, son impact sur la réduction des MCV reste un sujet de débat. (192) Une méta-analyse récente a révélé que le traitement par PPC diminue la somnolence diurne et améliore la qualité de vie, mais ne semble pas avoir d'impact sur les résultats CVs. (193) Des études complémentaires permettant de détecter les différences liées au sexe sont nécessaires pour confirmer son efficacité dans la prévention des MCV. (194) Le dépistage du SAOS devrait être amélioré chez les femmes, car elles peuvent présenter des plaintes fonctionnelles atypiques. (79)

II.2 Autres facteurs de risque CVs

II.2.1 Inflammation chronique

II.2.1.a Maladies auto-immunes systémiques

La réactivité immunitaire augmente chez les femmes pendant et après la transition ménopausique. (195) Les troubles auto-immunes systémiques, tels que le lupus érythémateux disséminé, la polyarthrite rhumatoïde, le syndrome des antiphospholipides, le syndrome de Sjögren et les troubles thyroïdiens sont associés à un risque accru de MCV, chez les hommes

et les femmes. (196–198) Les patients atteints de ces troubles présenteraient également un regroupement plus élevé de FDRs traditionnels. (199) Dans les maladies auto-immunes, la réponse immunitaire aux auto-antigènes entraîne des dommages ou un dysfonctionnement des tissus, qui peuvent survenir de manière systémique ou affecter des organes spécifiques. (94) Ces maladies inflammatoires affectent la microvascularisation et peuvent également entraîner une instabilité de la plaque d'athérome, ce qui peut augmenter le risque d'événements CVs aigus. (100)

La plupart des maladies auto-immunes systémiques touchent plus fréquemment les femmes : elles sont 2 à 3 fois plus susceptibles de développer une polyarthrite rhumatoïde que les hommes, et neuf fois plus susceptibles de développer un lupus érythémateux disséminé. (200) Les patients atteints de polyarthrite rhumatoïde ont un risque 2 à 3 fois plus élevé de MC et d'IDM et un risque 50% plus élevé d'AVC. (201,202) Pour le lupus érythémateux, le risque d'IDM est augmenté de 9 à 50 fois par rapport à celui de la population générale. (100,203) Chez les patients porteurs d'anticorps antiphospholipides, la prévalence des MCV varie de 1.7 à 6%, et pourrait augmenter jusqu'à 14%. Dans le syndrome de Sjögren, des événements CVs peuvent survenir dans 5 à 7.7% des cas. (196)

II.2.1.b Marqueurs biologiques de l'inflammation

Une corrélation entre l'inflammation et les MC a été mise en évidence et certains biomarqueurs de l'inflammation, peuvent être des éléments indiquant un risque de MCV : la protéine C réactive à haute sensibilité (hs-CRP), les cytokines, et le facteur de nécrose tumorale (TNF-α). (204) Toutefois, ce sont des marqueurs aspécifiques, aussi l'utilité des biomarqueurs seuls comme outils de dépistage de MC est controversée. (112)

Des taux de CRP <1, 1 à 3 et >3 mg/dl correspondent respectivement à un risque faible, modéré et élevé de MCV. (205) Chez les femmes ménopausées, l'élévation de la CRP serait l'un des facteurs prédictifs les plus importants du risque de MC, (206) même si les femmes ont tendance à avoir des taux de CRP plus élevés que les hommes. (207,208) Des taux élevés de CRP après un IDM seraient significativement associés à une incidence accrue de complications cardiaques, notamment l'insuffisance cardiaque et la mort subite. (207)

II.2.2 Dépression et autres facteurs psychosociaux

Les facteurs psychologiques, comprenant la dépression, l'anxiété, la colère, l'hostilité, le stress aigu et chronique de la vie et le manque de soutien social, constituent un autre déterminant de l'état de santé des individus. (209) Le stress chronique a été impliqué dans le développement

et l'accélération des changements athérosclérotiques dans les artères coronaires. (210) Certains facteurs psychologiques et le stress émotionnel peuvent influencer l'apparition et l'évolution clinique des cardiopathies ischémiques, en particulier chez les femmes. Dans l'étude INTERHEART, l'exposition globale aux FDRs psychosociaux était significativement associée à l'IDM chez les femmes, avec un OR ajusté de 3.5. (211) Les jeunes femmes atteintes d'IDM avaient des scores de stress perçu significativement plus élevés que les jeunes hommes selon l'étude VIRGO, et une récupération plus faible sur presque tous les éléments de santé 1 mois après leur IDM. Ces femmes présentaient par ailleurs des taux significativement plus élevés de diabète sucré, de dépression, d'antécédents d'ACT et d'AVC que les hommes. (212) De même, les femmes qui ont survécu à un IDM récent sont deux fois plus susceptibles de développer une ischémie myocardique en cas de stress mental que les hommes d'un âge similaire. (213) Il apparaît que les personnes stressées semblent également avoir tendance à adopter des modes de vie moins sains (tabagisme, consommation excessive d'alcool, AP réduite et nutrition peu équilibrée) donc un risque accru de présenter des FdRCVs traditionnels, augmentant ainsi leur risque de développer des MCV. (209)

Les interactions sociales semblent être un facteur atténuant important de l'incidence de la MC chez les femmes, (214) De plus, une disposition optimiste et une vitalité émotionnelle (caractérisée par un sentiment d'énergie, un bien-être positif et une régulation efficace des émotions) étaient associées à un risque réduit de MC chez les femmes, selon l'étude de Women's Health Initiative. (215)

L'anxiété est un FDR indépendant d'événements coronariens et de mortalité cardiaque chez les hommes et les femmes, (216) et serait associé à une augmentation de 52% de l'incidence des MCV. (217) La transition ménopausique jusqu'à la fin de la périménopause serait propice à une plus grande instabilité émotionnelle avec anxiété. (86) L'anxiété s'est avérée associée chez les patients post-IDM à un risque accru de nouveaux événements cardiaques, de mortalité cardiaque et de mortalité toutes causes confondues. Une méta-analyse a rapporté que l'anxiété post-IDM serait associée à un risque accru de 21 à 25% d'évolution défavorable. (218)

La colère/l'hostilité ont été signalées comme des prédicteurs significatifs d'un risque accru de présenter une cardiopathie ischémique, ou des événements en lien avec l'athérosclérose. (219) Ainsi, une revue systématique analysant l'association de la colère avec l'IDM, l'AVC, la rupture d'anévrysme et les arythmies ventriculaires a noté une augmentation des événements CVs dans les 2 heures suivant la crise de colère. (220)

De tous les facteurs psychosociaux associés aux MCV, le lien entre la dépression et les MCV est probablement le mieux documenté. (221) La dépression est deux fois plus fréquente chez les femmes que chez les hommes dans la population générale. (222) 20 à 25% de femmes souffriraient de dépression au cours de leur vie. (222) La dépression survient plus fréquemment pendant la périménopause et la postménopause. (86) Les femmes atteintes de MC ont une prévalence de dépression plus élevée que les hommes (avec un OR ajusté = 1.64). (223) Un diagnostic de troubles dépressifs à tout moment après un diagnostic confirmé de coronaropathie était associé à un risque doublé de décès. (224) Dans la Nurses Health Study (NHS), la dépression était associée à des événements coronariens mortels chez les femmes (HR : 1.49, IC 95% : 1.11-2.00) ; et l'utilisation d'antidépresseurs était associée à un risque accru de mort subite (HR : 3.34, IC 95% : 2.03-5.50). (225) Il a même été suggéré une relation dose-réponse entre la dépression et la MC ; plus la dépression est grave, plus le risque de développer une MC paraît élevé. (226)

Divers mécanismes peuvent potentiellement expliquer la comorbidité des MCV et de la dépression. Parmi ceux-ci, l'inflammation impliquant le système immunitaire est considérée comme un mécanisme courant de dépression et de maladie cardiaque, des cytokines ou des voies inflammatoires spécifiques étant des cibles potentielles pour la prévention et le traitement des maladies concomitantes. (227) En outre, la dépression chez les femmes pourrait être associée à une diminution du contrôle des FDRs modifiables et à une mauvaise adhérence aux traitements prescrits. (228)

II.2.3 Données économiques et sociales

II.2.3.a Statut socio-économique

Un faible niveau socio-économique est un facteur connu comme étant associé à un risque majoré de développer une coronaropathie. Ce facteur pourrait avoir un poids plus important chez les femmes que les hommes. (229) Le fardeau des FDRs modifiables est plus élevé chez les femmes de statut socio-économique inférieur. (230) Les femmes éduquées semblent moins susceptibles de fumer, de souffrir d'HTA, de diabète ou d'obésité, et seraient plus susceptibles de participer à une AP vigoureuse ; une diminution des événements CVs incidents a été observée avec l'augmentation des niveaux d'éducation et de revenu. (231) Une étude récente a montré que les hommes et les femmes d'un groupe à faible statut socioéconomique présentaient un taux de décès par IDM et MC doublé par rapport aux personnes ayant un statut socioéconomique plus élevé. (232) La volatilité et les baisses de revenu au cours d'une période

de 15 ans d'années de revenus étaient indépendamment associées à un risque presque 2 fois supérieur de MCV et de mortalité toutes causes confondues. (233)

Les travailleurs des classes professionnelles inférieures ont tendance à avoir un profil de risque CV plus élevé, en particulier dans les pays occidentaux. (234) Les conditions de l'environnement de travail telles que le stress élevé au travail et l'insécurité de l'emploi peuvent également contribuer de manière significative au développement de la MC. (235,236) De plus, une relation dose-réponse entre les heures de travail et les MCV incidentes a été mise en évidence. (237) L'étude de « Women's Ischemia Syndrome Evaluation Study » a montré qu'un faible statut socio-économique était le meilleur prédicteur de mortalité et de morbidité chez les femmes présentant des symptômes d'ischémie myocardique. (238)

II.2.3.b Qualité de vie

La qualité de vie liée à la santé (QVLS) est un indicateur considéré comme important dans les maladies chroniques, en particulier les MCV. (239) La présence des FdRCVs paraît liée à des scores plus faibles dans les domaines physique et psychologique de la qualité de vie, tandis que le sexe masculin et la pratique d'une AP régulière avaient des effets positifs sur la qualité de vie. (240) Un risque de MCV à 10 ans ≥20% s'est révélé être un prédicteur indépendant d'une altération de la QVLS dans la population générale. En particulier, des difficultés motrices (OR : 1.56, IC 95%, 1.09-2.24), des problèmes de soins personnels (OR : 2.14, IC 95%, 1.09-4.22) et un impact négatif sur les activités habituelles (OR : 1.80, IC 95%, 1.17-2.78) altéraient la qualité de vie chez les femmes. (239) Les inégalités socio-économiques affectent également la QVLS. Un statut socio-économique faible paraît associé à une QVLS inférieure. Les femmes atteintes de MCV présentent généralement une QVLS inférieure à celle des hommes en termes physiques et psychologiques. (241) Les personnes ayant un statut socio-économique faible et un mode de vie moins sain présentaient un risque de mortalité et de MCV de 2.09 à 3.53 fois plus élevé que celles ayant un statut socio-économique élevé et un mode de vie plus sain. (242)

II.2.4 Pollution

Un domaine d'intérêt croissant pour le public et la recherche est celui de l'impact des polluants atmosphériques sur la santé CV. (243) Parmi les trois polluants atmosphériques les plus courants (matières particulaires (PM), ozone et dioxyde d'azote), les PM semblent avoir l'impact le plus marqué sur les MCV, représentant la grande majorité de la charge de morbidité. (244) Les PM se sont avérées être associées à un risque accru d'événements

coronariens chez les femmes. L'estimation quantitative du rapport de risque relatif entre les femmes et les hommes a indiqué que les femmes présentaient un risque de coronaropathie supérieur de 5% par augmentation de 10 µg/m3 des $PM_{2.5}$ (particules de 2.5 µm ou moins de diamètre). (245)

Une augmentation du risque de cardiopathie ischémique peut être observée rapidement, dans les deux heures après l'exposition à des PM à taux élevé. (246) Bell et al. ont utilisé la modélisation hiérarchique bayésienne pour estimer l'association entre les particules fines ($PM_{2.5}$) et les MCV. Ces auteurs ont constaté que les femmes étaient plus susceptibles que les hommes d'être hospitalisées pour des causes respiratoires et CVs les jours où le nombre de particules fines était plus élevé. Une augmentation de 1.13% contre 0.03% du risque d'admission pour troubles du rythme cardiaque a été observée chez les femmes et les hommes, respectivement, le jour d'une augmentation de 10 g/m^3 des $PM_{2.5.}$ (247) De même, les particules PM_{10} (particules de diamètre inférieur à 10 µm) étaient associées à un risque accru de 12% d'événements coronariens par élévation de 10 $µg/m^3$ selon l'étude ESCAPE menée à travers l'Europe. (248)

Plusieurs mécanismes possibles par lesquels l'exposition (à court ou à long terme) à la pollution atmosphérique peut affecter le système CV, notamment le dysfonctionnement endothélial et la vasoconstriction, l'inflammation systémique, le stress oxydatif systémique, la thrombose et la coagulation, les modifications de la PA, la progression de l'athérosclérose et la variabilité réduite de la fréquence cardiaque. (246) De plus, une relation bidirectionnelle entre la pollution de l'air et les FdRCVs existent également. (249) Les PM augmentent la capacité des FDRs traditionnels à accélérer le développement de l'athérosclérose dans des contextes expérimentaux. En tant que tel, il est également plausible que les expositions à long terme puissent augmenter encore plus le risque CV en augmentant la susceptibilité d'un individu à de futurs événements CVs ou à des expositions aiguës. (246)

II.2.5 Facteurs iatrogènes

II.2.5.a Radiothérapie

L'irradiation de la paroi thoracique ou du médiastin pour le traitement de tumeurs malignes telles que le lymphome de Hodgkin et le cancer du sein est associée à un risque accru de MC. (250) Les complications CVs du traitement du cancer pèsent lourdement en termes de morbi-mortalité. (251) L'augmentation du risque est proportionnelle à la dose moyenne d'irradiation cardiaque, et augmente dans les 5 premières années après l'exposition en se poursuivant

pendant 20 ans. Le taux d'événements augmente de 7.4% par gray de rayonnement. Les femmes qui présentent des FdRCVs préexistants ont une augmentation absolue plus importante du risque d'atteinte cardiaque post-radiothérapie que les autres femmes. (250) La dose d'irradiation moyenne de l'artère coronaire interventriculaire antérieure (IVA) ainsi que la dose d'irradiation cardiaque moyenne sont fortement corrélées à la MC. (252) En général, les femmes traitées par radiothérapie pour un cancer du sein gauche présentaient un risque de MC plus de deux fois supérieur à celui des femmes traitées par radiothérapie pour un cancer du sein droit; (253) l'irradiation du sein gauche et de la paroi thoracique est associée à l'athérosclérose de l'artère IVA médiane et distale, de la diagonale distale et de l'artère coronaire droite proximale. (254)

Les mécanismes en cause sont discutés (112) mais la radiothérapie semble avoir des effets significatifs sur la macrovascularisation et la microvascularisation cardiaques. Dans les gros vaisseaux sanguins, tels que les artères coronaires et carotides, la radiothérapie provoque une inflammation et des dommages oxydatifs qui, en présence d'un taux de cholestérol élevé, entraînent la peroxydation des lipides et la formation de cellules spumeuses qui initient le processus athéroscléreux. La radiothérapie entraîne une athérosclérose accélérée, avec une média/adventice épaissie et fibreuse. (255) Par conséquent, il est extrêmement important d'associer une prévention des MCV à la prise en charge médicale des femmes qui présentent un cancer du sein traité par radiothérapie. (79)

II.2.5.b Thérapeutiques médicamenteuses

Un large éventail de substances pharmaceutiques peut induire des effets secondaires entraînant des modifications ou des événements CVs, s'ajoutant à d'autres FDRs ou aggravant une MCV préexistante. (256) Les femmes semblent présenter une incidence plus élevée (1.5 à 1.7 fois) d'effets indésirables des médicaments CVs et ceux-ci ont tendance à être plus graves que chez les hommes, nécessitant plus souvent des hospitalisations. (257)

Toutefois, les causes de l'incidence plus élevée des effets indésirables des médicaments chez les femmes ne sont pas claires et restent discutées. (258)

II.3 Facteurs de risque CVs spécifiques aux femmes

II.3.1 Syndrome des ovaires polykystiques

Le syndrome des ovaires polykystiques (SOPK) est un trouble endocrinien hétérogène, qui affecte 6 à 16% des femmes avec une variation ethnique marquée, et est une cause importante d'infertilité. (259) La dysovulation, l'hyperandrogénie et les troubles métaboliques, en particulier la résistance à l'insuline, sont au centre de la maladie. Selon les critères de Rotterdam, au moins deux des trois caractéristiques suivantes doivent être présentes : dysfonctionnement ovulatoire, hyperandrogénie clinique ou biochimique et morphologie d'ovaires polykystiques. (260) Le SOPK a été associé à de nombreux FdRCVs, notamment l'obésité, la dyslipidémie, l'hypertension, le diabète de type 2 et des marqueurs inflammatoires élevés. (261) De plus, les androgènes sont également connus pour réguler positivement les composants du système rénine-angiotensine avec une élévation conséquente de la PA et un stress oxydatif accru. (194) Les troubles de l'humeur, principalement une dépression sévère, sont fréquents chez les femmes atteintes du SOPK et contribuent à une altération de la qualité de vie, de la fatigue, des troubles du sommeil, des changements d'appétit et des crises de boulimie entraînant un IMC plus élevé et une plus grande résistance à l'insuline et des FDRs de MCV que les femmes non-déprimées atteintes du SOPK. (262) Bien que la plupart des femmes soient diagnostiquées dans la vingtaine et la trentaine, les études de suivi à long terme sont limitées. (16) A noter que plusieurs FdRCVs associés au SOPK semblent s'améliorer avec le temps. (263) Dans une méta-analyse, le risque de MCV était augmenté chez les femmes en âge de procréer, mais pas chez les femmes ménopausées/vieillissantes. (264) Cela peut être lié à une modification opportune des FdRCVs, à un effet cardio-protecteur d'une ménopause retardée ou à d'autres facteurs (génétiques) inconnus. (265,266)

II.3.2 Grossesse

II.3.2.a Pré-éclampsie

La grossesse est souvent citée comme offrant un aperçu de la santé future d'une femme avec des complications de la grossesse associées à un risque accru de MCV. (267) Une méta-analyse récente a conclu que le risque de coronaropathie était plus élevé chez les femmes ayant des antécédents d'hypertension gestationnelle, de prééclampsie, de décollement placentaire, d'accouchement prématuré, de diabète sucré gestationnel et de mortinatalité. (268) De plus, il a été démontré qu'un accouchement prématuré (<37 semaines de gestation) au cours de la

première grossesse était indépendamment associé à un risque 1.42 fois plus élevé de coronaropathie, par rapport aux femmes ayant accouché à terme (≥37 semaines) à la première grossesse. (269) L'obésité pendant la grossesse est également associée à des conséquences néfastes à court et à long terme pour la mère et l'enfant. (270)

Une HTA d'apparition récente après 20 semaines de gestation ainsi qu'une protéinurie et des lésions des organes cibles sont des critères de prééclampsie, (194) qui affecte 5 à 10% des grossesses dans le monde. (16) L'HTA préexistante est associée à un risque accru de développer une pré-éclampsie qui peut compliquer alors jusqu'à 25% des grossesses de femmes hypertendues. (16) La prééclampsie amplifie les manifestations physiologiques de la grossesse, notamment la résistance à l'insuline, l'hyperlipidémie, l'inflammation et l'hypercoagulabilité, qui pourraient à leur tour se traduire par un syndrome métabolique pendant la grossesse. (194) Un diagnostic de pré-éclampsie double le risque de développer un diabète futur chez la mère, (271) et triple le risque d'HTA d'apparition plus tardive. (272)

Une combinaison de ces FDRs semble potentialiser le risque CV. La survenue d'événements coronariens majeurs et la mortalité étaient 5.4 fois plus élevées après une prééclampsie associée à un accouchement prématuré et 3.3 fois plus élevées après une prééclampsie associée à des nourrissons de petit poids pour l'âge gestationnel. (273) En conséquence, l'ajout des complications de la grossesse aux modèles de risque traditionnels a conduit à des améliorations significatives dans la prédiction du risque de MCV chez la femme. (274) Ainsi, une orientation post-partum appropriée vers un médecin de soins primaires ou un cardiologue pourrait permettre que, dans les années qui suivent la grossesse, les FDRs puissent être soigneusement surveillés et contrôlés. (275)

II.3.2.b Interruptions spontanées de grossesses récurrentes

Les interruptions spontanées de grossesse correspondent aux grossesses interrompues entre la conception jusqu'à 24 semaines de gestation. (276) Les femmes ayant des antécédents de deux interruptions spontanées ou plus, consécutives ou non, semblent avoir un risque accru de MC. (277) Les MCV et les interruptions spontanées de grossesse récurrentes partagent des FDRs communs tels que le tabagisme, l'obésité et un dysfonctionnement endothélial. (278) Certaines études ont montré que les femmes issues de familles présentant une maladie athéroscléreuse pourraient être prédisposées aux fausses couches, ce qui pourrait induire un risque accru de MC et d'AVC. (279) Des antécédents familiaux détaillés de MCV et les antécédents de grossesse devraient donc faire partie intégrante de l'évaluation du risque CV chez les femmes.

II.3.2.c Diabète gestationnel

Le diabète gestationnel est une maladie développée au cours des deuxième et troisième trimestres de la grossesse, caractérisée par une résistance marquée à l'insuline, secondaire à la libération d'hormones placentaires (280) survenant dans environ 7% des grossesses. (16) Bien que le métabolisme du glucose revienne à la normale généralement après l'accouchement, (100) les femmes atteintes de diabète gestationnel et leurs descendants ont un risque plus élevé de complications à court et à long terme, y compris - dans le cas des mères - le développement ultérieur du diabète sucré de type 2 et des MCV. Les descendants courent à leur tour un risque accru de souffrir d'obésité, de diabète sucré de type 2 et de syndrome métabolique. (281) Les femmes diagnostiquées avec un diabète gestationnel semblent 20 fois plus susceptibles de développer un diabète de type 2 et deux fois plus susceptibles de développer une HTA. (282) De plus, il a été démontré que le développement d'un diabète gestationnel augmentait le risque de coronaropathie de 2 à 3 fois, même 25 ans après l'accouchement, (283), le risque semblant plus marqué dans les dix ans suivant l'accouchement. (284)

L'identification et le traitement précoce des femmes atteintes de diabète gestationnel peuvent réduire les complications pendant la grossesse et pendant la période périnatale. (281)

Cependant, malgré ces risques relatifs élevés, moins de 60% des femmes diagnostiquées avec un diabète gestationnel ont été évaluées en soins primaires pour exclure le diabète de type 2 dans la première année après l'accouchement. Il est donc nécessaire d'améliorer la prise en charge de ces femmes qui constituent un groupe à risque identifiable et sont des cibles idéales pour les interventions préventives. (282) Il est recommandé que toutes les femmes atteintes de diabète gestationnel subissent le test d'hyperglycémie provoquée par voie orale 4 à 12 semaines après l'accouchement. L'American Diabetes Association (ADA) recommande de répéter les tests tous les 1 à 3 ans pour les femmes ayant un diabète gestationnel et des résultats de tests glycémiques post-partum normaux. (285)

II.3.3 Ménopause, thérapie hormonale substitutive (THS)

La ménopause signifie l'arrêt définitif de la fonction ovarienne et la transition de la femme d'une phase reproductive à une phase non reproductive de la vie. Elle marque une étape critique caractérisée par des changements remarquables dans les schémas hormonaux et menstruels, ainsi que par des symptômes physiologiques et psychosociaux. (86) L'œstrogène est souvent reconnu par son effet cardioprotecteur chez les femmes préménopausées en retardant l'apparition de la coronaropathie d'environ 8 à 10 ans. (112) Des études expérimentales ont rapporté le rôle bénéfique des œstrogènes pour les 2 sexes, dans le soutien

de l'homéostasie mitochondriale, la réduction du stress oxydatif et la protection contre la fibrose cardiaque. (286)

Le passage au statut postménopausique est associé à une aggravation de risque de MC chez les femmes, qui transmet le même niveau de risque CV que les hommes. (287) Il a été rapporté que le risque de MCV augmente de 2 à 4 fois chez les femmes après la ménopause, ce qui pourrait expliquer l'apparition généralement retardée des événements CVs chez les femmes. (288) Les effets de la ménopause comprennent une augmentation du poids corporel, une modification de la distribution des graisses, une obésité centripète et un dépôt de graisse péri-viscérale, conduisant à un risque accru de syndrome métabolique. (289) De plus, les femmes ménopausées courent également un risque plus important de dyslipidémie, d'HTA et de diabète sucré. (288)

Les études prospectives rapportent une incidence élevée de coronaropathie chez les femmes ayant subi une hystérectomie/ovariectomie (RR : 1.51, IC 95% : 1.34-1.71). (290) Les femmes qui subissent une ménopause précoce courent un risque accru de MC, par rapport à celles qui ont une ménopause naturelle. Les femmes avec une ménopause prématurée (avant 45 ans) sont 1.5 fois plus susceptibles de souffrir de MC. (291) De plus, les femmes avec une déficience endogène en œstrogènes présentaient un risque accru d'athérosclérose et de MC ultérieure. (292) Toutefois des éléments de compréhension doivent encore être affinés puisqu'il semblerait ne pas exister de bénéfice du THS dans les essais de prévention primaire et secondaire des MCV. (293)

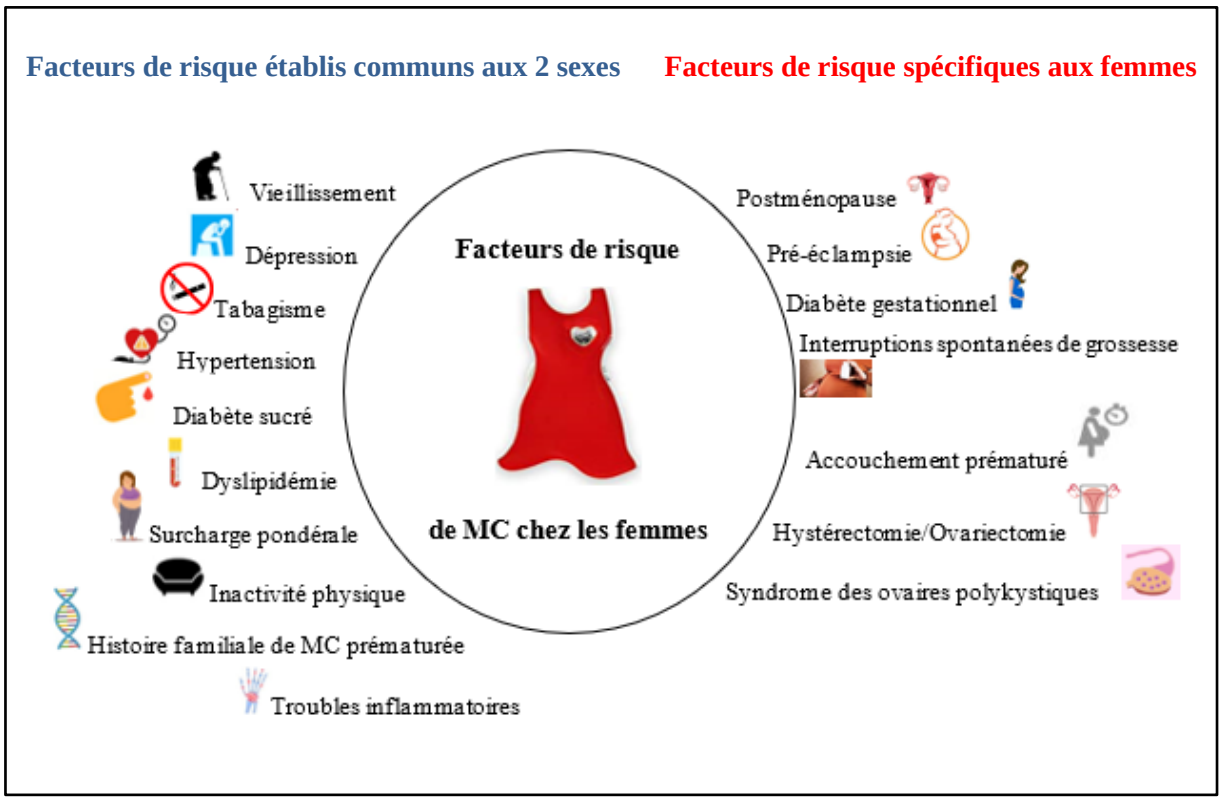

Figure 5. Facteurs de risque de maladie coronarienne chez les femmes. (d'après 294)

D'après les dernières directives de l'European Society of Cardiology/European Atherosclerosis Society (ESC/EAS), les cibles et les objectifs de traitement pour la prévention des MCV sont identiques pour les hommes et les femmes et doivent être atteints progressivement dans les deux sexes. Le tableau 1 résume les recommandations de l'ESC/EAS pour la prévention de la MCV.

Tableau 1. Objectifs à atteindre pour la prévention des maladies cardiovasculaires

Smoking	No exposure to tobacco in any form.
Diet	Healthy diet low in saturated fat with a focus on wholegrain products, vegetables, fruit, and fish.
Physical activity	3.5–7 h moderately vigorous physical activity per week or 30–60 min most days.
Body weight	BMI 20–25 kg/m^2, and waist circumference <94 cm (men) and <80 cm (women).
Blood pressure	<140/90 mmHg.[a]
LDL-C	**Very-high risk in primary or secondary prevention:** A therapeutic regimen that achieves ≥50% LDL-C reduction from baseline[b] and an LDL-C goal of <1.4 mmol/L (<55 mg/dL). No current statin use: this is likely to require high-intensity LDL-lowering therapy. Current LDL-lowering treatment: an increased treatment intensity is required. **High risk:** A therapeutic regimen that achieves ≥50% LDL-C reduction from baseline[b] and an LDL-C goal of <1.8 mmol/L (<70 mg/dL). **Moderate risk:** A goal of <2.6 mmol/L (<100 mg/dL). **Low risk:** A goal of <3.0 mmol/L (<116 mg/dL).
Non-HDL-C	Non-HDL-C secondary goals are <2.2, 2.6, and 3.4 mmol/L (<85, 100, and 130 mg/dL) for very-high-, high-, and moderate-risk people, respectively.
ApoB	ApoB secondary goals are <65, 80, and 100 mg/dL for very-high-, high-, and moderate-risk people, respectively.
Triglycerides	No goal, but <1.7 mmol/L (<150 mg/dL) indicates lower risk and higher levels indicate a need to look for other risk factors.
Diabetes	HbA1c: <7% (<53 mmol/mol).

Apo = apolipoprotein ; BMI = body mass index ; HbA1c = glycated haemoglobin ; HDL-C = high-density lipoprotein cholesterol ; LDL-C = low-density lipoprotein cholesterol.

[a]Lower treatment targets are recommended for most treated hypertensive patients, provided that the treatment is well tolerated. [b]The term 'baseline' refers to the LDL-C level in a person not taking any lipid-lowering medication, or to the extrapolated baseline value for those who are on current treatment. (295)

Chapitre 2. Objectifs de l’étude

La prévention, le diagnostic et le traitement des femmes atteintes de MC restent un grand défi qui conduit à des inégalités de soins de santé. D'une manière générale, les femmes continuent d'être sous-représentées dans la recherche sur les maladies cardiaques et moins impliquées dans les programmes de prévention des risques CVs notamment pro-athérogènes, malgré la gravité potentielle de ces situations.

Nous avions précédemment étudié, au cours de notre Master 2, la sensibilisation de patients libanais hospitalisés à leur FDRs de maladie coronaire (Ghaddar et al. Noncardiac Lebanese hospitalized adult patients' awareness of their coronary artery disease risk factors ; Vasc Health Risk Manag. 2018;14:371-382, ANNEXE 1).

Compte tenu des taux de plus en plus alarmants de MC chez les femmes libanaises, nous avons souhaité, au cours de notre travail de thèse, centrer notre intérêt sur l'épidémiologie des maladies coronaires chez ces femmes afin de mieux déterminer les FDRs associés à leur MC et envisager différents éléments pouvant être utiles à leur prévention.

Nous avons réalisé une étude cas-témoins chez des femmes libanaises coronariennes et non coronariennes de plus de 40 ans nous permettant d'envisager plusieurs objectifs :

1-Identifier les facteurs de risque de maladie coronaire chez les femmes libanaises.

Nous souhaitons déterminer les FDRs spécifiques aux femmes, associés à la MC en analysant des facteurs sociaux, démographiques, comportementaux et biologiques, afin de fournir une image plus précise de la charge de cette maladie et du risque CV chez les femmes.

2-Évaluer le rôle que l'activité physique pourrait jouer dans la prévention primaire des maladies coronaires chez les femmes libanaises.

Nous souhaitons identifier les profils et domaines de l'AP et du comportement sédentaire, trouvé chez les femmes incluses dans l'étude ainsi que leur lien avec le risque de MC.

3-Étudier la qualité de vie des femmes en regard de la présence de facteurs de risque cardiovasculaires.

Nous souhaitons évaluer la qualité de vie dans différents domaines des femmes incluses et évaluer le lien de certains éléments avec leur risque de MC.

Chapitre 3. Méthodologie

I. Conception de l'étude, éthique de la recherche

Il s'agit d'une étude comparative cas-témoins à visée prospective menée dans les 2 gouvernorats libanais les plus peuplés : Beyrouth et Mont-Liban. Après avoir obtenu une liste de tous les hôpitaux publics et privés des deux régions auprès du site du ministère de la santé, nous avons contacté les hôpitaux pour avoir leur autorisation de participation à l'étude.

L'étude a été approuvée par le comité d'éthique des différents hôpitaux participants (hôpital militaire central, hôpital libanais Geitaoui, hôpital Sacré-Coeur, hôpital Makassed, hôpital Mont-Liban et hôpital universitaire de Rafic Hariri). En accord avec la réglementation éthique, chaque patiente a été informée de façon claire et loyale de la méthodologie appliquée et des objectifs de l'étude, seules les patientes qui ne se sont pas opposées à l'étude ont été incluses, leur participation a ensuite été confirmée lors de l'entrevue individuelle réalisée avec l'investigatrice. Chaque patiente a été assurée que les données recueillies seraient anonymisées et qu'elle pourrait se retirer de l'étude à tout moment sans que sa prise en charge médicale ne soit modifiée.

II. Population de l'étude

Les inclusions ont été réalisées de Décembre 2018 à Décembre 2019. Les patientes « cas », étaient des patientes âgées de 40 ans ou plus, hospitalisées en Cardiologie pour une MC de découverte récente, diagnostiquées suite à un IDM avec ou sans élévation du segment ST ou un angor stable / instable ; diagnostics confirmés par un cardiologue sur la base de leur présentation clinique et des données paracliniques.

Les patientes présentant des signes antérieurs de MC comme un IDM, une intervention coronarienne ou un pontage coronarien n'ont pas été incluses, de même que les patientes qui avaient déjà bénéficié d'une angiographie coronaire, ou souffraient d'une cardiopathie valvulaire, de cardiomyopathies ou de myocardite.

Le groupe des patientes « témoin » était composé de patientes âgées de 40 ans ou plus admises dans les mêmes hôpitaux, dans les services de chirurgie ou de médecine générale pour des motifs excluant toute MCV (MC, AVC, artériopathies périphériques, cardiopathies rhumatismales, insuffisance cardiaque congestive, maladies thromboemboliques).

En outre, nous avons exclues les patientes cancéreuses, souffrant de troubles mentaux, de virus de l'immunodéficience humaine (VIH), d'insuffisance rénale terminale, incapables de participer

à une entrevue ou sous traitement stéroïdien chronique susceptible de générer des effets secondaires, ainsi que les femmes enceintes.

III. Collecte des données

Le support utilisé pour l'entretien en face à face et pour collecter les données du dossier médical est placé en ANNEXE 2.

Phase initiale de l'étude :

Après analyse des dossiers médicaux, permettant de recueillir certaines informations socio-démographiques (âge, poids, taille) et médicales (traitements médicaux, données biologiques et paracliniques), un entretien en face à face a été réalisé de manière à recueillir les données autodéclarées et à renseigner les différents questionnaires. L'investigatrice s'est assurée de la traduction arabe des questionnaires disponibles en anglais et a validé au préalable que la traduction ne modifiait pas la signification des concepts.

La durée de l'entretien est d'environ 30-35 minutes pour chaque patiente. En début d'étude, un entretien comportant les diverses questions a été testé sur 2% de l'échantillon d'étude (30 patientes) pour évaluer sa faisabilité et apporter les modifications nécessaires à la compréhension de la patiente. Cela a permis d'obtenir des réponses plus précises et complètes à partir d'un entretien semi-dirigé plus facile à comprendre.

Suivi à 3 mois :

Chaque patiente a été contactée par l'investigatrice par téléphone 3 mois après sa sortie de l'hôpital afin d'évaluer toute modification, notamment de son mode de vie, et pour s'enquérir de l'observance des recommandations de prévention des MCV qui lui ont été communiquées durant l'hospitalisation.

IV. Taille de l'échantillon

La taille de l'échantillon a été calculée à l'aide d'Epi info7, en supposant une erreur de type I de 5%, une puissance d'étude de 80% et un intervalle de confiance à 95%. Puisqu'aucune autre référence n'était disponible, nous avons utilisé la prévalence de la MC (9% chez les femmes âgées de 40 ans et plus) dans notre calcul, comme cela a été fait dans une étude libanaise publiée en 2016. (296)

Ainsi, nous avons déterminé que la taille minimale de l'échantillon, nécessaire pour montrer une double augmentation du risque de la MC, dans un rapport cas / contrôle = 1/4 permettant

d'avoir une puissance adéquate pour l'étude des groupes (afin de minimiser l'erreur de type II), et en accord avec la méthodologie utilisée dans certains travaux (297), était de 1500 participantes réparties en 300 cas et 1200 témoins.

V. Variables étudiées

V.1 Données socio-démographiques

Nous avons recueilli diverses données sociodémographiques connues comme pouvant interférer avec l'incidence des MCV :

- âge,
- zone de résidence : nous avons classé Beyrouth en zone urbaine, le Mont-Liban en zone péri-urbaine et le Sud et le Nord du Liban/Akkar, Nabatieh, Bekaa/Baalback/Hermel en zone rurale,
- niveau d'éducation scolaire/universitaire (analphabète / ou niveau scolaire primaire ; niveau scolaire complémentaire ; niveau secondaire ; université),
- statut marital,
- statut professionnel,
- revenus mensuels : le revenu par membre de la famille était défini comme le revenu mensuel du ménage d'une famille divisé par le nombre de ses membres, qui a été ensuite catégorisé en un revenu faible, intermédiaire ou élevé selon la ligne de pauvreté et le salaire minimum adopté au Liban (<180.00 Livres Libanais (LL)/mois/personne, entre 180.00–675.00 LL/mois/personne, et >675.00LL/mois/personne, respectivement). (298,299)

V.2 FDRs cardiométaboliques

Nous avons noté l'existence de ces FDRs selon l'utilisation actuelle de médicaments en rapport avec ces FDR, la notification comme antécédent médical dans le dossier médical de la patiente, ou les résultats d'analyses de laboratoire lorsqu'elles sont disponibles :

- statut ménopausique (absence de menstruations pendant 12 mois consécutifs),
- hypertension artérielle (HTA) (PA ≥140/90 mmHg),
- dyslipidémie à type d'hypercholestérolémie ou hypertriglycéridémie (non-HDL ≥3.4 mmol/L (130 mg/dL); triglycérides ≥1.7 mmol/L (150 mg/dL) ; LDL ≥3 mmol/L (116 mg/dL) (295),
- diabète sucré (glycémie à jeun ≥7 mmol/L (126 mg/dl) ou glycémie aléatoire ≥11.1 mmol/L (200 mg/dl) et/ou hémoglobine glyquée (HbA1c) ≥6.5% (300)),

- surcharge pondérale ou obésité définies respectivement par un indice de masse corporelle ((IMC), de 25 à 29.9 kg/m2, ou ≥30 kg/m2 (301)),
- histoire familiale de MC prématurée (parent du premier degré ayant développé une MC avant l'âge de 55 ans pour les hommes et de 65 ans pour les femmes (301)),

V.3 Facteurs liés au mode de vie

Nous avons évalué ces éléments selon la réponse des patientes à des questionnaires validés, ou en réponse ouverte déclarative.

- Tabagisme : l'existence d'un tabagisme actif a été évalué sur la base de la consommation déclarée de tabac, de cigarettes ou de pipe à eau (fumeur actuel, non-fumeur et ancien fumeur) (2,302). La consommation a été calculée comme la dose cumulée consommée (paquets ∗ années ou pipe à eau ∗ années) (303)). Le tabagisme passif (302) a été noté sur la base de la déclaration de la patiente après question ouverte.

- L'activité physique a été évaluée en utilisant l'échelle International Physical Activity Questionnaire (IPAQ). (304) L'IPAQ renseigne sur la fréquence moyenne (jours/semaine) et la durée (heures/jour) de l'AP d'intensité modérée et vigoureuse dans chacun des domaines du travail, du transport, des tâches ménagères / du jardinage et des loisirs, ainsi que la fréquence et la durée de la marche. (305)

L'équivalent métabolique (MET) décrivant le volume total d'AP, a été estimé à : 3.3 pour la marche ; 4 pour l'AP d'intensité modérée ou 8 d'intensité vigoureuse durant le travail ou le temps de loisirs ; 6 pour le cyclisme durant le transport ; 4 et 5.5 pour le travail de jardinage d'intensité modérée et vigoureuse, respectivement ; et 3 pour le travail de ménage d'intensité modérée. Ainsi, le score total d'AP était obtenu en multipliant le score MET par les minutes effectuées en une semaine pour tous les types d'activités dans tous les domaines (en additionnant les résultats de la durée (en minutes) et de la fréquence (jours)).
Chaque patiente était ensuite classifiée comme très active (score ≥3000 MET-minutes/semaine), modérément active (score entre 600 et 3000 MET-minutes/semaine) ou inactive (faible niveau d'AP, score < 600 MET-minutes/semaine). (305)

Sédentarité : Les sujets ont également été interrogées sur le nombre d'heures par jour consacrées à un comportement sédentaire en dehors du sommeil durant la semaine et en week-end (le temps passé assis durant le transport, le travail, le temps devant la télévision, l'utilisation des ordinateurs et des téléphones portables, et pendant le temps de loisirs). (306)

Ce temps quotidien auto-déclaré par les participantes, a été évalué en durée d'activité quotidienne moyenne (durée d'activité totale hebdomadaire divisée par 7).

V.4 Facteurs nutritionnels

- Les habitudes alimentaires ont été évaluées à l'aide du Lebanese Mediterranean Diet Score (LMDS), échelle validée au Liban dont 20 composantes principales ont été utilisées. (307) L'alimentation est répartie en 10 aliments bénéfiques (légumes crus ou cuits, ragoût, huile d'olive, céréales à grains entiers, poissons ou fruits de mer, pain brun (à grains entiers), riz et pâtes, fruits, et les produits laitiers faibles en matières grasses et fermentés) et 10 aliments présumés nuisibles pour la santé (man'ouché, fast-food, frites, viandes rouges en grande quantité, viandes transformées, pain blanc, sucreries, produits laitiers gras non fermentés; boissons sucrées, et jus de fruits artificiels). (295,307)

Pour la consommation d'articles présumés bénéfiques pour la santé, nous avons attribué des scores de 0, 1, 2, 3 et 4 lorsqu'une participante n'a déclaré aucune consommation, deux fois par semaine ou moins, 3 à 6 fois par semaine, au moins une fois par jour et à tous les repas respectivement. Pour la consommation d'aliments non bénéfiques, nous avons attribué les scores sur une échelle inverse. Quant à la consommation du café (thé ou nescafé), elle n'était pas incluse dans l'échelle car l'impact d'une telle consommation sur la santé est actuellement discuté. (308) Ainsi, le score total de LMDS varie de 0 indiquant une adhérence minimale au régime méditerranéen libanais à 80 pour une adhésion maximale.

- Nous avons de plus noté la consommation d'alcool auto-déclarée.

V.5 Facteurs psychologiques, comportementaux

- Le degré de stress a été mesuré à l'aide de l'échelle Beirut Distress Scale (BDS-22), (309) validée au Liban, composée de 22 questions et reflétant 6 facteurs (dépression, démotivation, psychosomatique, détérioration de l'humeur, inhibition intellectuelle et anxiété). On a demandé aux répondantes d'évaluer leurs états psychologiques au cours des dernières semaines. Les 22 éléments sont répondus sur une échelle de Likert de «0» à «3» (0-jamais, 1-parfois, 2-souvent et 3-toujours). Le degré de stress a été résumé en additionnant tous les éléments de l'échelle. Les scores possibles variants de 0 à 66. Les scores les plus élevés indiquent un plus grand risque de détresse psychologique.

- L'adhésion aux médicaments a été mesurée à l'aide de l'échelle LMAS (Lebanese Medication Adherence Scale), échelle validée au Liban, dont les valeurs possibles varient de 0 à 14 (14 correspond à une adhérence thérapeutique maximale). (310)

V.6 Qualité de vie

Le questionnaire SF-12 (Short Form-12), la forme pratique abrégée du SF-36, a été utilisé pour mesurer le bien-être physique et mental afin d'évaluer la qualité de vie. (311) Le SF-12 comprend 12 questions et huit échelles couramment utilisées dans les enquêtes : niveau d'AP possible, limitation physique, douleur corporelle, santé générale, vitalité (énergie / fatigue), fonctionnement social, humeur et santé mentale.

Le schéma de codage tel que décrit par Ware et al (312), en utilisant des poids de régression pour standardiser les scores a été effectué. Les scores de santé physique (physical component summary [PCS]) et mentale (mental component summary [MCS]) ont été développés et analysés et les échelles SF-12 ont été transformées de manière appropriée pour fournir une moyenne de la population de référence= 50 avec un écart-type = 10. La gamme de score varie de 0 à 100 (où 0 indique un niveau de santé plus bas et 100 un niveau de santé plus élevé).

V.7 Facteurs environnementaux

L'exposition à la pollution de l'air extérieur (zone d'habitation, proximité d'une route, d'un embouteillage, d'un générateur d'électricité ou d'usines et exposition à des gaz ou à des substances toxiques) et intérieur (méthodes de chauffage et de cuisson) (313) a été auto-déclarée.

V.8 Variables évaluées 3 mois après la sortie de l'hôpital

L'investigatrice a contacté chaque patiente incluse dans l'étude, par téléphone, 3 mois après sa sortie de l'hôpital, pour déterminer tout changement dans la qualité de vie, les habitudes de vie et l'adhérence aux traitements médicaux ainsi que le respect des recommandations communiquées durant l'hospitalisation.

- L'évolution des habitudes de vie favorisant l'hypertension, la dyslipidémie et le diabète parmi les patientes qualifiées comme hypertendues, dyslipidémiques et diabétiques respectivement, a été analysée par les questions relatives à l'adhérence aux médicaments, le taux d'apport en sel, sucres et graisses, le tabagisme, et l'essai de la perte du poids. (105,295,300)

- La gestion de l'obésité a été évaluée chez les patientes en surpoids ou obèses à partir de mesures de tout changement des habitudes alimentaires et les mesures mises en place pour perdre du poids. (314)
- La réduction de la détresse psychologique chez les patientes déprimées a été évaluée en utilisant trois moyens parmi les moyens mentionnés dans l'article de Sarri et al. (315) : le tabagisme (considéré comme pouvant être favorisé par un trouble de l'humeur selon l'étude de Holahan et al (316)), l'adhérence aux traitements médicamenteux et les habitudes alimentaires.
- La cessation du tabagisme et la poursuite d'un régime alimentaire plus sain ont été évaluées chez les fumeuses et toutes les patientes respectivement.
- Les changements dans la qualité de vie et l'adhérence aux médicaments ont été évalués en réadaptant les échelles SF-12 et LMAS.

VI. Analyse Statistique

Les données ont été saisies et analysées sur SPSS (Statistical Package for the Social Sciences), version 21. Une valeur $p < 0.05$ a été jugée significative pour tous les tests. Des statistiques descriptives comprenant le pourcentage et la moyenne (± écart-type) ont été utilisées pour décrire les caractéristiques des patientes. Une analyse bivariée appropriée a été effectuée pour chaque variable explicative avec la variable dépendante. Pour la comparaison des moyennes entre deux groupes, le test T de Student ou le test d'analyse des variances (ANOVA) ont été utilisés ; si leurs conditions d'utiliation n'étaient pas remplies, les tests de Cochrane, Mann-Whitney ou Kruskal-wallis ont été appliqués. Le test T pour échantillon apparié ou ANOVA à mesures répétées ont été utilisés pour la comparaison des moyennes entre les observations appariées (avant / après la sortie des patientes). Pour les variables catégorielles, les tests de Pearson-Chi^2 et de Fisher ont été utilisés pour comparer les pourcentages entre les variables indépendantes et Mc Nemar Chi^2 pour l'évaluation des changements de mode de vie entre les échantillons appariés (avant et après hospitalisation).

Le rapport des cotes d'exposition (odds ratio) a été calculé pour chacune des variables avec son intervalle de confiance à 95%. La fiabilité des scores a été estimée en testant la cohérence interne par le calcul du coefficient alpha de Cronbach, dont les valeurs alpha dépassant le niveau de 0.70 ont été considérées comme acceptables. (317) Des analyses multivariées en utilisant la régression logistique et la régression linéaire multiple ont été réalisées pour éliminer les facteurs de confusion et déterminer les facteurs associés à la variable dépendante, en prenant comme

variables indépendantes toutes les variables qui avaient un p <0.2 dans l'analyse bivariée. Le test Hosmer-Lemeshow a été effectué pour mesurer la qualité de l'ajustement ; un résultat au test >0.05 indique que le modèle est adéquat.

Chapitre 4. Résultats

I. Facteurs de risque de maladie coronarienne chez les femmes libanaises : une étude cas-témoins

I.1 Introduction

Bien que les femmes aient tendance à vivre plus longtemps que les hommes, beaucoup de ces années supplémentaires sont vécues en mauvaise santé. (28) Une augmentation significative des taux de létalité du SCA chez les jeunes femmes de moins de 55 ans a été signalée dans des études récentes, sans changement significatif chez leurs homologues masculins. (318) La MC continue d'être la principale cause de décès chez les femmes. Les données spécifiques au sexe, axées sur la MC ont augmenté régulièrement, mais ne sont pas systématiquement collectées ni mises en pratique. Pourtant, elle est toujours considérée comme une maladie masculine et son importance chez les femmes est peu reconnue. L'identification précoce des FDRs est importante pour la promotion de la santé et pour réduire l'épidémie croissante de coronaropathie chez les femmes.

I.2 Objectif de l'étude

Le but de notre travail a été d'évaluer les facteurs de risque de MC chez les femmes libanaises âgées de 40 ans et plus.

Notre étude permettra de mieux définir le profil des femmes libanaises présentant une MC, notamment en fonction de leur statut ménopausique ou non. Cette étude sera utile à guider une démarche de prévention chez ces femmes.

I.3 Résultats

Ghaddar F et al. Risk Factors for Coronary Heart Disease Among Lebanese Women: A Case-Control Study. Vasc Health Risk Manag. 2022 Apr 16;18:297-311.

Ghaddar F et al. Risk factors for coronary heart disease among Lebanese women: a case-control study. European Journal of Preventive Cardiology, Volume 28, Issue Supplement_1, May 2021, zwab061.173.

Ghaddar F et al. Risk factors for coronary heart disease among Lebanese women: a case-control study. ESC Preventive Cardiology congress 2021 (communication affichée).

I.3.1 Article

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ORIGINAL RESEARCH

Risk Factors for Coronary Heart Disease Among Lebanese Women: A Case–Control Study

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Purpose: Women are increasingly concerned by coronary heart disease (CHD), with peculiarities of their own, particularly concerning risk factors. The aim of the study was to assess the risk factors for CHD in Lebanese women over forty.

Patients and Methods: A case–control study was carried out in 6 hospitals in Beirut and Mount-Lebanon, from December 2018 to December 2019 including 1500 patients (1200 controls and 300 cases). Women were stratified into pre- and post-menopausal groups. Personal and medical data were collected from hospital records and during an interview where validated questionnaires were used. Binary logistic regressions were performed to investigate potential predictors of CHD in the 2 groups.

Results: In post-menopausal women, dyslipidemia (adjusted odds ratio [aOR], 3.018; 95% confidence interval, 2.102–4.332), hypertension (aOR: 2.449, [1.386–4.327]), a family history of CHD (aOR: 2.724, [1.949–3.808]), cigarette smoking (aOR: 2.317, [1.574–3.410]) and common non-rheumatic joint pain (aOR: 1.457, [1.053–2.016]) were strongly associated with CHD. Conversely, living in Mount Lebanon seemed protective, compared to Beirut (aOR: 0.589, [0.406–0.854]), as well as having a moderate monthly income (aOR: 0.450, [0.220–0.923]), adhering to a Mediterranean diet (aOR: 0.965, [0.936–0.994]), and practicing physical activity [PA] (aOR: 0.396, [0.206–0.759] and 0.725, [0.529–0.992], respectively for high and moderate vs low PA). In pre-menopausal women, dyslipidemia (aOR: 6.938, [1.835–26.224]), hypertension (aOR: 6.195, [1.318–29.119]), family histories of dyslipidemia (aOR: 6.143, [1.560–24.191]) and CHD (aOR: 4.739, [1.336–16.805]) reached statistical significance.

Conclusion: The identification of factors associated with CHD in women, some of which are frequent and trivialized in post-menopause, underlines the need to put in place specific and dedicated CHD prevention strategies in women.

Keywords: coronary disease, risk factors, aging, pre-menopausal women, post-menopausal women

Introduction

According to recent world health organization (WHO) data, coronary heart disease (CHD) remains the leading cause of death worldwide, with increasing prevalence in Africa and Middle East countries,[1] and ranked as the main cause of death in Lebanon.[2] While premenopausal women have a lower cardiovascular risk than men, it is well recognized that their risk catches up to that of men as they age and change their hormonal status.[3] Also, recent epidemiological studies show a more important decrease in CHD mortality rates in men compared to women.[4]

Although everyone shares most traditional risk factors (RFs), a significantly different gender weighting seems to exist. Some RFs might have a higher impact on women's cardiovascular disease (CVD) risk. Women are also increasingly adopting smoking and alcohol consumption.[5] Moreover, environmental stressors caused by urban living or urbanization (population density, economic activity, transportation, sanitation, long-term exposures to air pollution, noise, lack of surrounding greenery, building morphology, ….) cannot be denied as factors leading to cardiovascular health problems, especially among women.[6,7]

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This relation was also demonstrated by previous work, indicating the effect of living in Beirut, the capital of Lebanon, on heart disease compared with outside of Beirut; where older participants and women were more likely to report cardiovascular risk factors (CVRFs) than younger participants and men.[8,9] Furthermore, it has been reported that the medical management of women, due to various factors (failure to consider initial symptoms, delay in medical consultation, sometimes less pathognomonic symptomatology) could differ significantly from that of men, increasing the risk of medical problems.[10] Thus, despite women living longer than men, many of those extra years are spent in poor health.[11]

Some studies have previously been interested in CVRFs in the general Lebanese population[12,13] due to the considerable impact of the topic in public health and the need to improve knowledge of a medical problem which appears to be worsening.[9] However, women are under-represented in heart disease research (about 20% of enrolled patients in most clinical studies),[10] while CVD accounting for one third of all female deaths.[14] This lack is not in accordance with the health, social and environmental evolution of society. The aim of our study is to carry out an analysis of the RFs for CHD in Lebanese women over 40, based on a case-control study. This would allow us to develop avenues of reflection to propose an improvement in the medical prevention of these women who are currently less concerned with cardiovascular risk programs.

Materials and Methods

Study Design and Study Population

A case-control study was carried out in Beirut and Mount-Lebanon, approved by the Institutional Review Board ethical committee of each participating hospital, in accordance with Lebanon's ethical legislation, and the Declaration of Helsinki. Six hospitals were contacted to obtain their authorization to participate in the study (Central Military Hospital, Lebanese Hospital Geitaoui, Sacred Heart Hospital, Makassed General Hospital, Mount-Lebanon University Hospital, and Rafik Hariri University Hospital). Eligible patients were selected from hospital admission lists and their informed consent was obtained prior to enrollment.

Women aged over 40, hospitalized between December 2018 and December 2019, without previous heart disease (myocardial infarction [MI], CHD, valvular heart disease, cardiomyopathy, and myocarditis) could be included. The cases group was composed of women diagnosed with CHD (MI, or stable/unstable angina) for the first time, and control group consisted of women randomly selected from surgery and general medicine departments of the same hospitals with no personal history of CHD.

Cancer, mental disorder, human immunodeficiency virus, end-stage renal disease, chronic steroid treatment and pregnancy were exclusion criteria.

Data Collection

Data were obtained from medical records and questionnaires completed during a face-to-face interview after assessing participants' capacity to respond using the Abbreviated Mental Test Score.[15]

The data collected, secondarily anonymized, were: socio-demographics (age, marital status, educational level, working status, monthly income and place of residence (Beirut, Mount-Lebanon, South Lebanon and Nabatieh, North Lebanon and Bekaa Valley)), lifestyle data (smoking, eating habits (using Lebanese Mediterranean Diet Score (LMDS)[13]), alcohol consumption and self-reported pollution exposure (closeness to generators, traffic, factories, …)[16]). Joint pain, rheumatic diseases, periodontitis, and post-menopausal status were self-declared. Medical and family histories were evaluated, in relation to the onset of premature CHD, presence of CVRFs and comorbidities. Several health-related scores such as medication adherence (Lebanese Medication Adherence Scale (LMAS),[17] Beirut Distress Scale-22 (BDS-22),[18] physical activity (PA, International Physical Activity Questionnaire (IPAQ)),[19] and sedentary lifestyle were calculated.

Sample Size

Sample size was calculated using Epi info7, assuming a Type I error of 5%, a study power of 80%, and a confidence interval (CI) of 95%. We used the CHD prevalence (9% in over forty Lebanese women[13]) in our calculation. Thus, the minimum sample size necessary to show a double increase in CHD risk, in a ratio case/control of 1/4, was 1500 participants.

Individual RFs Definitions

Hypertensive women were either self-declared, taking anti-hypertensive drugs or with a hospitalized blood pressure measured over 140/90 mmHg. Women with diabetes were defined as taking hypoglycemic drugs, self-declared or those with biological evidence for diabetes (blood sugar: fasting ≥7 mmol/L or random ≥11.1 mmol/L or glycated hemoglobin ≥6.5%). Dyslipidemia was defined through self-reporting, lipid-lowering treatment, or by biological data when available (non-High-Density Lipoprotein Cholesterol (non-HDLc) ≥3.4 mmol/L; triglycerides ≥1.7 mmol/L; or Low-Density Lipoprotein Cholesterol (LDLc) ≥3 mmol/L).

A family history of premature CHD was defined as a first-degree relative who developed CHD before the age of 55 for men and 65 for women.

Body Mass Index (BMI) was calculated (overweight defined as BMI ≥25 kg/m^2 and obese as BMI ≥30 kg/m^2). Menopause was considered to be present when there was no history of menstruation for 12 consecutive months.

Environmental and Behavioral RFs Definitions

Income per family member was defined as the monthly household income of the family divided by the number of its members, and categorized into low, middle or high income according to the poverty line and the minimum wage adopted in Lebanon.[20]

Exposure to outdoor (living area, closeness to a road, traffic jam, an electricity generator, or factories and exposure to gases or toxic substances) and indoor (heating and cooking methods) air pollution[16] was also assessed based on patients' self-reported information.

The women's residence was further analyzed in terms of CHD RFs, highlighting the impact of living in the Lebanese capital (Beirut) compared to outside Beirut.

Women who had smoked cigarettes and/or waterpipes in the previous 12 months were considered current smokers and those who had quit smoking more than a year earlier were considered former smokers. The cumulative doses of cigarettes and waterpipes were computed as the average number of daily packs or weekly waterpipes respectively, multiplied by the duration of smoking.[21] Exposure to secondhand smoking (home or workplace) was defined by the self-declared average exposure period in daily hours from the previous week.[22]

The IPAQ long form assessed the level of PA in four domains: work, domestic, transport and leisure; PA intensity was evaluated by frequency (days/week) and duration (min/day) over the past 7 days.[23] The total volume of PA was computed by weighting each type of activity by its estimated energy needs (metabolic equivalent (MET): 3.3 for walking, 4 for moderate PA and 8 for vigorous PA) generating a combined score in MET.minutes/week (low amount: <600, moderate: 600 to <3000 and high PA levels ≥3000 MET.min/week). We have also estimated sedentary periods, for weekdays and weekends.

Dietary habits were evaluated using LMDS, consisting of twenty major components, distributed into 10 beneficial and 10 harmful foods.[13] Scores varied from 0 to 80 (maximal adherence to Mediterranean diet).

Psychological distress was measured using BDS-22,[18] composed of 22 questions and reflecting 6 factors (depression, demotivation, psychosomatic, mood deterioration, intellectual inhibition and anxiety), with a Likert scale (0-never to 3-always). Possible scores range from 0 to 66 (maximum psychological distress).

Patient Medication Adherence was assessed by the LMAS composed of occupational, psychological, annoyance and economic factors.[17] The sum of all items vary from 0 to 14 (maximum therapeutic adherence).

Statistical Analysis

Data were analyzed using SPSS, version 21. Descriptive statistics including percentages and means (± standard deviations) were used to describe patients' characteristics. Bivariate analyses were performed using Student's *t*-test to verify the association between CHD and continuous variables, or with the adjusted *t*-test. For categorical variables, Pearson-Chi^2 and Fisher exact tests were used to compare percentages. Crude odds ratios (OR) and adjusted OR with their respective 95% CI were reported. The reliability of some scores was estimated by calculating Cronbach's alpha (>0.7: acceptable). The candidate predictors for the multivariate analyses were identified by taking those which had

a p-value <0.20 in the bivariate analysis. Two multivariate logistic regression models (using the "backward" method) were performed to control for confounding variables (particularly age) and determine independent predictors of CHD among pre- and post-menopausal women. A p-value <0.05 was considered significant. The final models were reached after ensuring the adequacy of data using Hosmer-Lemeshow test, and the absence of any multicollinearity between predictors using the correlation matrix.[24]

Results

Sample Description and Sociodemographic Patients' Characteristics

From 2146 women initially screened, 646 (30.1%) were not included, leading to a study size of 1500 patients (1200 as controls (80%) and 300 as cases (20%)) (Figure 1).

Women were divided into pre- and post-menopausal groups. Table 1 shows the baseline socio-demographic characteristics of the study sample. CHD patients were significantly older in both groups (46.44±4.27 vs 44.48±3.82 in pre-menopausal group, and 66.68±9.38 vs 65.39±10.73 in post-menopausal group, for cases and controls, respectively). Almost half (48.7%) of the non-coronary post-menopausal women lived in Mount-Lebanon, while 28% of cases lived in the capital Beirut.

Lifestyle and Individual RFs for CHD

As expected, usual RFs of CHD emerged in our study (Table 2). Regarding risky behaviors, current cigarette smoking was associated with CHD in pre-menopausal (OR: 4.878 [1.441–16.508]) and post-menopausal (OR: 1.917 [1.431–2.567]) women, where a clear positive dose-response relationship between pack-years and odds of CHD was also demonstrated. Moreover, the majority of individual RFs were significantly and markedly more common in CHD patients of both groups.

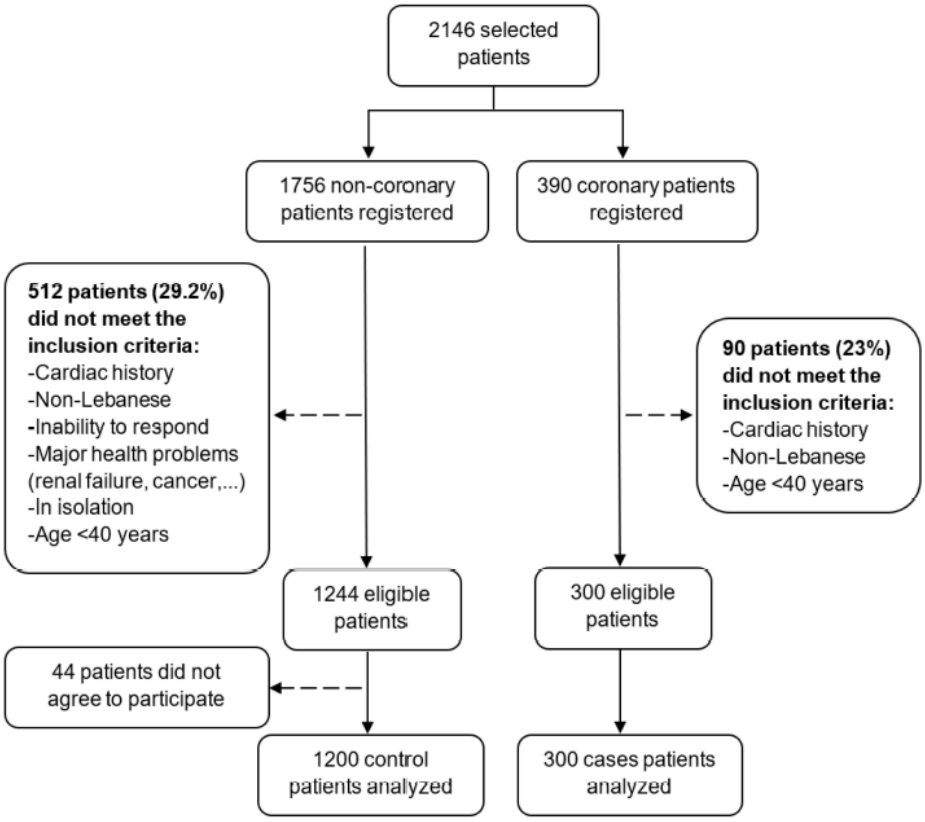

Figure 1 Flowchart of women included in the study.

Table 1 Baseline Socio-Demographic Characteristics of Study Population

Characteristics	Pre-Menopausal Women n (%) 192 (12.8%)			Post-Menopausal Women n (%) 1308 (87.2%)		
Total Patients: 1500	**Controls 174 (90.6%)**	**Cases 18 (9.4%)**	**P-value**	**Controls 1026 (78.4%)**	**Cases 282 (21.6%)**	**P-value**
Age (years)	44.48 ± 3.82	46.44 ± 4.27	0.047*	65.39 ± 10.73	66.68 ± 9.38	0.049*
Place of residence			0.297			0.020*
Beirut	36 (20.7%)	5 (27.8%)		231 (22.5%)	79 (28.0%)	
Mount Lebanon	79 (45.4%)	6 (33.3%)		500 (48.7%)	108 (38.3%)	
South Lebanon/Nabatieh	12 (6.9%)	1 (5.6%)		77 (7.5%)	21 (7.4%)	
North/ Akkar	21 (12.1%)	5 (27.8%)		121 (11.8%)	36 (12.8%)	
Bekaa/Baalback/Hermel	26 (14.9%)	1 (5.6%)		97 (9.5%)	38 (13.5%)	
Type of living area			0.576			0.238
Urban	45 (25.9%)	6 (33.3%)		301 (29.3%)	93 (33.0%)	
Rural/peri-urban	129 (74.1%)	12 (66.7%)		725 (70.7%)	189 (67.0%)	
Marital status			0.221			0.118
Married	135 (77.6%)	17 (94.4%)		540 (52.6%)	132 (46.8%)	
Divorced/widowed	16 (9.2%)	1 (5.6%)		432 (42.1%)	138 (48.9%)	
Single	23 (13.2%)	0		54 (5.3%)	12 (4.3%)	
Working status			0.784			0.489
In professional activity	49 (28.2%)	4 (22.2%)		74 (7.2%)	17 (6.0%)	
Unemployed/ Retired	125 (71.8%)	14 (77.8%)		952 (92.8%)	265 (94.0%)	
Educational level			0.198			0.115
Illiterate/or primary school level	23 (13.2%)	5 (27.8%)		418 (40.7%)	137 (48.6%)	
Complementary school level	59 (33.9%)	4 (22.2%)		386 (37.6%)	96 (34.0%)	
Secondary school level	40 (23.0%)	6 (33.3%)		125 (12.2%)	28 (9.9%)	
University	52 (29.9%)	3 (16.7%)		97 (9.5%)	21 (7.4%)	
Monthly income of the women's family			0.582			0.143
< 500,000 LBP	11 (6.3%)	1 (5.6%)		214 (20.9%)	56 (19.9%)	
500,000–1,000,000 LBP	22 (12.6%)	1 (5.6%)		195 (19.0%)	54 (19.1%)	
1,000,000–2,000,000 LBP	83 (47.7%)	7 (38.9%)		373 (36.4%)	106 (37.6%)	
2,000,000–4,000,0000 LBP	53 (30.5%)	9 (50.0%)		202 (19.7%)	63 (22.3%)	
> 4,000,000 LBP	5 (2.9%)	0		42 (4.1%)	3 (1.1%)	
Monthly income per individual			0.608			0.129
Low (<180,000 LBP/month/person)	14 (8.0%)	1 (5.6%)		33 (3.2%)	16 (5.7%)	
Middle (180,000–675,000 LBP/month/person)	120 (69.0%)	11 (61.1%)		732 (71.3%)	191 (67.7%)	
High (>675,000 LBP/month/person)	40 (23.0%)	6 (33.3%)		261 (25.4%)	75 (26.6%)	

Notes: Data are presented as count (%). *P <0.05 was considered significant.
Abbreviation: LBP, Lebanese pounds.

We also found that common joint pain, was significantly associated with higher odds of CHD (OR: 2.985 [1.020–8.734] and 1.686 [1.270–2.237] for pre- and post-menopausal groups, respectively).

Environmental and Behavioral RFs for CHD

Our results (Table 3) showed that a toxic respiratory environment is associated with CHD in women with a significant result for passive smoking (OR: 4.541 [1.011–20.393] and 1.401 [1.075–1.828] for pre- and post-menopausal women, respectively), while declared exposure to pollution tended to be higher among cases, but did not reach statistical significance.

Table 2 Differences in Lifestyle and Individual Risk Factors According to Studied Women Status

Characteristics	Pre-Menopausal Women n (%) 192 (12.8%)				Post-Menopausal Women n (%) 1308 (87.2%)			
	Controls 174 (90.6%)	Cases 18 (9.4%)	OR (95% CI)	P-value	Controls 1026 (78.4%)	Cases 282 (21.6%)	OR (95% CI)	P-value
BMI (mean ± SD)	29.32 ± 6.67	29.53 ± 5.40	1.005 (0.934–1.081)	0.896	29.70 ± 6.68	29.62 ± 5.86	0.998 (0.978–1.019)	0.868
Smoking status (cigarette/or waterpipe)								
Non-smoker	80 (46.0%)	4 (22.2%)	1.00 (Ref.)	–	542 (52.8%)	112 (39.7%)	1.00 (Ref.)	–
Active smoking history	2 (1.1%)	0	–	0.999	77 (7.5%)	20 (7.1%)	1.257 (0.738–2.140)	0.400
Current active smoker	92 (52.9%)	14 (77.8%)	3.043 (0.963–9.620)	0.058	407 (39.7%)	150 (53.2%)	1.784 (1.353–2.352)	<0.001*
Previous smoking status								
Never	80 (46.0%)	4 (22.2%)	1.00 (Ref.)	–	542 (52.8%)	112 (39.7%)	1.00 (Ref.)	–
Cigarette	0	0	–	–	55 (5.4%)	15 (5.3%)	1.320 (0.720–2.419)	0.370
Waterpipe	3 (1.7%)	0	–	0.999	26 (2.5%)	2 (0.7%)	1.936 (1.445–2.593)	<0.001*
Mixed smoking	0	0	–	–	6 (0.6%)	4 (1.4%)	1.452 (0.393–5.360)	0.576
Current smoking status								
Never	80 (46.0%)	4 (22.2%)	1.00 (Ref.)	–	542 (52.8%)	112 (39.7%)	1.00 (Ref.)	–
Cigarette	41 (23.6%)	10 (55.6%)	4.878 (1.441–16.508)	0.011*	308 (30.0%)	122 (43.3%)	1.917 (1.431–2.567)	<0.001*
Waterpipe	48 (27.6%)	3 (16.7%)	1.250 (0.268–5.826)	0.776	89 (8.7%)	25 (8.9%)	1.359 (0.834–2.215)	0.218
Mixed smoking	3 (1.7%)	1 (5.6%)	6.667 (0.561–79.287)	0.133	10 (1.0%)	3 (1.1%)	1.452 (0.393–5.360)	0.576
Total cigarette smoking, quantification (for previous and current smokers)								
Non smoker	130 (74.7%)	7 (38.9%)	1.00 (Ref.)	–	647 (63.1%)	138 (48.9%)	1.00 (Ref.)	–
Up to 20 pack-years	23 (13.2%)	4 (22.2%)	3.230 (0.875–11.923)	0.078	125 (12.2%)	28 (9.9%)	1.050 (0.670–1.646)	0.831
More than 20 up to 40 pack-years	16 (9.2%)	2 (11.1%)	2.321 (0.444–12.149)	0.319	122 (11.9%)	44 (15.6%)	1.691 (1.144–2.499)	0.008*
More than 40 pack-years	5 (2.9%)	5 (27.8%)	18.571 (4.338–79.511)	<0.001*	132 (12.9%)	72 (25.5%)	2.557 (1.819–3.596)	<0.001*
Total waterpipe smoking, quantification (for previous and current smokers)								
Non smoker	120 (69.0%)	14 (77.8%)	1.00 (Ref.)	–	895 (87.2%)	248 (87.9%)	1.00 (Ref.)	
Up to 30 waterpipes-years	16 (9.2%)	2 (11.1%)	1.071 (0.223–5.154)	0.931	25 (2.4%)	3 (1.1%)	0.433 (0.130–1.446)	0.174
More than 30 waterpipes-years	38 (21.8%)	2 (11.1%)	0.451 (0.098–2.075)	0.307	106 (10.3%)	31 (11.0%)	1.055 (0.691–1.613)	0.803
Hypertension								
No	122 (70.1%)	3 (16.7%)	1.00 (Ref.)	–	257 (25.0%)	23 (8.2%)	1.00 (Ref.)	–
Yes	52 (29.9%)	15 (83.3%)	11.731 (3.257–42.250)	<0.001*	769 (75.0%)	259 (91.8%)	3.763 (2.402–5.898)	<0.001*
Diabetes								
No	147 (84.5%)	11 (61.1%)	1.00 (Ref.)	–	615 (59.9%)	127 (45.0%)	1.00 (Ref.)	–
Yes	27 (15.5%)	7 (38.9%)	3.465 (1.234–9.731)	0.018*	411 (40.1%)	155 (55.0%)	1.826 (1.400–2.382)	<0.001*
Dyslipidemia								
No	136 (78.2%)	4 (22.2%)	1.00 (Ref.)	–	480 (46.8%)	62 (22.0%)	1.00 (Ref.)	–
Yes	38 (21.8%)	14 (77.8%)	12.526 (3.896–40.277)	<0.001*	546 (53.2%)	220 (78.0%)	3.119 (2.294–4.242)	<0.001*
Declared joint pain								
No	93 (53.4%)	5 (27.8%)	1.00 (Ref.)	–	432 (42.1%)	85 (30.1%)	1.00 (Ref.)	–
Yes	81 (46.6%)	13 (72.2%)	2.985 (1.020–8.734)	0.046*	594 (57.9%)	197 (69.9%)	1.686 (1.270–2.237)	<0.001*

Rheumatic diseases								
No	170 (97.7%)	18 (100.0%)	1.00 (Ref.)	–	972 (94.7%)	270 (95.7%)	1.00 (Ref.)	–
Yes	4 (2.3%)	0	–	0.999	54 (5.3%)	12 (4.3%)	0.800 (0.422–1.517)	0.494
Periodontitis								
No	144 (82.8%)	14 (77.8%)	1.00 (Ref.)	–	841 (82.0%)	223 (79.1%)	1.00 (Ref.)	–
Yes	30 (17.2%)	4 (22.2%)	1.371 (0.422–4.458)	0.599	185 (18.0%)	59 (20.9%)	1.203 (0.866–1.670)	0.270
Family history of								
- Premature CHD								
No	142 (81.6%)	7 (38.9%)	1.00 (Ref.)	–	861 (83.9%)	184 (65.2%)	1.00 (Ref.)	–
Yes	32 (18.4%)	11 (61.1%)	6.973 (2.509–19.383)	<0.001*	165 (16.1%)	98 (34.8%)	2.779 (2.066–3.738)	<0.001*
- Stroke								
No	173 (99.4%)	18 (100.0%)	1.00 (Ref.)	–	1016 (99.0%)	277 (98.2%)	1.00 (Ref.)	–
Yes	1 (0.6%)	0	–	1.00	10 (1.0%)	5 (1.8%)	1.834 (0.622–5.410)	0.272
- Hypertension								
No	103 (59.2%)	8 (44.4%)	1.00 (Ref.)	–	624 (60.8%)	152 (53.9%)	1.00 (Ref.)	–
Yes	71 (40.8%)	10 (55.6%)	1.813 (0.682–4.820)	0.233	402 (39.2%)	130 (46.1%)	1.328 (1.018–1.731)	0.037*
- Diabetes								
No	98 (56.3%)	9 (50.0%)	1.00 (Ref.)	–	627 (61.1%)	167 (59.2%)	1.00 (Ref.)	–
Yes	76 (43.7%)	9 (50.0%)	1.289 (0.488–3.406)	0.608	399 (38.9%)	115 (40.8%)	1.082 (0.827–1.416)	0.565
- Dyslipidemia								
No	153 (87.9%)	10 (55.6%)	1.00 (Ref.)	–	936 (91.2%)	254 (90.1%)	1.00 (Ref.)	–
Yes	21 (12.1%)	8 (44.4%)	5.829 (2.069–16.417)	0.001*	90 (8.8%)	28 (9.9%)	1.146 (0.734–1.791)	0.548

Notes: Data are presented as count (%) or mean ± standard deviation (SD). *P <0.05 was considered significant.
Abbreviations: OR, odds ratio; CI, confidence interval; BMI, body mass index; CHD, coronary heart disease.

Table 3 Difference in Various Environmental and Behavioral Risk Factors According to Studied Women Status

Scores	Cronbach's Alpha	Pre-Menopausal Women n (%)				Post-Menopausal Women n (%)			
		192 (12.8%)				1308 (87.2%)			
		Controls 174 (90.6%)	Cases 18 (9.4%)	OR (95% CI)	P-value	Controls 1026 (78.4%)	Cases 282 (21.6%)	OR (95% CI)	P-value
Declared current exposure to passive smoking									
No		63 (36.2%)	2 (11.1%)	1.00 (Ref.)	–	530 (51.7%)	122 (43.3%)	1.00 (Ref.)	–
Yes		111 (63.8%)	16 (88.9%)	4.541 (1.011–20.393)	0.048*	496 (48.3%)	160 (56.7%)	1.401 (1.075–1.828)	0.013*
Alcohol intake									
No		159 (91.4%)	16 (88.9%)	1.00 (Ref.)	–	937 (91.3%)	255 (90.4%)	1.00 (Ref.)	–
Current drinker		15 (8.6%)	2 (11.1%)	1.325 (0.278–6.321)	0.724	89 (8.7%)	27 (9.6%)	1.115 (0.709–1.752)	0.638
Declared exposure to pollution									
No		76 (43.7%)	6 (33.3%)	1.00 (Ref.)	–	393 (38.3%)	96 (34.0%)	1.00 (Ref.)	–
Yes		98 (56.3%)	12 (66.7%)	1.551 (0.557–4.322)	0.401	633 (61.7%)	186 (66.0%)	1.203 (0.912–1.586)	0.191
LMDS (mean ± SD)	0.602	38.63 ± 5.36	38.83 ± 5.54	1.007 (0.920–1.102)	0.876	40.59 ± 4.98	39.57 ± 5.65	0.962 (0.937–0.987)	0.004*
BDS-22 (mean ± SD)	0.981	12.39 ± 13.82	11.89 ± 14.10	0.997 (0.962–1.034)	0.987	10.62 ± 13.61	12.91 ± 15.99	1.011 (1.002–1.020)	0.028*
Depression		3.44 ± 4.01	3.22 ± 4.07	0.986 (0.870–1.117)	0.956	2.91 ± 3.86	3.54 ± 4.65	1.037 (1.005–1.069)	0.039*
Demotivation		1.83 ± 2.78	1.67 ± 2.70	0.978 (0.815–1.174)	0.810	1.48 ± 2.60	1.90 ± 3.20	1.052 (1.005–1.100)	0.051
Psychosomatic		2.09 ± 2.72	1.94 ± 2.88	0.981 (0.816–1.178)	0.688	1.78 ± 2.65	2.11 ± 2.94	1.043 (0.995–1.092)	0.097
Mood deterioration		2.41 ± 2.35	2.06 ± 2.04	0.934 (0.752–1.161)	0.657	1.98 ± 2.25	2.33 ± 2.50	1.066 (1.009–1.126)	0.033*
Intellectual inhibition		1.36 ± 2.05	1.61 ± 2.00	1.058 (0.846–1.323)	0.265	1.27 ± 1.96	1.59 ± 2.40	1.073 (1.010–1.140)	0.040*
Anxiety		1.26 ± 1.60	1.39 ± 1.42	1.050 (0.778–1.418)	0.563	1.19 ± 1.59	1.46 ± 1.72	1.102 (1.019–1.192)	0.020*
LMAS (mean ± SD) [for 1257 patients under medical treatment]	0.870	12.59 ± 2.62	12.71 ± 2.13	1.021 (0.807–1.292)	0.904	12.83 ± 2.25	12.46 ± 2.78	0.942 (0.894–0.994)	0.048*
Occupational factor		4.41 ± 1.06	4.50 ± 0.94	1.092 (0.609–1.957)	0.848	4.52 ± 0.93	4.38 ± 1.03	0.875 (0.764–1.001)	0.065
Psychological factor		3.66 ± 0.89	3.79 ± 0.80	1.218 (0.561–2.647)	0.515	3.77 ± 0.81	3.65 ± 1.00	0.862 (0.746–0.997)	0.072
Annoyance factor		2.73 ± 0.68	2.86 ± 0.36	1.513 (0.454–5.039)	0.702	2.80 ± 0.61	2.72 ± 0.75	0.842 (0.692–1.025)	0.123
Economical factor		1.79 ± 0.62	1.57 ± 0.85	0.659 (0.319–1.362)	0.252	1.75 ± 0.67	1.71 ± 0.71	0.916 (0.753–1.115)	0.383
IPAQ n (%)	0.587								
No/or low physical activity		34 (19.5%)	7 (38.9%)	1 (Ref.)	–	442 (43.1%)	153 (54.3%)	1 (Ref.)	–
Moderate physical activity		91 (52.3%)	10 (55.6%)	0.534 (0.188–1.515)	0.238	463 (45.1%)	113 (40.1%)	0.705 (0.535–0.929)	0.013*
High physical activity		49 (28.2%)	1 (5.6%)	0.099 (0.012–0.843)	0.034*	121 (11.8%)	16 (5.7%)	0.382 (0.220–0.664)	0.001*
Total sitting time/day, min (mean ± SD)		369.43 ± 180.61	447.14 ± 228.42	1.002 (1.000–1.005)	0.139	504.02 ± 199.96	530.12 ± 203.66	1.001 (1.000–1.001)	0.053

Notes: Data are presented as count (%) or mean ± standard deviation (SD). *P <0.05 was considered significant.

Abbreviations: OR, odds ratio; CI, confidence interval; LMDS, Lebanese Mediterranean diet score; BDS-22, Beirut Distress Scale; LMAS, Lebanese Medication adherence scale; IPAQ, International Physical Activity Questionnaire.

Conversely, adherence to LMDS appeared to be responsible for a significant reduction of approximately 4% in odds of CHD in post-menopausal women for each one-unit increase in LMDS (OR: 0.962 [0.937–0.987]).

Psychological distress was found to be more frequent for coronary postmenopausal women, with a remarkable internal consistency (alpha's Cronbach: 0.981) specifically in the depression (OR: 1.037 [1.005–1.069]), mood deterioration (OR: 1.066 [1.009–1.126]), intellectual inhibition (OR: 1.073 [1.010–1.140]) and anxiety domains (OR: 1.102 [1.019–1.192]).

Medication adherence, assessed by LMAS (with excellent internal consistency, alpha's Cronbach=0.87), was significant only for the post-menopausal group among the 1257 studied women under medical treatment, revealing a reduction of about 6% in odds of CHD.

Concerning PA, more than half of coronary post-menopausal women reported exercising a little or not at all (54.3%), while PA seemed to be associated with a significant decrease in odds of CHD: moderate PA showed a 29.5% reduction in odds of CHD, and high PA a 61.8% decrease, compared to no or low PA (OR: 0.705 [0.535–0.929] or 0.382 [0.220–0.664] respectively). While, for pre-menopausal women, high PA alone was found to be significant in protecting against CHD (OR: 0.099 [0.012–0.843]).

Independent Predictors of CHD

Dyslipidemia (aOR: 6.938 [1.835–26.224], p=0.004), hypertension (aOR: 6.195 [1.318–29.119], p=0.021), family histories of dyslipidemia (aOR: 6.143 [1.560–24.191], p=0.009) and premature CHD (aOR: 4.739 [1.336–16.805], p=0.016) were the only RFs associated with CHD in pre-menopausal women.

Dyslipidemia (aOR: 3.018 [2.102–4.332], p<0.001), hypertension (aOR: 2.449 [1.386–4.327], p=0.002), family history of premature CHD (aOR: 2.724 [1.949–3.808], p<0.001), cumulative cigarette smoking (aOR: 2.317 [1.574–3.410], p<0.001), and joint pain (aOR: 1.457 [1.053–2.016], p=0.023) were the independent RFs for CHD in post-menopausal women, while an inverse association was found between CHD and living in Mount-Lebanon (compared to Beirut, aOR: 0.589 [0.406–0.854], p=0.005), having a moderate individual monthly income (aOR: 0.450 [0.220–0.923], p=0.029), following the Mediterranean diet (aOR: 0.965 [0.936–0.994], p=0.020), and PA (aOR: 0.725 [0.529–0.992] and 0.396 [0.206–0.759], for moderate and high PA, respectively, p=0.007) (Table 4).

Another protective factor assessed, LMAS, was not significantly associated with CHD at this stage.

Discussion

This is, to our knowledge, the first case-control study conducted to assess RFs of CHD among hospitalized Lebanese women and we hope that the results found will help shed light on a currently not yet sufficiently studied problem concerning the cardiovascular health of aging women. This study was conducted to further clarify the nature of CHD RFs in Lebanese women, not only the elderly but also those of reproductive age. It is not uncommon nowadays to see pre-menopausal women admitted with CHD.

Common coronary RFs were noted, but their relative importance differed in pre- and post-menopausal women. Dyslipidemia was found to be associated with the highest odds ratio in both groups, consistent with previous works, showing that dyslipidemia has the greatest population-adjusted risk in women compared to all other known CVRFs.[25] In contrast, other studies in South Asia found a statistically significant relationship in post-menopausal women only,[26] which could be explained by their sample size and the younger age of pre-menopausal women included in their study (30 years and older). On another hand, previous data showed that 3.9 million worldwide deaths were attributable to high non-HDLc in 2017, increasing among women since 1980,[27] and it is actually well known that lipid levels change in post-menopausal women after reduction of estrogen production (decline in HDLc and increase in LDLc), subsequently contributing to an increased CHD risk.[28,29] Moreover, Lebanon has the highest prevalence of hypercholesterolemia[30] compared with other countries such as Turkey, Saudi Arabia and India. Also, it has been found that Lebanese women were more likely to suffer from dyslipidemia than men.[9]

Hypertension was also significantly associated with CHD in both groups which correlates well with the findings of Gierach et al and Maas et al[31,32] Our findings underscore the importance of early identification of hypertension in middle-aged women as a first step in the evaluation and treatment of CHD in the premenopausal period, as each 10 mmHg increment of systolic

Table 4 Factors Believed to Be Associated with Cardiovascular Risk for the Women Studied

Predictors	P-value	aOR[a]	95% CI
Model 1: among pre-menopausal women			
Dyslipidemia	0.004*	6.938	1.835–26.224
Hypertension	0.021*	6.195	1.318–29.119
Family history of dyslipidemia	0.009*	6.143	1.560–24.191
Family history of premature CHD	0.016*	4.739	1.336–16.805
Model 2: among post-menopausal women			
Dyslipidemia	<0.001*	3.018	2.102–4.332
Hypertension	0.002*	2.449	1.386–4.327
Family history of premature CHD	<0.001*	2.724	1.949–3.808
Cigarette smoking, quantification			
Non-smoker (reference)	<0.001*	–	–
Up to 20 pack-years	0.818	1.061	0.639–1.763
More than 20 up to 40 pack-years	0.005*	1.881	1.206–2.935
More than 40 pack-years	<0.001*	2.317	1.574–3.410
Declared joint pain	0.023*	1.457	1.053–2.016
Monthly income per individual			
Low (<180,000 LBP/month/person)/Reference	0.070	–	–
Middle (180,000–675,000 LBP/month/person)	0.029*	0.450	0.220–0.923
High (>675,000 LBP/month/person)	0.110	0.540	0.254–1.149
Place of residence			
Beirut (Reference)	0.014*	–	–
Mount Lebanon (peri-urban area)	0.005*	0.589	0.406–0.854
South Lebanon/Nabatieh (rural area dominance)	0.787	0.919	0.497–1.700
North/Akkar (rural area dominance)	0.221	0.728	0.438–1.210
Bekaa/Baalback/Hermel (rural area dominance)	0.496	1.198	0.713–2.013
IPAQ			
No/or low physical activity (Reference)	0.007*	–	–
Moderate physical activity	0.045*	0.725	0.529–0.992
High physical activity	0.005*	0.396	0.206–0.759
LMAS	0.088	0.950	0.895–1.008
LMDS	0.020*	0.965	0.936–0.994

Notes: [a]Odds ratios were adjusted by regression analyses for all possible confounders (particularly age). *P <0.05 was considered significant. Regression model 1 included the following variables: age, educational level, cigarette smoking-quantification, hypertension, diabetes, dyslipidemia, declared joint pain, family histories of premature CHD and dyslipidemia, declared current exposure to passive smoking, IPAQ and sedentary time. Regression model 2 included the following variables: age, place of residence, marital status, educational level, monthly income per individual, cigarette smoking-quantification, waterpipe smoking-quantification, hypertension, diabetes, dyslipidemia, declared joint pain, family histories of premature CHD and HTN, declared current exposure to passive smoking, declared exposure to pollution, LMDS, BDS-22, LMAS, IPAQ and sedentary time. The model was suitable and Hosmer-Lemeshow test was adequate (p>0.05). Absence of multi-collinearity between predictors (correlation coefficients <0.8).

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; CHD, coronary heart disease; LBP, Lebanese pounds; LMDS, Lebanese Mediterranean Diet Score; IPAQ, International Physical Activity Questionnaire; BDS-22, Beirut Distress Scale; LMAS, Lebanese Medication Adherence Scale.

blood pressure was found to be associated with a 25% increased risk of cardiovascular events.[4] While hypertension prevalence and severity reach significantly higher rates in women than men over 65, this gap is likely to increase with the aging population.[4] A systematic review showed that the hypertension prevalence occurs more frequently among Arab women,[33] and is increasing in Lebanon.[9] Moreover, women appear to have lower rates of hypertension control than men,[34,35] including in Lebanon.[36] This could be due to the political instability and various conflicts that have occurred in recent years in Lebanon. Previous studies have demonstrated the importance of stress exposure (war, disaster, explosion and terror) on blood pressure levels and hypertension control, especially among women.[37]

Similar to previous studies,[13] we found that family history of premature CHD increased the CHD risk. It is an independent prognostic indicator, and early detection of silent atherosclerosis may usefully improve the CHD prevention in concerned women. Additionally, a first-degree family history of dyslipidemia predicted CHD in the premenopausal group, which could also help to better identify high-risk women and potentially initiate or intensify CHD prevention strategies.

Smoking, an avoidable factor that appeared to have a multiplicator effect with the other major CHD RFs,[4] was well correlated with postmenopausal women's CHD, with a known cumulative deleterious effect in our study as previously described.[38] A meta-analysis reported that women had a 25% increased risk of smoking-induced CHD compared to men.[39] However, the harmful impact of smoking in CHD is underestimated, especially in low- and middle-income countries, and real risk on women's health could be higher.[39] Unfortunately, Lebanese women exhibit the highest rates of smoking prevalence of the Middle Eastern countries, due to its liberal character, westernization and the lessening of cultural constraints on women's behavior.[40] WHO reported that about one-third of women in Lebanon use tobacco, compared to 6% in Jordan, a demographic group that could greatly benefit from control initiatives.[41,42] However, it seems that implementing such tobacco control programs may be a challenge in Lebanon, given that a recent ban on smoking in public areas has been largely ignored.[41]

A socio-economic gradient in heart disease, previously reported in wealthy, mainly Western countries, is also discernible in Lebanon.[43] In fact, the economic factor was inversely associated with CHD, consistent with population-based studies from Lebanon.[8] It suggests that among residents of Lebanon, a middle-income developing country, women with moderate monthly income level have lower odds of CHD than those with a lower monthly income level. However, the higher income level, although achieving an odds ratio<1, did not reach statistical significance, perhaps due to the small (but representative) sample size in this category.

Living in the capital Beirut (crowded urban area) compared to Mount-Lebanon (peri-urban area) was positively associated to CHD. Living in Beirut exposes participants to higher levels of stress, in part due to exposure to various environmental factors, traffic-related air pollutants, noise, higher levels of violence, and lower social support, consistent with previous national[8,9] and international[44,45] studies. Similarly, the lack of green spaces in an urban area can negatively affect a person's well-being and PA.[46] Previous works revealed that women may be more vulnerable to urbanization in terms of CVRFs (hypertension, psychiatric disorders) than men.[7,47,48] Further national analysis will be needed to elucidate the effect of urban environment in Lebanon on cardiovascular health in both genders.

Adherence to LMDS was associated with lower odds of CHD in postmenopausal women, in agreement with previous national studies.[49] This relation was also described in recent studies, where adopting a Mediterranean diet pattern was related to improved arterial stiffness and reduced risk of chronic diseases.[50,51] Bihuniak et al also demonstrated positive associations between the Mediterranean diet and health of postmenopausal American women, particularly with a reduced risk of CVRFs.[52] Furthermore, women adhering to the Mediterranean diet may have better CVRFs protection than men (21% vs 14% respectively).[53] Unfortunately, a deviation in dietary habits exists in Lebanon, as in all transitional countries adopting a more Westernized lifestyle.

Moreover, our results showed that moderate or vigorous PA had an inverse association with CHD in women compared to those with no or low PA. This is consistent with data in favor of a substantial reduction in the incidence of cardiovascular events by PA in postmenopausal women.[54,55] We also demonstrated an inverse dose-response relationship, with higher activity levels being associated with lower CHD, in agreement with several previous reports.[56] However, an overview of systematic reviews and meta-analysis from 20 MENA (Middle East and North Africa) countries revealed that only the adult Lebanese and Jordanian women were more active than men compared to other regions.[55] Urbanization, residence in Beirut, car ownership, and obstacles in some areas of Lebanon's governorates, mainly rural villages, where it is socially unacceptable for women to walk or exercise alone outside the home without the company of a family member, may affect their PA.[57,58] In our study, 93% of postmenopausal women were unemployed, factor that may be of importance in physical engagement of women,[59] we can deduce that the domestic activity could protect from CHD by fighting against sedentary lifestyle, as has been mentioned by others.[60]

Finally, an enlightening result of our study was the significant link between CHD and the presence of joint pain. Studied postmenopausal women who suffer from it were almost 1.5 times more likely to have CHD than those without. Thus, this disorder, which increases with age, especially in menopause,[61] can not only affect the daily life of aging women, it also limits their PA,[62] which increases the CVD risk, therefore has an impact on women's life expectancy. Additionally, evidence shows that chronic diseases and musculoskeletal disorders frequently coexist; people with musculoskeletal problems are about twice as likely to suffer from chronic diseases such as heart disease, gastric ulcers, neurological and endocrine disorders.[63] Other evidence also suggests that this relation is biologically plausible, as daily

back pain was associated with reduced quality of life, mobility and longevity and increased risk of coronary events in elderly women.[64] Relation between rheumatoid arthritis and heart disease is described,[65,66] but very few studies focus on commonplace joint pain.[67] A previous study reported that over half (56%) of CHD patients suffered from musculoskeletal conditions, with joint pain accounting for 64.4% of them.[61] Joint pain in aging women seems harmless and is thus probably neglected by women, while it could constitute a medical warning sign for them and their attending physicians.

Strengths and Limitations

This study has several strengths in its design: the random selection of controls minimizes associated biases; also, the use of incident cases allows more accurate recall of past exposures, helps with temporality and avoids survival bias. The relatively large number of participants and the choice of a control/case ratio of 4/1 increased its power. However, it is a retrospective observational study that cannot determine causality between factors and disease occurrence. Otherwise, evaluation of some RFs and preventive measures were self-declared, which could lead to misclassification. A differential recall bias could be present, as CHD patients were more likely to remember accurately their exposures' history compared to non-coronary patients. Finally, although we considered many RFs to decrease potential confounding, residual confounding might still be possible, related to unmeasured factors.

Conclusion

The study of CVRFs in women is a necessity since they are well affected by CHD. Improved screening and therapeutic management of arterial hypertension and dyslipidemia in this population is needed. It is necessary to intensify the fight against smoking and encourage women to adhere to a Mediterranean diet. Screening mechanisms for silent atherosclerosis in women with a family history of premature CHD, increased awareness of dwelling region and reduction of poverty are also important steps. Moreover, the common joint pain, often trivialized and neglected in menopaused women, could be integrated in prevention strategies and dedicated care. Women in pre-menopause could benefit from a dedicated information program aimed at not trivializing this symptom, probably associated with other deleterious elements such as less PA and a more sedentary lifestyle. Taken together, these findings highlight the importance of formulating appropriate policies and implementing interventions to halt the CHD progression in Lebanese women. Thus, the role of policymakers and health providers, in cooperation with the ministry of public health and non-governmental organizations, to provide quality services and to raise awareness in women to lower the burden of the disease.

Abbreviations

aOR, adjusted odds ratio; BDS-22, Beirut Distress Scale; BMI, body mass index; CHD, coronary heart disease; CI, confidence interval; CVD, cardiovascular disease; CVRFs, cardiovascular risk factors; HDLc, high-density lipoprotein cholesterol; IPAQ, International Physical Activity Questionnaire; LDLc, low-density lipoprotein cholesterol; LMAS, Lebanese Medication Adherence Scale; LMDS, Lebanese Mediterranean Diet Score; MET, metabolic equivalent; MI, myocardial infarction; OR, odds ratio; PA, physical activity; RFs, risk factors; SPSS, Statistical Package for the Social Sciences; WHO, World Health Organization.

Data Sharing Statement

The data can be made available upon reasonable request to the corresponding author.

Ethics Approval and Informed Consent

The study protocol was reviewed and approved by the Institutional Review Board (IRB) ethical committee of each participating hospital, in accordance with Lebanon's ethical legislation, and the Declaration of Helsinki. The informed consent process was confirmed by the IRB and obtained from all participants before the interview. Patients were informed that their response will be kept confidential.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting the article or reviewing it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to take responsibility and be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest for this work.

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I.3.2 Abstract

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Epidemiology

Risk factors for coronary heart disease among Lebanese women: a case-control study

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Backgroung: Given the expected epidemic rise of coronary heart disease (CHD) in healthcare system and the potential severity of disease, CHD remains underestimated in women. Early identification of risk factors (RFs) will be important for their health promotion.

Purpose: The aim of this study is to evaluate the RFs for CHD among Lebanese women aged 40 years and above.

Methods: A case-control study was carried out in 6 hospitals in the regions of Beirut and Mount-Lebanon, from December 2018 to December 2019 with a total of 1500 patients. Anthropometric and laboratory data were collected from the medical records of patients and structured questionnaire were used.

Results: CHD was positively associated with hyperlipidemia (aOR 2.852, 95% CI: 2.021–4.023), hypertension (2.715, 1.598–4.614), family history of CHD (2.645, 1.925–3.634), smoking (1.888, 1.393–2.558) and interestingly presence of joint pain (1.513, 1.107–2.068). While, residence in Mount-Lebanon seemed negatively associated with CHD (0.669, 0.467–0.959), as well as adherence to Mediterranean diet (0.964, 0.938–0.992) and physical activity (0.491, 0.259–0.930 and 0.718, 0.530–0.972, for high and moderate activity, respectively).

Conclusion: In our study, most of RFs associated with CHD in women are modifiable and preventable, highlighting the need of lifestyle interventions and appropriate control strategies and measures.

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I.3.3 Communication affichée

Risk Factors For Coronary Heart Disease Among Lebanese Women: A Case-Control Study

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Background

Given the expected epidemic rise of coronary heart disease (CHD) in healthcare system and the potential severity of disease, CHD remains underestimated in women. Early identification of risk factors (RFs) will be important for their health promotion[1].

Purpose

The aim of this study is to evaluate the RFs for CHD among Lebanese women aged 40 years and above.

Methods

- A case-control study was carried out in 6 hospitals in the regions of Beirut and Mount-Lebanon, from December 2018 to December 2019.
- Study was approved by the ethics committee of the hospitals.
- Validated questionnaires were used [2-4].
- Binary logistic regression was realized to investigate the potential predictors of CHD.

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Results

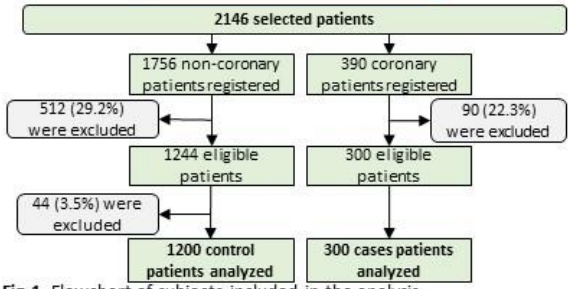

Fig.1 Flowchart of subjects included in the analysis.

Characteristics	Controls n(%) 1200 (80%)	Cases n(%) 300 (20%)	P-value
Age (years)			0.001**
40-60	546 (45.5%)	99 (33%)	
61-80	562 (46.8%)	180 (60%)	
>80	92 (7.7%)	21 (7%)	
District			0.005*
Beirut	267 (22.3%)	84 (28%)	
Mount-Lebanon	579 (48.3%)	114 (38%)	
Others	354 (29.5%)	102 (34%)	
Marital status			0.010*
Married	675 (56.3%)	149 (49.7%)	
Divorced/widowed	448 (37.3%)	139 (46.3%)	
Single	77 (6.4%)	12 (4%)	
Educational level			0.005*
Illiterate/primary	441 (36.8%)	142 (47.3%)	
Complementary	445 (37.1%)	100 (33.3%)	
Secondary	165 (13.8%)	34 (11.3%)	
University or higher	149 (12.4%)	24 (8%)	

Table 1. Socio-demographic characteristics of study groups.
(* p<0.05 ; ** p≤0.001)

Characteristics	Controls n(%) 1200 (80%)	Cases n(%) 300 (20%)	OR (95% CI)
Current smoker **	362 (30.2%)	136 (45.3%)	2.013 (1.544–2.624)
Second-hand smoking*	607 (50.6%)	176 (58.7%)	1.387 (1.073–1.791)
LMDS*	40.30±5.08	39.53±5.64	0.971 (0.948–0.996)
Intellectual inhibition*	1.28±1.97	1.59±2.37	1.070 (1.010–1.134)
Anxiety*	1.21±1.59	1.46±1.70	1.097 (1.017–1.183)
Moderate activity**	588 (49%)	124 (41.3%)	0.638 (0.490–0.831)
High physical activity**	131 (10.9%)	17 (5.7%)	0.393 (0.230–0.671)
Hypertension**	821 (68.4%)	274 (91.3%)	4.865 (3.196–7.406)
Dyslipidemia**	584 (48.7%)	234 (78%)	3.740 (2.782–5.026)
Family history of CHD**	197 (16.4%)	109 (36.3%)	2.906 (2.195–3.846)
Menopause**	1026 (85.5%)	282 (94%)	2.657 (1.607–4.393)
Diabetes**	438 (36.5%)	162 (54%)	2.042 (1.582–2.637)
Joint pain**	675 (56.3%)	210 (70%)	1.815 (1.383–2.382)
Family history of HTN*	473 (39.4%)	140 (46.7%)	1.345 (1.043–1.735)

Table 2. Lifestyle and individual RFs according to CHD status.
(* p<0.05 ; ** p≤0.001)

Risk factors for CHD	Protective factors
• Dyslipidemia: aOR=2.852 • Hypertension: aOR=2.715 • Family history of CHD: aOR=2.645 • Cigarette smoking: aOR= 1.888 • Joint pain: aOR= 1.513	• Dwelling in Mount-Lebanon: (peri-urban area) aOR= 0.669 • Adherence to Mediterranean diet: aOR=0.964 • Moderate and High physical activity: aOR= 0.718 and 0.491

Fig. 2 Predictors of CHD in women aged ≥ 40 (multivariate analysis).

Conclusion

These findings should alert on the importance of formulating appropriate policies and implementing interventions to halt the progression of CHD, in the country.

Figure 6. Ghaddar F et al. Risk factors for coronary heart disease among Lebanese women: a case-control study. ESC Preventive Cardiology 2021.

I.3.4 Conclusion

Il s'agit de la première étude cas-témoins sur ce thème réalisé chez les femmes libanaises, alors que la MC chez la femme reste un problème majeur de santé publique. Outre les FDRs classiques des MCV (hypertension, dyslipidémie, tabagisme et histoire familiale prématurée d'une MC), dont leur importance relative diffère chez les femmes pré et post-ménopausées, d'autres éléments liés aux habitudes de vie, suscitent notre intérêt pour leur potentiel intérêt dans la protection des MCV chez les femmes ménopausées : la vie périurbaine (habitation au Mont-Liban) et les revenus mensuels modérés sont intéressants à noter, mais laisse peu de place à une stratégie facilement applicable de prévention. Par contre, l'adhésion au régime alimentaire méditerranéen et la pratique d'une AP régulière sont des éléments qui pourraient bénéficier d'une meilleure information à diffuser au près des femmes à des fins de prévention CV.

L'un des résultats intéressants de notre étude concerne l'effet des douleurs articulaires, sans rapport avec les maladies inflammatoires, sur le développement des MC chez les femmes (OR :1.457, IC 95% : 1.053-2.016), les femmes ménopausées souffrant de douleurs articulaires étaient 1,5 fois plus susceptibles d'avoir une MC que les autres. Ce trouble souvent négligé et banalisé peut affecter la vie quotidienne des patientes, limitant ainsi leur exercice et augmentant leur temps de sédentarité. Ainsi un programme d'information dédié aux femmes en périménopause, visant à ne pas banaliser ce symptôme, pourrait être utile à la prévention de futures maladies coronaires durant la ménopause.

Compte tenu de l'augmentation épidémique attendue de la MC, ainsi que du manque de sensibilisation des femmes que la MC est leur principale cause de décès, notre étude souligne l'importance des politiques de santé publique pour promouvoir les soins de santé des femmes et améliorer la détection des MCV à des stades plus précoces et leur prise en charge.

II. Activité physique et risque de maladie coronarienne chez les femmes libanaises

II.1 Introduction

Nous avons montré dans notre précédent travail que l'AP était un facteur inversement associé à la maladie coronaire chez les patientes incluses. Par ailleurs, l'inactivité physique a été identifiée comme le quatrième FDR principal de mortalité mondiale (6 à 10% de tous les décès par maladies non transmissibles dans le monde) et l'un des principaux indicateurs de santé publique. (154) L'évolution rapide de la démographie, l'urbanisation désordonnée, le développement économique et l'adaptation du mode de vie occidental pour rechercher une vie plus confortable (transports motorisés, utilisation d'appareils et de produits favorisant les comportements sédentaires, tels que les téléviseurs, les ordinateurs, etc.), s'est avérée augmenter le taux de MCV. (10) Les preuves que l'AP est cardioprotectrice chez les femmes ne sont pas aussi solides que celles observées chez les hommes. En outre, le nombre limité d'études incluses sur le sujet restreint la possibilité de tirer des conclusions pragmatiques sur le lien entre AP et protection CV chez les femmes. En effet, différents types d'AP peuvent avoir des effets différents (cf revue générale, chapitre II.1.2.f « inactivité physique, sédentarité ») pour cela, l'identification des schémas d'AP intéressants ainsi que la détermination plus précise de l'intensité de la pratique est cruciale pour décider quel profil particulier d'AP peut réduire le risque de MC chez la femme.

II.2 Objectif de l'étude

Nous avons souhaité évaluer si la pratique d'une AP pourrait être bénéfique en prévention primaire des MC chez les femmes libanaises adultes.

Nous avons recueilli de manière assez détaillée sous quels profils l'AP était pratiquée dans notre étude cas-témoins. Nous avons évalué les différents modèles et intensités d'AP et analysé quel type plus particulier d'activité était susceptible de réduire le risque de MC chez les femmes. Nos résultats pourraient être utiles à élaborer des recommandations de pratique physique adaptée à la prévention des MC chez les femmes.

Par ailleurs, nous avons ciblé les données de la littérature actuellement disponibles concernant l'AP et les maladies coronaires chez la femme pour les présenter sous forme d'une revue.

II.3 Résultats

Ghaddar F et al. Physical activity and odds of coronary heart disease among Lebanese women (*article soumis pour publication*).

Ghaddar F et al. Physical Activity and Coronary Heart Disease Prevention in Women: Epidemiological Reality and Practical Limitations (*revue soumise pour publication).*

Ghaddar F et al. Physical activity and odds of coronary heart disease among Lebanese women. Atherosclerosis. Volume 331, E157, August 01, 2021.

Ghaddar F et al. Physical activity and odds of coronary heart disease among Lebanese women. European Atherosclerosis Society (EAS) congress 2021 (communication affichée).

II.3.1 Article

Physical activity and odds of coronary heart disease among Lebanese women

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Authors' contributions

Fatima Ghaddar contributed to study design, data collection, data entry, statistical analysis and interpretation, manuscript drafting, and write-up of the paper. Fatima Ghaddar has full access to all the data in the study and takes responsibility for the integrity and accuracy of the data analysis. Rouba K Zeidan contributed toward study conception, questionnaire design and article revision. Pascale Salameh contributed toward the study design and population, conception, analysis planning, sample size calculation, project supervision and article correction. Françoise Maupas Schwalm contributed to the conception of the hypothesis, the study design and population, interpretation, working strategy, project supervision and critical review of the article. All authors read and approved the final manuscript submitted for publication.

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Availability of data and materials

Data can be obtained upon request.

Requests should be directed to the corresponding author of this study (fatmeghaddar90@gmail.com). Due to restrictions based on privacy regulations and informed consent of participants, data cannot be made freely available in a public repository and is limited to this specific research group.

Compliance with Ethical Standards

Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical approval and consent to participate

This study was reviewed and approved by the Institutional Review Board (IRB) ethical committee of each participating hospitals in Beirut and Mount-Lebanon. Informed consent was obtained from the participants prior to enrollment in the study.

Consent for publication

Not applicable.

Manuscript (WITHOUT authors' details)

Physical activity and odds of coronary heart disease among Lebanese women

Abstract

Background: It is known that physical activity (PA) is protective against cardiovascular morbidity and mortality. However, few studies have examined the association between PA, sedentary lifestyle and coronary heart disease (CHD) in women.

Purpose: This case-control study investigates the effect of PA, sedentary behavior and their relationship on CHD odds in Lebanese women over forty.

Methods: 1,500 randomly selected Lebanese women (300 cases and 1200 controls) were included between 2018-2019. Data on socio-demographic, lifestyle, cardiovascular factors, PA and sedentary lifestyle were collected.

Results: A sedentary lifestyle combined with low activity levels increased the odds of CHD. Among cases, 46.7% participated in moderate or vigorous PA against almost 60.3% of controls. 36.3% of coronary patients had more than 10 hours/day of sedentary time, with a positive correlation with CHD (adjusted OR: 1.677, 95% CI: 1.145-2.457). Conversely, moderate and high levels of domestic/garden PA revealed lower CHD odds (OR: 0.556, 95% CI: 0.388-0.795 and 0.201, 0.067-0.606 respectively). The detrimental effects of sedentary lifestyle appeared to be significantly reversed by weekly moderate PA (600-3000 MET-min/week), especially as weekly sedentary time was less (OR: 0.616, 95% CI: 0.427-0.888/ 6 to 10h of sedentary time and OR: 0.537, 95% CI: 0.37-0.779/≤ 6h), and except sedentary time exceeding 10h daily. Two PA patterns revealed lower CHD odds: transport-related and domestic/garden PA, as early as low amount, even after adjustment for possible confounders.

Conclusion: These results could guide a comprehensive strategy to improve the prevention of CHD in aging women.

Keywords: physical activity, sedentary behavior, coronary heart disease, Lebanese women, case-control study.

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Introduction

Physical activity (PA) is recognized by the American Heart Association as an independent protective factor against coronary heart disease (CHD). In particular, PA can help lower blood pressure, maintain normal glucose tolerance and improve lipid balance [1], thereby reducing the risk of developing CHD [2]. Although PA is cardioprotective [3], different patterns of PA have different benefits for cardiovascular disease (CVD) prevention [4–6]. While CHD was responsible for more than 9 million deaths worldwide in 2019, and though CVD mortality has decreased in recent decades in Western countries, especially due to improved diagnostic and preventive methods, CHD continues to increase in developing countries, due to globalization and the adoption of more Western lifestyles [7,8]. In Lebanon, CHD accounts for nearly 47% of total annual deaths [9].

Lack of PA has been identified as the fourth leading risk factor (RF) for global mortality and one of the leading public health indicators [10]. Physical inactivity is an important RF for CHD [11] and is the highest in high-income countries. Nowadays, high levels of physical inactivity are also observed in some middle-income countries, particularly among women [12].

It is known that physically active women seem less likely to develop CHD compared to inactive women [13–15]. However, in most countries, women are less active than men [16] and a third of women do not engage in leisure-time PA [2]. PA levels appear to decrease progressively after 65, with a greater decline among women [17]. Otherwise, sedentary time was associated in a dose-response relationship with an increased cardiovascular risk. On average, each additional hour of sedentary time in older women was associated with a 12% increase in adjusted CVD risk [18]. Replacing sitting with moderate or vigorous PA may be associated with reduced CVD mortality risk [19].

While women have CHD that is sometimes difficult to identify quickly (i.e., INOCA syndrome) [20], which may lead to a delay in their management and an unfavorable impact on

their prognosis, few studies have focused on specifying the intensity and profile of PA that could be useful in preventing CHD in women.

According to the WHO, currently 42% of Lebanese women are physically inactive [21], thus constituting a major public health problem [22].

The aim of our study is to identify the PA and sedentary pattern of Lebanese women in order to determine a potentially useful profile for the prevention of CHD in women.

Methods

Study design

The methodology has been previously described elsewhere [23]. We included 300 women aged 40 years and older, with a primary diagnosis of CHD, hospitalized in Beirut and Mount Lebanon regions (Military Hospital, Makassed Hospital, Sacred Heart Hospital, Lebanese Geitaoui Hospital, Rafik Hariri University Hospital, and Mount Lebanon Hospital) from December 2018 to December 2019. For each case, four controls aged ≥40, matched by hospital, were randomly selected from surgical and general medicine wards, constituting a control group of 1200 patients (excluded were patients with a history of CHD, pregnant patients, or those suffering from cancer or mental disorders). Informed consent was obtained from each patient included, after validation of the protocol by the ethics committee of each hospital.

Calculation of total enrollment (n=1500) was done by estimating the minimum sample size that would be necessary to show a twofold increase in CHD risk, in a case-control ratio of 1/4, based on the prevalence of CHD in Lebanese women older than 40 years (9%) [24], an alpha error of 5%, and a study power of 80% (Epi Info™).

Physical Activity (PA)

PA was assessed using the International Physical Activity Questionnaire (IPAQ) long form version [25].

Total PA was calculated by giving each type of activity by its estimated energy requirements: 3.3 metabolic equivalent (MET) for walking; 4 for moderate-intensity and 8 for vigorous PA (during work or leisure); 6 for cycling (transport); 4 and 5.5 for moderate- and heavy-intensity garden work, respectively; and 3 for moderate-intensity housework. Thus, the total PA score was obtained by multiplying the MET score by the minutes performed in a week for all types of activities in all domains (work, transportation, housework/gardening, leisure). A woman was considered moderately active for a score of 600 to 3000 MET-minutes/week combining all types of activities (equivalent to 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day; or 20 minutes of vigorous activity 3 days per week, or a combination of both), and physically very active if the score was ≥ 3000 MET-minutes/week. A woman was classified as low active or inactive if she did not meet any of these criteria [26]. Sedentary time was further determined as the time reported to be at rest, other than sleep (such as sitting during transportation, work, or leisure, watching television, using a computer or cell phone) [27].

Covariates

We collected socio-demographic elements (area of residence, educational level, marital status, professional status, monthly income), factors related to patients' health, particularly cardiovascular: age, menopausal status, smoking (assessed based on tobacco, cigarette or waterpipe consumption (current smoker, non-smoker and former smoker)), RFs for CHD based on patient self-reported, current use of medications and/or laboratory test results when available: (hypertension (≥140/90 mmHg), dyslipidemia (non-HDLc (non-High-Density Lipoprotein Cholesterol) ≥3.4 mmol/L, triglycerides ≥1.7 mmol/L or LDLc (Low-Density Lipoprotein Cholesterol) ≥3 mmol/L [28], diabetes (random blood sugar ≥11.1 mmol/L or glycated hemoglobin ≥6.5% [29]), body mass index ((BMI), overweight: BMI of 25 to 29.9 kg/m2, obesity: BMI ≥30 kg/m2 [12]), lifestyle factors (alcohol consumption, diet). Eating

habits were assessed using the Lebanese Mediterranean Diet Score (LMDS) (scores from 0 to 80 (best nutritional quality score)) [30]. Depression was assessed using the Beirut Distress Scale (BDS-22) (score from 0 to 66 (maximum psychological distress)) [31].

Data analysis

Data were analyzed using SPSS version 21. Categorical variables are expressed in frequency and percentages, continuous variables in mean and standard deviation. Pearson's chi-square test assessed the association between the different independent variables and the dependent variable. Means were compared using the Independent Samples T-test. Row percentages were calculated for each subcategory according to a homogeneous PA distribution (Tables 1 & 2). Patients were classified according to a minimum level of PA, with at least 600 MET-min/week defining a "physically active" status. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. Multivariate logistic regression, using the enter method, assessed the association of PA domains and sedentarity with CHD, adjusted for covariates. To reduce the potential for multicollinearity, the domains of PA and sedentary time were entered as independent variables in the first block of the analysis and the other variables in the second block. Each variable having a p value <0.2 in the bivariate analysis was included in the models. The final model was accepted after checking the adequacy of the data using the Hosmer-Lemeshow test.

Results

Socio-demographic characteristics by PA status

The females in our study appeared significantly more likely to be at least moderately active than inactive (57.6% vs 42.4%, p<0.001). The non-urban living environment seemed to be associated with the practice of at least moderate PA in women. Most patients living outside Beirut, and particularly in Mount Lebanon, were physically active (60.2% and 59.2%

5

respectively), whereas the distribution between the 2 groups was similar for Beirut (50.4% vs 49.6%, ns) (Table 1).

Moreover, in-relationship and professionally active women were significantly more likely to report regular PA (68.2% and 81.9% respectively, p<0.001).

PA was also associated with education level: 54.5% of women with less than primary school education were physically inactive, whereas more than 70% of women with high education reported at least moderate PA. Similarly, women with higher monthly income were significantly more active than inactive (64.1% vs. 35.9%).

Health characteristics by PA status

300 patients were hospitalized for recent coronary pathology (Table 2). Only 46.7% of them reported regular PA, whereas more women were significantly physically active in the control group (60.3%).

Aging is associated with a decrease in PA, where women under 60 were reported to be more physically active (78.6%), while a significant reverse trend was recorded for over-70 (66.4% inactive women). Moreover, postmenopausal patients were more active than inactive (54.5% vs. 45.5%; p=0.001), but this proportion was lower than that of non-menopausal patients (78.6% vs. 21.4%; p<0.001).

Non-overweight patients were significantly more likely to be physically active (63.4%, p<0.001), whereas the distribution of obese patients was balanced between the 2 PA groups (53% vs 47%, ns). Similarly, patients without cardiovascular RFs were significantly more physically active (non-hypertensive (73.8% vs 26.2%, p<0.001), non-dyslipidemic (63.9% vs 36.1%, p<0.001), and non-diabetic (66% vs 34%, p<0.001) patients), whereas the distribution of hypertensive, dyslipidemic, and diabetic patients was balanced between the 2 profiles.

Regarding lifestyle habits, it is interesting to note that smoking, which involves more than 44% of the study patients, was not a barrier to PA, as active smokers were significantly more

physically active than inactive ones (64.6% vs. 35.4%). This seemed to be significantly different with regard to alcohol consumption.

Interestingly, the LMDS score was generally high in our study's patients, with no significant difference between the 2 patient groups, which may be related to the cultural culinary habits of Lebanese women.

We note that women with depression were less likely to engage in PA, as the BDS score was significantly higher in the inactive group (13.16 vs 9.89, p<0.001).

Logically, the absence of painful joint pathology favors PA; women without rheumatic problems were significantly more numerous in the active group (57.8% vs. 42.2%, p<0.001), whereas patients suffering from these pathologies were evenly distributed between the 2 groups. It is interesting to note the same for common joint pain, which is very frequent in our population (59% of women report having it), with 64.7% of physically active women having no pain compared with 35.3% (p<0.001), and a more or less equal distribution between the 2 groups for patients with joint pain.

PA and coronary risk

We studied the PA pattern (intensity and domains) in our study's patients (Table 3).

53.3% of hospitalized patients with newly diagnosed CHD reported no or low PA before hospitalization, whereas 60.3% of patients in the control group engaged in at least moderate activity (OR=0.575 [0.446-0.742], p<0.001). While walking or vigorous PA did not appear to be significantly different between CHD patients and controls, moderate PA appeared to be associated with a significantly reduced risk of developing CHD with a graded effect of weekly practice duration: 60-180 minutes/week of moderate PA had a lower odd of CHD (OR=0.658 [0.441-0.983], p<0.05) and more than 180 minutes/week had the lowest likelihood of CHD (OR=0.472 [0.358-0.621], p<0.001) compared with patients exercising less than 1 hour/week. Concerning the PA domains, that inherent to the work does not seem to be very different.

Similarly, leisure time PA did not appear to differ significantly between the 2 patient groups, although more women in the control group tended to engage in moderate-intensity leisure time PA. On the other hand, PA for transportation and domestic or gardening work seemed significantly different between the 2 groups. Moderate-intensity transport-related PA was associated with a significantly lower odds of CHD (OR=0.351 [0.212-0.579], p<0.001), with the non-significance of high-intensity transport-related PA. In addition, there was a lower odd of CHD in household or garden activities, with a 'dose-response' relationship (OR=0.483 [0.368-0.635], p<0.001, moderate intensity, and 0.157 [0.057-0.434], p<0.001, high intensity).

Sedentary lifestyle and PA

We assessed the sedentary profile of our study's patients (Figure 1A). The total daily sedentary time (in minutes/day) emerged significantly different between the two groups, on weekdays and weekends (524±206 vs 484±204, p<0.01 and 529±205 vs 486±202, p=0.001, respectively); essentially corresponded to substantially more leisure time spent sitting on weekdays (347±219 vs 297±200, p<0.001) and weekends (344±219 vs 298±198, p=0.001) in coronary patients compared with controls (Figure1A, left). In contrast, controls tended to spend more time sitting at work during the week (30±75 vs. 22.52±60, p=0.049).

Note that the domain usually taken as a reference to assess sedentary time (screen time) did not appear significant between coronary women and controls if total screen time was measured (Figure 1A, right).

An inverse significant correlation was found between PA level and reported sedentary time in the women studied (Pearson coefficient = -0.580, p<0.001) (Figure 1B).

PA, sedentary lifestyle and coronary risk

Low total weekly PA (<600 MET-min/week) was accompanied by an increased odds of CHD when daily sedentary time was more than 6 h/day (OR=3.035 [1.588-5.798]/ 6-10 h/day and

3.769 (2.037-6.974)/ >10h/day, p≤0.001) (Figure 2A). Of note, very few women in our study engaged in weekly PA ≥3000 MET-min/week, but rather moderate or low PA, associated with a significant gradation of CHD risk increased by sedentary time (OR=2.023 [1.066-3.838], p<0.05; OR=2.322 [1.229-4.388], p<0.01; OR=3.475 [1.389-8.696], p<0.01, respectively for increasing sedentary time) (Figure 2B). Also, we specifically assessed the association between weekly moderate-intensity PA duration, sedentary time, and coronary risk (Figure 2C & 2D): weekly moderate-intensity PA of 1 to 3 hours was accompanied by an increased odds of CHD with a daily sedentary time greater than 10 hours (Figure 2C) (OR=2.178 [1.095-4.335], p<0.05) (Figure 2D). Below 1 h of weekly moderate PA, the odds of CHD was significantly increased regardless of the sedentary time level (Figure 2C & D), but more so the higher the daily sedentary time (OR=2.200 [1.050-4.611], p<0.05; OR=2.239 [1.474-3.401], p=0.001; OR=2.342 [1.623-3.379], p=0.001, respectively for increasing duration of sedentary time) compared with a moderate PA level of at least 3 hours in a woman spending less than 6 h per day sitting (Fig. 2C & 2D).

In contrast to these results, the detrimental effects of sedentary lifestyle on coronary risk appeared to be reversed by weekly PA of moderate intensity and duration (600-3000 MET-min/week), especially as sedentary lifestyle was less (OR=0.616 [0.427-0.888], p=0.01; OR=0.537 [0.37-0.779], p=0.001, respectively for sedentary time of 6 to 10h and ≤ 6h weekly) and as soon as sedentary time did not exceed 10h daily (OR=0.922 [0.433-1.962], ns) (Figure 3A & 3B).

The odds of CHD (adjusted OR and 95% CI) in women associated with PA domains and sedentary time was assessed in different models: after adjustment for sociodemographic factors (model 1), further combining adjustment for BMI, joint pain, and depression (model 2), and finally adjusted for smoking, alcohol, and biological RFs (model 3) (Table 4).

Leisure-time PA and transport-related vigorous-intensity PA were associated with a decreased but non-significant odd of CHD. In contrast, moderate-intensity transport PA was correlated with a significant decrease in the odds of CHD in model 1, and remained statistically significant after adjustment for sociodemographic, lifestyle, and cardiovascular RFs (model 3) (OR=0.447 [0.259-0.771], p=0.004, compared with low-intensity PA in the context of transportation.

PA related to housework or gardening was associated with a significantly lower odds of CHD, with a substantial reduction of 44.4% and 79.9% observed for moderate- (600-3000 MET-min/week) and high-intensity (≥3000 MET-min/week) PA, respectively, compared with those with little or no exercise. In contrast, women who sat for long periods of time (>10 h/day) had a significant increase of approximately 68% in the odds of CHD (OR=1.677 [1.145-2.457], p=0.008) compared with those sitting less than 6 h/day.

Discussion

To our knowledge, our study is the first to assess the relationship between PA and odds of CHD in Lebanese women. It is also the first to provide a unique insight into the different patterns of PA and sedentary behavior in Lebanese women with CHD. Essentially, our results showed that women who practice at least moderate-intensity PA, both in transportation and in conventional activities of daily living, appeared to be protected against CHD. On the other hand, a significant sedentary lifestyle in women, more than 10 hours of daily sitting, was associated with an increased odd of CHD.

The rapid sociodemographic transition in developing countries has introduced substantial lifestyle changes that have been largely characterized by increasing prevalence of obesity and physical inactivity [32] and consequently increasing risk of CVD [8]. In general, low or declining PA levels often correspond to high or rising gross national product [2,16].

The prevalence of physical inactivity among women in our study (42.4%) was very close to that of non-communicable diseases (41.7%) published in 2010 by WHO. This result was consistent with other studies showing that most women in Arab countries suffer from insufficient PA, for example, 76.2% in Saudi Arabia, 72.1% in Kuwait, 68.9% in the Emirates, 47.6% in Mauritania, 54% in Iraq, and 40.3% in Tunisia [12,33].

We did not find a significant protective association of leisure-time PA or high-intensity transport PA with CHD, which is puzzling compared with the literature [34,35]. This could be explained by the low prevalence of high-intensity PA for transport in our population, possibly due to the predominance of hot, sunny weather limiting this type of activity. In addition, there is a barrier related to the lifestyle habits, most of the women live in urban/peri-urban areas (Beirut and Mount Lebanon), thus with a lack of green spaces for regular PA practice, and Lebanese women are generally not accustomed to using gyms, as demonstrated in Polish women who do not practice enough during their leisure time [36]. However, moderate PA in the transport setting resulted in a substantial reduction in the odds of coronary events among women studied, a result consistent with previous studies [13,15] showing that intense activities were not necessary to reduce the rate of CHD in women.

Work-related PA did not appear to be associated with CHD in our study, in line with the results of a previous study [37], which is quite old, but perhaps consistent with the low proportion of working women in our study (144 patients (9.6% of the total number), of whom only 21 were CHD patients (1.4%)), and on the other hand infrequently in physically demanding jobs. However, it should be noted that previous research had not suggested a greater potential protective effect for vigorous-intensity PA [4], moreover, intense occupational PA could be detrimental to health [38–40].

Several studies suggest that sitting for 10 or more hours per day was associated with an increased risk of CVD [41,42] and mortality, but at least moderate PA could reverse this

adverse effect [19]. However, sedentary behavior is not simply the absence of PA. Individuals may engage in PA while otherwise spending a lot of time sitting [43]. In our study, women with CHD had significantly more sedentary time than controls, including after adjustment for confounders. We note the protective effect of various household and/or gardening activities on CHD. These results are interesting, because domestic activity remains the main contributor to daily PA, especially in the elderly [44]. These findings are consistent with previous studies showing that home activity has beneficial effects on health, by reducing cardiovascular mortality [45,46] and CHD risk [5]. Gardening can, moreover, be discussed as an integral part of the "Mediterranean diet" combining an omega-3 and vitamin rich, protective dietary culturally adopted in Mediterranean countries (which our patients present), and outdoor moderate daily PA, favoring vitamin D synthesis, seasonal adaptation to light, consumption of mature fruits and vegetables; this combined strategy improves women's health [47].

One study noted that PA related to housework was not associated with a reduced risk of CVD [48], but the mean age was lower (52.4 years) and the assessment was for intense domestic PA only. Although retired or unemployed women were less likely to participate in PAs during their leisure time, they appeared to spend more time on housework, as shown in Brownson's study [49].

Thus, our results in Lebanese women are consistent with recent European Society of Cardiology (ESC) guidelines recommending adults of all ages to strive for at least 150-300 min a week of moderate-intensity PA [50], and could be used in a pragmatic CVD prevention strategy in aging Lebanese women, as has been considered for other countries [51].

Our study has some limitations. The sample was composed of hospitalized patients from 2 regions and therefore may not represent a balanced distribution of the overall population. However, to minimize the selection bias effect, controls were selected from the same hospital as the cases. Self-reported PA likely has a significant measurement error [52], which may lead

to underestimate the effect of PA on CHD risk. Although we performed a multivariate analysis, the possibility of residual confounding by unmeasured factors remains. However, the large sample size and face-to-face interviews increased the precision of the study. The use of incident cases also avoids survival bias. In addition, the assessment of all domains of daily PA enhances reflection on the outcomes. Furthermore, we collected detailed information on demographic, socioeconomic, and health factors, which allowed adjustment for these important confounders.

Conclusion

Our results highlight the cardiovascular health benefits of PA in preventing CHD risk in Lebanese women, even while spending several hours sitting. As urbanization continues, promoting the potential benefits of easily accessible PA could be an important public health message for aging women who do not participate in PA in a sports club setting. Thus, actions to raise women's awareness through the commitment of dedicated government policies could promote the virtuous couple: a Mediterranean diet associated with regular PA, accessible and adapted to the female population in developing countries for the benefit of their cardiovascular health.

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Tables

Table 1 Socio-demographic characteristics of study participants grouped according to their physical activity status

Characteristics	Total	Physically active[a] n (%)	Physically inactive[b] n (%)	p-value
Frequency	**1500**	**864 [57.6%]**	**636 [42.4%]**	<0.001***
Governorate				
Beirut	351 [23.4%]	177 (50.4%)	174 (49.6%)	0.873
Mount Lebanon	693 [46.2%]	417 (60.2%)	276 (39.8%)	<0.001***
Others[c]	456 [30.4%]	270 (59.2%)	186 (40.8%)	<0.001***
Marital status				
In a relationship	824 [54.9%]	562 (68.2%)	262 (31.8%)	<0.001***
Life alone	676 [45.1%]	302 (44.7%)	374 (55.3%)	0.006**
Work status				
No/Retired	1356 [90.4%]	746 (55.0%)	610 (45.0%)	<0.001***
Yes	144 [9.6%]	118 (81.9%)	26 (18.1%)	<0.001***
Educational level[d]				
Low	583 [38.9%]	265 (45.5%)	318 (54.5%)	0.028*
Middle	744 [49.6%]	477 (64.1%)	267 (35.9%)	<0.001***
High	173 [11.5%]	122 (70.5%)	51 (29.5%)	<0.001***
Monthly individual income[e]				
Low	64 [4.3%]	36 (56.3%)	28 (43.8%)	0.317
Middle	1054 [70.3%]	583 (55.3%)	471 (44.7%)	0.001***
High	382 [25.5%]	245 (64.1%)	137 (35.9%)	<0.001***

[a]Physically active: at least moderate intensity (≥ 600 MET-min/week)
[b]Physically inactive: none or low intensity (< 600 MET-min/week)
[c]Others regions of Lebanon include: South Lebanon, North/Akkar, Bekaa, Baalback/Hermel and Nabatieh.
[d]Educational level: low is illiterate or primary school level, middle is complementary or secondary school level, high is university level.
[e]Monthly income per individual: low is <180 LBP/month/person, middle is 180 to 675 LBP/month/person, high is >675 LBP/month/person (LBP: Lebanese pound).
Results are expressed as frequencies and percentages for qualitative data (the total percentages were calculated on the basis on the total effective [1500]; and the row percentages were calculated for each sub-category according to a homogeneous distribution).
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.

Table 2 Health related characteristics of study participants grouped according to their physical activity status

Characteristics	Total	Physically active[a] n (%)	Physically inactive[b] n (%)	p-value
Frequency	**1500**	**864 [57.6%]**	**636 [42.4%]**	<0.001***
Presence of CHD				
No	1200 [80%]	724 (60.3%)	476 (39.7%)	<0.001***
Yes	300 [20%]	140 (46.7%)	160 (53.3%)	0.248
Age group				
40-50 years	266 [17.7%]	209 (78.6%)	57 (21.4%)	<0.001***
50-60 years	379 [25.3%]	285 (75.2%)	94 (24.8%)	<0.001***
60-70 years	432 [28.8%]	228 (52.8%)	204 (47.2%)	0.248
> 70 years	423 [28.2%]	142 (33.6%)	281 (66.4%)	<0.001***
Postmenopausal status				
No	192 [12.8%]	151 (78.6%)	41 (21.4%)	<0.001***
Yes	1308 [87.2%]	713 (54.5%)	595 (45.5%)	0.001***
BMI				
Underweight / Normal	369 [24.6%]	234 (63.4%)	135 (36.6%)	<0.001***
Overweight	484 [32.3%]	287 (59.3%)	197 (40.7%)	<0.001***
Obese	647 [43.1%]	343 (53.0%)	304 (47.0%)	0.125
Hypertension				
No	405 [27%]	299 (73.8%)	106 (26.2%)	<0.001***
Yes	1095 [73%]	565 (51.6%)	530 (48.4%)	0.290
Dyslipidemia				
No	682 [45.5%]	436 (63.9%)	246 (36.1%)	<0.001***
Yes	818 [54.5%]	428 (52.3%)	390 (47.7%)	0.184
Diabetes				
No	900 [60%]	594 (66.0%)	306 (34.0%)	<0.001***
Yes	600 [40%]	270 (45.0%)	330 (55.0%)	0.014*
Smoking status[c]				
Never / past	837 [55.8%]	436 (52.1%)	401 (47.9%)	0.226
Current	663 [44.2%]	428 (64.6%)	235 (35.4%)	<0.001***
Alcohol consumption				
No	1367 [91.1%]	777 (56.8%)	590 (43.2%)	<0.001***
Yes	133 [8.9%]	87 (65.4%)	46 (34.6%)	<0.001***
LMDS, mean ± SD	40.15 ± 5.20	40.21 ± 5.29	40.06 ± 5.08	0.566
BDS-22, mean ± SD	11.27 ± 14.13	9.89 ± 13.20	13.16 ± 15.12	<0.001***
Rheumatic diseases				
No	1430 [95.3%]	827 (57.8%)	603 (42.2%)	<0.001***
Yes	70 [4.7%]	37 (52.9%)	33 (47.1%)	0.633
Declared joint pain				
No	615 [41%]	398 (64.7%)	217 (35.3%)	<0.001***
Yes	885 [59%]	466 (52.7%)	419 (47.3%)	0.114

[a]Physically active: at least moderate intensity (≥ 600 MET-min/week).
[b]Physically inactive: none or low intensity (< 600 MET-min/week).
[c]Smoking status corresponds to cigarettes and/ or waterpipes consumption.
CHD: coronary heart disease, BMI: body mass index, LMDS: Lebanese Mediterranean Diet Score, BDS: Beirut Distress Scale.
Results are expressed as: Mean ± standard deviation (SD) for quantitative data; frequencies and percentages for qualitative data (the total percentages were calculated on the basis on the total effective [1500]; and the row percentages were calculated for each sub-category according to a homogeneous distribution).
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.

Table 3 Coronary heart disease risk according to different types and domains of physical activity

	Controls n (%)	Coronary cases n (%)	Overall p-value	OR (95% CI)	p-value
Frequency	1200 (80%)	300 (20%)			
Total PA[a], n (%)			<0.001***		
Physically inactive[b]	476 (39.7%)	160 (53.3%)		1.00 (Ref.)	
Physically active[c]	724 (60.3%)	140 (46.7%)		0.575 (0.446 - 0.742)	<0.001***
Types of PA, n (%)					
Total walking[d]			0.453		
< 60 minutes/week	730 (60.8%)	193 (64.3%)		1.00 (Ref.)	
60-180 minutes/week	157 (13.1%)	39 (13%)		0.940 (0.639 - 1.381)	0.751
≥ 180 minutes/week	313 (26.1%)	68 (22.7%)		0.822 (0.605 - 1.116)	0.209
Total PA of moderate intensity[e]			<0.001***		
< 60 minutes/week	408 (34%)	151 (50.3%)		1.00 (Ref.)	
60-180 minutes/week	156 (13%)	38 (12.7%)		0.658 (0.441 - 0.983)	0.041*
≥ 180 minutes/week	636 (53%)	111 (37%)		0.472 (0.358 - 0.621)	<0.001***
Total PA of vigorous intensity[f]			0.784		
< 60 minutes/week	1179 (98.3%)	297 (99%)		1.00 (Ref.)	
60-180 minutes/week	10 (0.8%)	2 (0.7%)		0.794 (0.173 - 3.643)	0.767
≥ 180 minutes/week	11 (0.9%)	1 (0.3%)		0.361 (0.046 - 2.806)	0.330
Domains of PA, n (%)					
Work Domain			0.384		
Unemployed and low amount	1151(95.9%)	291 (97%)		1.00 (Ref.)	
Moderate and high amount	49 (4.1%)	9 (3%)		0.726 (0.353 - 1.496)	0.386
Transportation Domain			<0.001***		
Low amount	1002 (83.5%)	281 (93.7%)		1.00 (Ref.)	
Moderate amount	183 (15.3%)	18 (6%)		0.351 (0.212 - 0.579)	<0.001***
High amount	15 (1.3%)	1 (0.3%)		0.238 (0.031 - 1.807)	0.165
Domestic and Garden Domain			<0.001***		
Low amount	583 (48.6%)	204 (68%)		1.00 (Ref.)	
Moderate amount	544 (45.3%)	92 (30.7%)		0.483 (0.368 - 0.635)	<0.001***
High amount	73 (6.1%)	4 (1.3%)		0.157 (0.057 - 0.434)	<0.001***
Leisure-time Domain			0.081		
Low amount	1074 (89.5%)	281 (93.7%)		1.00 (Ref.)	
Moderate amount	114 (9.5%)	18 (6%)		0.603 (0.361 - 1.009)	0.054
High amount	12 (1%)	1 (0.3%)		0.319 (0.041 - 2.460)	0.273

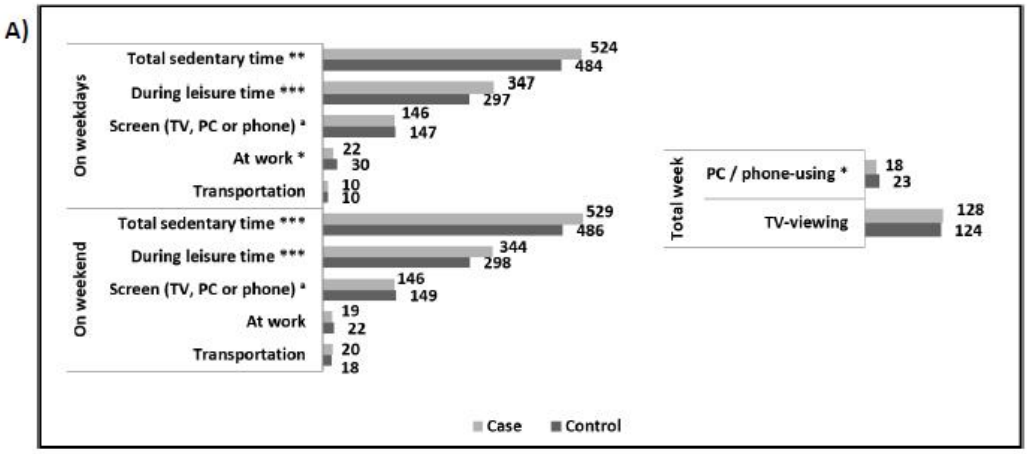
[a]Total PA: sum of work, transportation, domestic and garden and leisure scores of IPAQ (International Physical Activity Questionnaire), expressed in MET-minutes/week.
[b]Physically inactive: none or low intensity (< 600 MET-min/week)
[c]Physically active: at least moderate intensity (≥ 600 MET-min/week)
[d]Total walking: sum of weekly walking activities at work, for transportation and in leisure time, expressed in minutes/week.
[e]Total PA of moderate intensity: sum of weekly moderate activities at work, in domestic and garden chores, in leisure time and by cycling for transportation as well as vigorous garden chores, expressed in minutes/week.
[f]Total PA of vigorous intensity: sum of weekly vigorous activities at work and in leisure time, expressed in minutes/week. Low amount is equivalent to values <600 MET-minutes/week; moderate amount to values ≥600 and <3000 MET-minutes/week and high amount to values ≥3000 MET-minutes/week.
PA: physical activity, OR: Odds ratio, CI: Confidence interval, MET: metabolic equivalent task. Results are presented as: frequencies and percentages (qualitative data).
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.

Table 4 Association between domains related physical activity, sedentary time and CHD among women

PA and Sedentary time	Model 1[a] Adjusted OR (95% CI)	P-value	Model 2[b] Adjusted OR (95% CI)	P-value	Model 3[c] Adjusted OR (95% CI)	P-value
Transportation Domain						
Low amount[d]	–_	0.001***	–	0.006*	–	0.012*
Moderate amount[e]	0.378 (0.226–0.630)	<0.001***	0.437 (0.258–0.738)	0.002**	0.447 (0.259–0.771)	0.004**
High amount [f]	0.320 (0.041–2.515)	0.279	0.391 (0.049–3.135)	0.377	0.397 (0.047–3.370)	0.397
Domestic and Garden Domain						
Low amount[d]	–	<0.001***	–	<0.001***	–	0.001***
Moderate amount[e]	0.508 (0.379–0.681)	<0.001***	0.536 (0.379–0.757)	<0.001***	0.556 (0.388–0.795)	0.001***
High amount [f]	0.173 (0.061–0.488)	0.001***	0.167 (0.057–0.491)	0.001***	0.201 (0.067 - 0.606)	0.004**
Leisure-time Domain						
Low amount[d]	–	0.214	–	0.584	–	0.592
Moderate amount[e]	0.643 (0.380–1.087)	0.099	0.769 (0.448–1.319)	0.339	0.784 (0.445–1.384)	0.402
High amount [f]	0.506 (0.063–4.088)	0.523	0.627 (0.076–5.147)	0.664	0.510 (0.059–4.383)	0.540
Sedentary time, h/day, n (%)						
≤ 6 h/day	–	0.004**	–	0.025*	–	0.028*
6 to 10 h/day	1.319 (0.949–1.835)	0.099	1.302 (0.933–1.816)	0.120	1.268 (0.895–1.795)	0.181
>10 h/day	1.816 (1.272–2.593)	0.001***	1.658 (1.151–2.388)	0.007**	1.677 (1.145–2.457)	0.008**

[a] Regression model 1 adjusted for sociodemographic factors: age, governorate, region type, education, work, marital status and income (for each person of the household).
[b] Regression model 2 adjusted for variables included in model 1, plus body mass index, joint pain, depression (BDS-22 score).
[c] Regression model 3 adjusted for variables included in model 2, plus smoking, alcohol, and biological (menopause, dyslipidemia, hypertension, diabetes) risk factors.
[d]Low amount: <600 MET-minutes/week; [e]moderate amount: 600 to 3000 MET-minutes/week; [f]high amount: ≥ 3000 MET-minutes/week.
PA: physical activity, OR: odds ratio, CI: confidence interval, MET: metabolic equivalent task.
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.

Figures



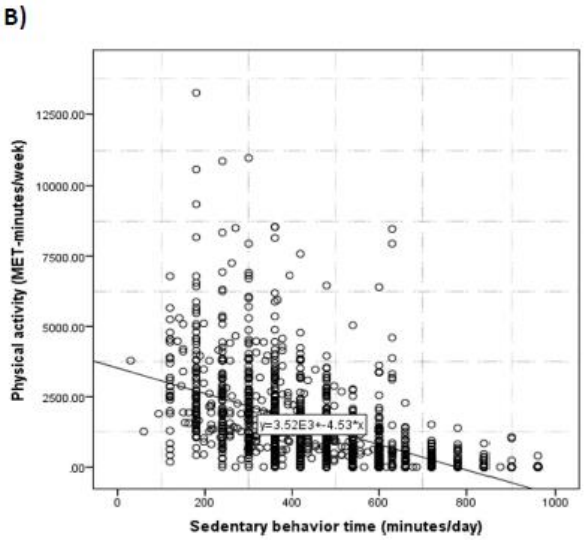
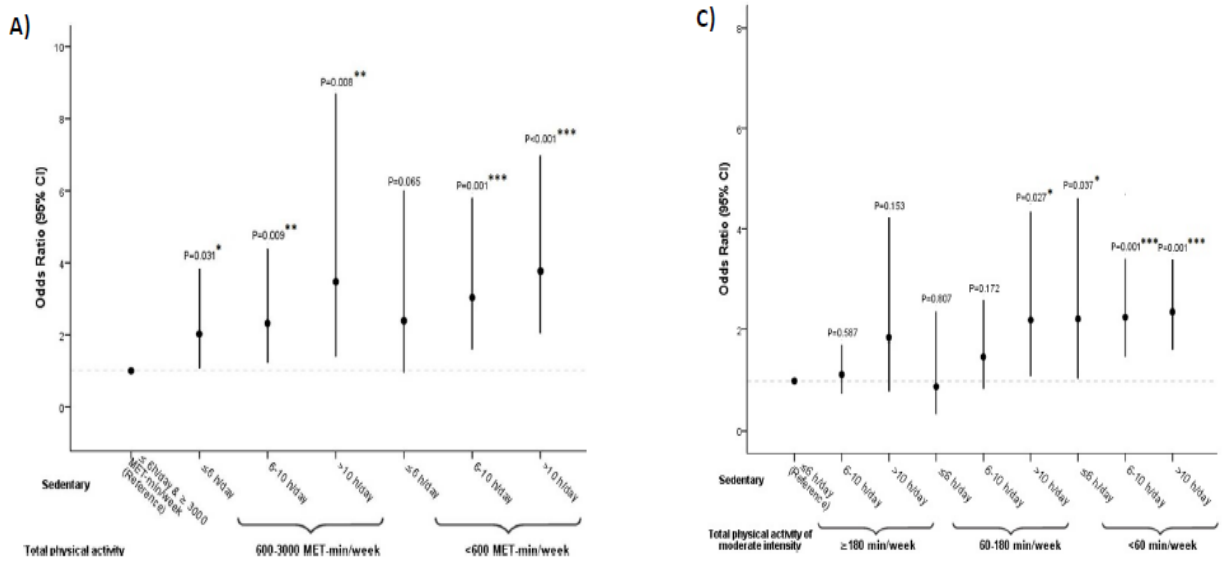


Fig. 1 Sedentary in study participant.
A. Sedentary time and domains of sedentary in study participants.
Average time (in minutes/day) reportedly spent sitting in each domain on a usual weekday and weekend day (left) and in front of a screen over the week (right) among coronary and control women.
[a] Screen represents the sum of TV-viewing and PC or phone-using.
B. Scatter plot for the relationship between time spent sitting (minutes/day) and physical activity (MET-minutes/week). Pearson's correlation coefficient = - 0.580 ($P < 0.001$).
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.



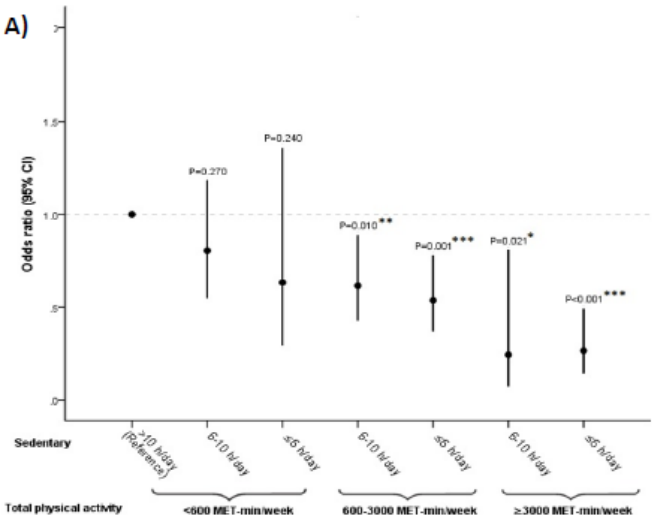
Levels of total PA and sedentary time tertiles		Controls n (%) 1200 (80%)	Cases n (%) 300 (20%)	OR (95% CI)	Significance level
High total PA					
Sedentary	≤ 6h/day	131 (10.9%)	13 (4.3%)	1.00 (Ref.)	
	6 to 10h/day	33 (2.8%)	3 (1.0%)	0.916 (0.247 - 3.402)	0.896
	> 10h/day	6 (0.5%)	1 (0.3%)	1.679 (0.188 - 15.042)	0.643
Moderate total PA					
Sedentary	≤ 6h/day	269 (22.4%)	54 (18.0%)	2.023 (1.066 - 3.838)	0.031*
	6 to 10h/day	256 (21.3%)	59 (19.7%)	2.322 (1.229 - 4.388)	0.009**
	> 10h/day	29 (2.4%)	10 (3.3%)	3.475 (1.389 - 8.696)	0.008**
Low total PA					
Sedentary	≤ 6h/day	38 (3.2%)	9 (3.0%)	2.387 (0.948 - 6.009)	0.065
	6 to 10h/day	176 (14.7%)	53 (17.7%)	3.035 (1.588 - 5.798)	0.001***
	> 10h/day	262 (21.8%)	98 (32.7%)	3.769 (2.037 - 6.974)	<0.001***

D)

	Weekly duration of moderate PA		
Sedentary	≥ 180 min/week	60 to 180 min/week	≤ 60 min/week
≤ 6h/day	Ref	0.886 (0.334-2.350)	2.200 (1.050-4.611) *
6 to 10h/day	1.125 (0.736-1.719)	1.476 (0.844-2.581)	2.239 (1.474-3.401) ***
> 10h/day	1.837 (0.797-4.233)	2.178 (1.095-4.335) *	2.342 (1.623-3.379) ***

Fig. 2 Odds ratio of daily sedentary associated with weekly physical activity and the odds of coronary heart disease.
A, B. Sedentary and total PA; *C, D*. Sedentary and duration of total PA of moderate intensity
A, C. Schematic representation of ORs with 95% CI. B, D. Table including the numerical values of the ORs (95% CI).
The reference category is the group with the best condition: lowest levels of sedentary (≤ 6 h/day) and higher weekly total PA (≥ 3000 MET-min/week) (A, B), lowest levels of sedentary (≤ 6 h/day) and higher weekly duration of moderate-intensity PA (≥ 180 min/week) (C, D).
PA: physical activity, OR: Odds ratio, CI: Confidence interval, MET: metabolic equivalent task.
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.

A)



B)

	Total PA		
Sedentary	**< 600 MET-min/week**	**600-3000 MET-min/week**	**≥3000 MET-min/week**
> 10 h/day	Ref	0.922 (0.433-1.962)	0.446 (0.053-3.748)
6 to 10 h/day	0.805 (0.548-1.183)	0.616 (0.427-0.888) **	0.243 (0.073-0.811) *
≤ 6 h/day	0.633 (0.295-1.358)	0.537 (0.370-0.779) ***	0.265 (0.143-0.491) ***

Fig. 3 Odds ratio of daily sedentary associated with weekly total physical activity level and the odds of coronary heart disease.
A. Schematic representation of ORs with 95% CI. B. Table including the numerical values of the ORs (95% CI).
The reference category is the group with the highest levels of sitting time (>10 h/day) and lowest total physical activity (<600 MET-min/week).
PA: physical activity, OR: odds ratio, CI: confidence interval, MET: metabolic equivalent task.
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.

II.3.2 Revue

Physical Activity and Coronary Heart Disease Prevention in Women: Epidemiological Reality and Practical Limitations

Short title: Exercise and coronary heart disease in women

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Brief summary

Physical activity (PA) is a powerful preventive tool for diseases, particularly coronary heart disease (CHD). This review aims to summarize the benefits of PA on cardiovascular health in women. Additional research is needed to better characterize the optimal PA that can lead to a reduction in the risk of CHD and mortality in women. This should make it possible to improve the prevention of cardiovascular diseases in women by promoting this non-drug therapy.

Abstract

Physical activity (PA) is a powerful tool for disease prevention and health promotion in perimenopausal women as well as in the entire population. This review aims to summarize the findings on the benefits of PA on women's cardiovascular health. We focused on the types and intensities of PA on coronary heart disease (CHD), mechanisms and recommendations of PA. Physically active subjects have higher insulin sensitivity, lower blood pressure, improved lipoprotein profile, decreased blood viscosity and promotion of endothelial nitric oxide production, thus lower occurrence of atherogenesis. Different types and domains of PA have demonstrated favorable health outcomes. Particularly relevant for older women, replacing sedentary time with low-intensity activity could reduce CHD mortality rates. The new WHO-recommended range of exercise intensity for adults to prevent cardiovascular disease is 150-300 minutes of moderate-intensity and 75-150 minutes of vigorous-intensity PA per-week. Women who do not currently meet these recommendations should start with at least small amounts of PA. In fact, even the simplest activity is better than nothing. Moderate exercise levels were consistently associated with a lower cardiovascular risk. Nevertheless, the relationship is curvilinear, with the largest benefits occurring with minor PA volumes and lesser benefits at high PA volumes. However, further research is needed, particularly regarding the beneficial dose-response association, to better characterize the optimal PA that may lead to reduced CHD risk and mortality in women. Similarly, analysis of the psychosocial obstacles to PA practice should make it possible to improve cardiovascular diseases prevention in women by promoting this non-drug therapy.

Keywords: Physical activity, coronary heart disease, sedentary lifestyle, women, epidemiology

Introduction

Coronary heart disease (CHD) is the leading cause of cardiovascular disease (CVD) death in women worldwide,[1] with a marked increase in frequency after menopause, highlighting the impact of reduced sex hormones on metabolic profile and adverse changes in body composition, lipids and lipoproteins, in turn affecting vascular health.[2] However, women are about 10 years behind men for the incidence of total coronary events, and 20 years for more severe manifestations of CHD, such as myocardial infarction (MI) and sudden death; but the sex ratio for incidence gradually narrows with age.[3] In addition, the global burden of disease (GBD) reported that CHD was responsible for approximately nine million deaths in 2019 (9,137,791.14 for both genders, 16.17% of overall death), of which 4,169,539.80 were female.[4] In addition, the total burden of disability increased by 52% between 1990 and 2017, globally; and women continued to experience higher rates of disability[5] and death[6] than men, despite the late onset.

Although the overall management of CVD is similar for both sexes, gender-based differences exist in pathophysiology, symptoms, presentation, effectiveness of diagnostic tests, and response to pharmacological interventions.[7] An improvement in cardiovascular mortality was observed between 1980 and 2010, but an increase has been noted in recent years. Nonetheless, CHD remains underdiagnosed and undertreated in women compared to men.[8]

Several healthy lifestyle choices seem useful to prevent CVD, such as regular physical activity (PA), for which a strong inverse dose-response relationship was observed with the incidence of CVD, partly mediated by a lower incidence of obesity, high blood pressure, dyslipidemia and diabetes mellitus.[9] Primordial prevention, described as preventing the evolution of clinical risk factors (RFs), by adopting or maintaining a healthy lifestyle, will keep women at a lower CVD risk, and thus reduce their CHD incidence.[10] Nevertheless, physical inactivity remains a global problem, particularly in CHD patients.

Over the past decades, PA levels have declined worldwide, mainly due to rapid urbanization, motorized transportation, reduced PA in the workplace, use of devices and products that promote sedentary behaviors (televisions, computers, etc..), increase in the number of housemaids, especially among working women, and other aspects of lifestyle.[11] Recent data reported that 7.2% of all-cause deaths and 7.6% of CVD deaths globally were linked to physical inactivity.[12] Different types of PA can have different effects on the development of CVD[13–15]; therefore, identifying its patterns and intensities is crucial in deciding which particular type of activity can reduce the risk of heart disease.

Previous studies showed that lifestyle modification interventions remain effective in improving cardiovascular risk factors (CVRFs) in premenopausal women, such as PA, blood pressure and fasting blood sugar.[16] However, in most countries, females are less active than males (global average of 31.7% vs 23.4% for inactive women and men, respectively).[17] Although gender differences in prevention have been demonstrated in previous studies, the present review will summarize the relationship between different types and intensities of PA and cardiovascular health among women. Although the atherosclerotic process causes several heart problems, the focus of this review is CHD. We also include a summary measure of the mechanisms by which PA and regular exercise can improve cardiovascular health and reduce the disease burden.

Sedentary lifestyles and physical inactivity as a risk factor for women's CHD

Physical inactivity and sedentary behavior (characterized by sitting with energy expenditure ≤1.5 metabolic equivalents (MET)[18]) are among the major modifiable CVRFs and all-cause mortality. Despite the known health benefits of moderate and vigorous PA, a low percentage of adult and older women meet the recommended guidelines.[8] Notably, only 3.2% of women and 3.8% of men aged 20-59 years consistently met the current recommendations. For objectively measured PA (e.g., by accelerometer), compliance with PA recommendations was 2.3% and 2.5% for women and men aged ≥ 60 years, respectively.[19] In high-income countries, 35% of women and 26% of men were insufficiently active, compared to 24% and 12% in low-income countries, respectively.[20] Women who report insufficient PA appear to be 8% higher than men, worldwide.[8] The associations between sedentary behavior and PA with all-cause mortality were examined in recent meta-analyses; moderate- to vigorous-intensity PA levels appear to attenuate, but do not eliminate the increasing risk related to prolonged sitting time (high TV-viewing time).[21,22] Replacing sitting with standing was associated with reduced CVD mortality risk among least sedentary persons only (Hazard ratio, HR: 0.94; 95% confidence interval (CI): 0.91–0.98). Sitting substitution with moderate or vigorous PA (but not walking) was associated with reduced CVD mortality risk, although the replacement effects were more marked among high sedentary persons (>6 sitting h/day) (HR: 0.80; 95% CI: 0.70–0.93 for moderate PA; HR: 0.36; 95% CI: 0.17–0.74 for vigorous PA).[23]

Evidence-based guidelines are the keys of public health and clinical practice.[24,25] Understanding the common associations and health-promoting potential of different PA alternatives to sitting is important for developing such guidelines. As no such evidence exists, the currently established guidelines for sedentary behavior are non-specific and not always evidence-based.[26]

Based on recent epidemiological studies, it has been suggested that sedentary time and its accumulation may be relevant for cardiovascular health in older women. They were associated in a dose-response relationship with an increased CVD risk, with hazard ratios up to 2-fold higher for CHD than for CVD.[27] On average, each extra hour of sedentary time in older women, was associated with a 12% increment in adjusted CVD risk. Likewise, every 1-minute increase in sedentary bout duration was associated with a 4% risk.[27] Various experimental studies have demonstrated that interrupted periods of sitting time, compared to uninterrupted ones, may have beneficial effects on cardiometabolic health. Interruption of prolonged sedentary periods of 5-min every 30 min by standing or light-intensity walking activity reduced postprandial glucose metabolism, insulin, and unesterified fatty acids responses in postmenopausal and dysglycemic women.[28] After 6 years of follow-up, it was shown that women who sat >8h/day or >11h/day had 1.45- and 1.65-times higher risks of death than those who sat <4h/day, respectively. Likewise, for women over 70 years, who had a prolonged sitting time (>8 h/day) and did not follow PA guidelines, were at risk of dying within the next 9 years.[29]

It was also declared that diurnal habits of sitting time varied by socio-demographic variables; older and widowed adults were more sedentary during the day (morning and afternoon) compared to their younger and non-widowed counterparts, but there were no differences during

the evening. Older adults accumulated 35 more sedentary minutes/day than younger adults and men accumulated 32 more sedentary minutes/day than women.[30] Women, especially younger ones, are on average more involved in household and care activities as a secondary activity than men. The persistence of negative associations between sedentary behavior (total sedentary time and mean sedentary bout duration) and cardiometabolic RFs (waist circumference, body mass index (BMI), fasting blood sugar, insulin, insulin resistance, and triglycerides), even after adjustment for moderate- to- vigorous PA or BMI, underscores the importance of considering sitting time and patterns in the assessment of cardiovascular health in overweight/obese postmenopausal women.[18]

The possibility that certain types or domains of sitting behavior may be more harmful to health than others was also considered. In a large population-based cohort study, it was suggested that sitting ≥ 6h/day while watching TV was associated with an increased risk of mortality from CHD and total CVD. Each 1h/day increase in TV viewing was associated with a 4% increase in CHD mortality and 2% increase in total CVD mortality.[31] Furthermore, a study of Scottish adults found that the average time spent watching TV and other screen-based entertainment was 3.6 h/day in men and 3.2 h/day in women; on average, people in the lowest socioeconomic position spent an additional 1.8 h/day on screen-based entertainment compared to those in the highest socioeconomic position.[32] Women who engaged in higher levels of leisure- time moderate to vigorous PA and watched less TV were found to have a nonfatal CHD- free life expectancy 2.4 years longer than women who reported no leisure time PA and viewed more TV.[33]

Menopause and PA

Menopause is a period of life with many symptoms and physical, psychological and social changes.[2] Menopausal transition and postmenopausal periods can generally affect body composition, cardiometabolic RFs and inflammatory markers, as well as a decrease in PA.[34] Women seem to accumulate more sedentary time throughout life than men before age 30, but this trend reverses after age 60.[18] Although less sedentary than men of the same age, older women have an increased CVD risk after menopause as cardioprotective estrogen levels decrease.[18] Biologically, estrogen levels that decline after menopause negatively affect muscle mass and bone density, as well as cardiovascular function,[2] which are RFs for poor physical function.

Several studies examining the differences in physical performance across menopausal status in middle-aged women showed that postmenopausal women have lower muscle strength and power than premenopausal women.[35,36] However, usual walking speed did not appear to differ significantly between pre-, peri-, and postmenopausal women.[36,37] In addition, other studies highlighted the importance of premature menopause; in fact age at natural menopause < 40 years was found to be a RF for impaired physical performance.[38] On the other hand, PA can counteract the potential adverse effect of menopausal factors on muscle strength and power: a higher level and greater frequency of PA can provide better physical performance in the menopausal transition.[35]

Pathways of benefits for physical activity on cardiovascular health

Regular exercise has several beneficial effects on overall health. Exercise poses a major challenge to whole body homeostasis and causes widespread changes in many cells, tissues and organs in response to increased metabolic demand,[39] including adaptations to the cardiovascular system.[40]

Exercise increases the intensity of physiological shear stress, leading to the shear stress-dependent activity of c-Src in endothelial cells and increasing endothelial nitric oxide synthase (eNOS) expression.[41] In the vascular endothelium, eNOS stimulates nitric oxide production that causes vasodilation, inhibits platelet aggregation and prevents adhesion of leukocytes to vessel walls, thereby reducing the onset of atherosclerosis, ischemia, thrombosis, or other cardiac events.[42] Various epidemiological studies highlighted the importance of exercise in increasing plasma nitric oxide levels for the prevention of CVD and atherosclerosis in elderly women.[43,44]

PA increases mitochondrial biogenesis in adipocytes,[45] skeletal muscle cells[46] and cardiomyocytes,[40] which enhances aerobic respiration in these tissues. Furthermore, exercise enhances the oxygen supply to the body by vasodilation and angiogenesis,[47] thus protecting against ischemia/reperfusion damage.[48]

Additionally, exercise leads to a long-term anti-inflammatory effect.[49] The reduction in exercise-induced metabolic inflammation during disease is believed to be associated with downregulation of nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB),[50] but exercise also reduces monocyte accumulation in adipose tissue and suppresses the liberation of tumor necrosis factor-α (TNF-α) and other pro-inflammatory adipokines, producing an anti-inflammatory effect.[51] Myokines released from skeletal muscle during exercise partially mediate these anti-inflammatory effects and promote inter-tissue communication to mediate other cardiovascular benefits.[52] Epidemiological studies investigating the effect of PA on reducing inflammatory markers in elderly women.[53]

Besides, PA both prevents and helps treat many established atherosclerotic RFs, including high blood pressure, insulin resistance and glucose intolerance, high triglyceride levels, low HDL-C levels, and obesity,[54] which subsequently reduces the CHD risk.
The HERITAGE study (The Health, Risk factors, Exercise Training And Genetics), the largest and most carefully controlled exercise trial, demonstrated an increase of 1.4 mg/dL (3%) in HDL-c levels and a decrease of 0.6 mg/dL (0.6%) and 4.4 mg/dL (4%) in triglyceride and LDL-c levels, respectively, among the 376 women studied.[55] Recently, Ratajczak et al. investigated the effectiveness of 3-months endurance and endurance–strength training programs, and found that both improved lipid metabolism among obese women. A significant decrease in total cholesterol [TC] (−6.2%) and an increase in HDL-c (+9.1%) were reported after endurance training alone.[56] Further, a previous meta-analysis reported that walking can reduce non-HDL-c by 4% among adults.[57] Additionally, aerobic exercise leads to an increase of ApoA1 and a decrease of ApoB.[58]

Regular exercise also reduces high blood pressure and this effect is more pronounced in hypertensive than in normotensive or prehypertensive individuals. According to Delgado-Floody et al, mean systolic and diastolic blood pressures decreased by 7.14 and 5.43 mmHg, respectively, in normotensive subjects, while in hypertensive patients, there was a reduction of 8.70 mmHg for systolic and 4.90 mmHg for diastolic.[59] Similar improvements can be obtained in hypertensive older women.[60] Likewise, for sedentary behavior, where the inverse relationship between sedentary time and blood pressure was more prominent in reproductive-age women with less PA.[61] The epidemiological study shows that a 2 mmHg decrease in SBP results in a 4% reduction in CHD mortality, and a 5 mmHg decrease results in 9% of this reduction. Thus, the meta-analysis results confirm the indisputable role of the noninvasive therapeutic method, acute exercise.[62] Moderate-intensity PA induces a vasodilatory response and reduces the vasoconstriction response and lipid profile in rat aortas, resulting in a decline in diastolic blood pressure.[54]

PA also causes a decline in insulin resistance, glucose intolerance, postprandial hyperglycemia and hepatic glucose production.[54] A systematic review and dose-response meta-analysis of 81 trials examining the effects of all PA subtypes, provided strong evidence of the inverse relation between PA and type 2 diabetes.[63] Recently, a randomized acute study demonstrated that walking and standing significantly reduced postprandial glucose and insulin responses compared to prolonged sitting in postmenopausal women at high risk of type 2 diabetes.[28] The walking condition decreased the postprandial increase in glucose by 28% (and 34% for standing) and the postprandial increase in insulin by 37% (and 20% for standing) on the first intervention day. Exercise stimulates the translocation of glucose transporter type 4 (GLUT4) from the cytoplasm to the cell membrane, thereby increasing glucose uptake and enhancing insulin resistance.[64] Furthermore, improvement in insulin sensitivity is independent of exercise training modalities.[65] In addition, PA facilitates the absorption and usage of glucose via insulin-independent mechanisms.[66]

PA also has a protective effect against weight gain and abdominal obesity, an important factor in cardiometabolic diseases. The effect of exercise is significantly greater when combined with a diet change to achieve and maintain weight loss.[67] Combined diet and exercise interventions were more effective than diet-only interventions in achieving weight loss at 6 months (8–11% weight loss). However, interventions of moderate- to high-intensity aerobic exercise-only without a prescribed diet, performed at least 3-5 times per week, also resulted in a loss of approximately 2–3% of the initial weight in 6 months.[67] Therefore, these two interventions can help obese people achieve the 3–5% weight loss recommended by the AHA/ACC/TOS Guidelines.[68] A randomized controlled trial described the effect of weekly PA frequency in overweight and obese women: there is a significant improvement in cardiometabolic risk over 24 weeks of interventions in both groups, and low-frequency PA women had the greatest decrement in anthropometric measurements, including weight compared with high-frequency PA women.[69]

Patterns of PA in women

Physically active women are less likely to develop CHD than inactive women.[70] However, the association between the different types and intensities of PA and CHD among women remains unclear. In a large prospective study of young American women, adherence to PA ≥2.5 hours/week was associated with a 28% lower risk of incident CHD as well as a 12% lower risk of diagnosis with one or more clinical CVRFs.[10] Evidence shows that different types of PA and PA performed in different domains (occupation, transport, or leisure) can lead to favorable health outcomes. For CVD and all-cause mortality, aerobic PA alone, or in combination with muscle-strengthening exercises showed beneficial associations, although reaching the recommended levels for both types was shown to be optimal.[71] Based on survey data from 1994 to 2008, participation in any form of strength-promoting exercise alone was favorably associated with a 16% reduction in CVD mortality; adhering only to the aerobic activity guideline (equivalent to 150 minutes/week of moderate-intensity activity) was linked with a 22% reduction in CVD mortality. However, adherence to both guidelines appeared to be associated with a greater reduction in CVD mortality risk than adherence to the aerobic guideline alone.[71] These results indicate that the health benefits associated with muscle-strengthening exercise were independent of aerobic activity and also provide evidence to support the recommendation of two days weekly of muscle-strengthening exercise.

The association between different types of PA (occupational and leisure time PA) and incident CHD was reviewed, including beyond 650,000 participants who were followed over a period ranging from 5 to 32 years.[15] Among women, the pooled relative risk (RR) of overall CHD in the group with a high leisure time PA was 0.71 (95% CI: 0.65–0.77), compared to those with a low leisure time PA, with a clear dose-response relationship. A strong protective effect of occupational PA was revealed for moderate levels in women (RR: 0.75, 95% CI: 0.66–0.85). These results indicate that a high level of leisure time PA and a moderate level of professional PA have a favorable effect on cardiovascular health by decreasing the incidence of CHD in women by 20-40% and 20-30%, respectively. More, a recent study found an increased risk of CHD in postmenopausal older women who practiced moderate to high occupational PA (cumulative or most recent) and low leisure-time PA.[72] Dinu et al. provided supporting proof reinforcing that PA conducted in domains other than recreation can be beneficial as well, and especially reported that active commuting (walking or cycling for transport) can significantly reduce CVD incidence (CHD, stroke and heart failure) (RR: 0.91 [95% CI: 0.83–0.99]) compared to those not participating in active commuting.[73] Dancing is a multidimensional activity of a psychosocial nature, which has been shown to be as effective as walking in improving cardiovascular in healthy older women.[74] Similar effects were found for other social activities, such as voluntary work, religious group, art/craft/music, adult education, sports club and yoga.[75]

Regarding PA intensities, previous studies indicate that even light to moderate activity is associated with lower CHD rates among women. At least 1 hour of walking per week predicted a lower coronary risk. Walking for 1-59 min/week, 1.0-1.5 h/week, or 2 or more h/week were associated with CHD relative risk of 0.86 (95% CI: 0.57-1.29), 0.49 (95% CI: 0.28-0.86), and 0.48 (95% CI: 0.29-0.78), compared with no regular walking, respectively.[76] Other recent

prospective studies also support the conclusion that all movements are important for CHD and CVD prevention in older women. In the Women's Health Initiative, each 1 hour/day increase in light-intensity PA was associated with a lower CHD risk (HR: 0.86; 95% CI: 0.73–1.00) and lower CVD (HR: 0.92; 95% CI: 0.85-0.99). Similarly, moderate to vigorous PA can reduce the risk of coronary events by up to 46% and cardiovascular events by 31% compared to their less active peers.[77] In addition, older women (63-99 years), with greater amounts of total, light, and moderate to vigorous PA benefit from better levels of LDLc and HDLc, triglycerides, glucose, BMI, CRP, and Reynolds Risk Score. Each increment of 30- minute/day in PA in women was favorably associated with odds for a high 10-year predicted CVD risk (Reynolds Risk Score ≥20) of 0.96 (95% CI: 0.92-1.00), 0.88 (95% CI: 0.83-0.94), and 0.85 (95% CI: 0.79-0.91) for low-light, high-light, and moderate- to- vigorous intensity PA, respectively.[78] High levels of PA can not only improve life expectancy, but also increase the number of years lived without CVD. In the Rotterdam study, high cycling provided a longer CVD-free life expectancy in women (2.4 years) and men (3.1 years). Additionally, household work among women was also correlated with increment CVD-free life of 2.4 years.[79]

A recent longitudinal study emphasized the importance of examining daily movement composition on the incidence of CVD rather than solitary movement. They showed that a decrease in moderate-to-vigorous PA duration below current recommendations accompanied by an increase in sedentary behavior or light-intensity PA had a negative effect on CVD risk. However, when light-intensity PA duration is short and sedentary behavior duration is high, CVD risk benefits are observable when moderate-to-vigorous PA rises at the expense of sitting behavior rather than light-intensity PA.[80]

In addition, a dose-response relation was also evaluated. Women who met baseline guidelines (150 min/week of moderate-intensity leisure-time PA) had a 20% lower risk of CHD (RR: 0.80; 95% CI: 0.69-0.92) than women who did not participate in any leisure-time PA; women who achieved the advanced guideline (300 min/week of moderate-intensity leisure-time PA), had a 28% lower risk (RR: 0.72; 95% CI: 0.63–0.83). In women, no additional risk was observed at higher levels of leisure-time PA, up to five times the baseline guideline, which was associated with a 48% lower risk (RR: 0.52; 95% CI: 0.40-0.67);[81] and these associations were stronger in women than in men. However, there is not enough evidence to suggest progressive reductions in vascular diseases risk with increasing frequency of activity, among active women. During a 9-year follow-up, it was reported that women who were engaged in moderate activity had a significantly lower incidence of CHD; but those who engaged in intense PA daily had a higher CHD risk than those who participated in such activities 2-3 times per week.[70]

Therefore, the association between PA and CVD and all-cause mortality is a curvilinear inverse dose-response relationship.[82] Higher amounts of PA (both below and at, or above the recommended levels of 150 mins/week of moderate-intensity activity) gradually reduce the risk. For example, compared to no activity, participation in some activity was associated with a 32% reduction in cardiovascular mortality risk, while participation in activities at or above PA guidelines was associated with a 40% greater reduction in cardiovascular mortality risk.[83] Additional evidence demonstrated that compared to the recommended level of 750 MET-minutes per week, participation in 2000 MET-minutes per week resulted in a significantly

lower risk of CHD mortality (HR: 0.79, 95% CI: 0.74-0.85), while HR at 5000 MET-minutes was 0.65 (95% CI: 0.44-0.95).[84] However, there is insufficient evidence to make recommendations on different types or domains of sedentary behavior.[85]

Thus, regardless of recreational or non-recreational activity choice and the economic level, PA was associated with a lower risk of mortality and cardiovascular events in people from low-, middle- and high-income countries.[86]

Recommendations on PA for women

Increasing PA is a simple, broadly applicable, and inexpensive universal procedure that could reduce mortality and CVD at any age. In 2018, the World Health Organization (WHO) was invited to update the 2010 PA global health recommendations based on the latest available scientific data, including sitting behavior, as part of general efforts to help countries implement the recommendations announced in the Global Action Plan on PA 2018–2030 and achieve a 15% decrease of insufficient PA by 2030.[87]

Although several studies show a positive relation between exercise and good health, a thorough physical assessment is essential before an intense training program. The intensity, mode, frequency, and duration of exercise can greatly affect the results. The 2020 WHO guidelines supply evidence-based recommendations for PA and sedentary behavior that national authorities can adopt.[25] Adults should start with little amounts of PA and gradually increase over time. And for the elderly, they need to be as physically active as their functional capacity permits and adapt their level of PA exertion according to their fitness level.[85]

The WHO recommends that all women aged above 18 years should undertake moderate-intensity aerobic PA of at least 150-300 min per week, or 75-150 min of high-intensity aerobic PA per week, or a combination of these. For additional health benefits, women should also perform muscle-strengthening activities at moderate or higher intensity that involve all main muscle groups at least twice a week. Women over 65 should perform a variety of multi-component exercises that emphasizes functional balance and strength training at moderate- or higher-intensity, at least 3 days a week as part of their weekly PA, to improve functional ability and prevent falls.[85] At this threshold, individuals tend to improve their cardio-respiratory endurance, muscle strength, and bone condition but also reduce the risk of non-communicable diseases and depression.

Previous WHO recommendations[88] deduced that aerobic exercise should be done in bouts no less than 10 minutes. However, new evidence, using instrument-based assessments, shows that PA of any duration, with no minimum threshold, may be associated with better health outcomes, including all-cause mortality.[82,89] Subsequently suggesting the need for a contemporary revolution in public health recommendations for PA which supports moderate-to vigorous-intensity PA as an essential lifestyle habit, regardless of bout duration.

More attention should be paid to sedentary behaviors in persons with disabilities (wheelchair users, inevitably sitting for extended periods of time) or chronic illnesses, or pregnant or postpartum women. For these people, sedentary behavior is best determined in terms of a low

energy expenditure component, rather than a postural component.[85] Limiting time spent sitting and replacing it with healthier activity of any intensity (assuming no contraindications), including light intensity, can help reduce the harmful effects of sedentary behavior. Similarly, for pregnant and postpartum women, PA can confer in addition to good heart health, several benefits for their maternal and fetal health: reduced risk of pre-eclampsia, gestational diabetes, gestational hypertension, excessive gestational weight gain, childbirth complications and postpartum depression, less neonatal complications, no negative effects on birthweight; and no increased risk of stillbirth. It was recommended that all pregnant and postpartum women engage in regular PA of at least 150 minutes per week at a moderate intensity. Adding muscle building and stretching activities can also be beneficial.[85]

Thus, promoting compliance with a healthy lifestyle may not only significantly reduce the burden of CHD and CVD-associated conditions, but could also be a simple, yet important, approach to reduce morbidity and premature mortality in young and middle-aged women.

Barriers to PA practice among women

PA is a potential factor against CVD among those who follow the current recommendations.[24] However, these recommendations are not followed by the majority of the population, especially the elderly and women,[8] in part due to the reduced physiological ability to perform higher intensity activity.[90] For women, several factors seem to influence PA adherence, which can be categorized into intrapersonal, interpersonal, and environmental/community barriers.

Intrapersonal barriers contained lack of time, consciousness and motivation, physical appearance worries, cultural expectations, health problems, women's income, and fatigue. Interpersonal barriers included family and care-giving roles, lack of a PA partner (lack of encouragement), and lack of social support. Environmental barriers included security concerns, lack of amenities, weather problems, and lack of sidewalks.[91]

Enjoyment can play a role in PA adherence. Allowing women to choose the modalities they like can improve PA participation.[92] Women report that daily housework is the preferred mode of PA.[93] This is understandable as housework is convenient, accessible and inexpensive. Longer exercise bouts can lead to greater gains in health benefits. However, for women, increasing PA throughout the day by participating in multiple short bouts can be beneficial in increasing total minutes of PA and improving adherence. It is heavy for some women to fit one long bout of activity in a day filled with time commitments and other responsibilities.[92]

Important interactions between setting (location), intensity, frequency (days/week), time and adherence may exist.[92] Evidence suggests that home-based PA programs in which women participate in moderate-intensity walking in or near the home environment, and in which they are able to choose when to participate, may improve adherence rates.[94] Workplace PA has also been used to increase adherence. PA participation in the workplace can facilitate increased adherence due to convenience and social support available at work.[95]

Therefore, it is necessary to determine factors that contribute to continued participation in PA over time, especially when it is evident that a variety of factors may change over time (self-

efficacy, age). By removing barriers to PA, healthcare providers may be more successful in their efforts to increase PA in their female patients.

Conclusion

Physical inactivity is one of the major RFs of CHD. The evidence from this review supports the association between PA and decreased risk of CHD in women, with a non-linear dose-response; and that PA accumulated in bouts of ≥10 minutes or <10 minutes in duration is also associated with better cardiovascular health. Despite this, the prevalence of physical inactivity is still elevated in women compared to men worldwide, being directly responsible for the high incidence of cardiovascular mortality. Reducing sedentary behaviors and engaging in the minimum recommended leisure time PA may be sufficient to reduce CHD risk, but meeting the recommended moderate- or vigorous-intensity PA guidelines and reducing sedentary behaviors is associated with greater health benefits. Understanding the mechanisms contributing to worsening RF profiles in women is imperative to reduce future morbidity and mortality from atherosclerotic CVD.
Further research is required to identify common barriers faced by physicians and patients in adopting these evidence-based recommendations.

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II.3.3 Abstract

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ABSTRACT ONLY | VOLUME 331, E157, AUGUST 01, 2021

Physical activity and odds of coronary heart disease among Lebanese women.

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Background and Aims: Physical activity (PA) is an independent and a protective risk factor (RF) against cardiovascular morbidity and mortality. Few studies have examined the association between PA and coronary heart disease (CHD) in women. This study investigates the relationship between reported PA and CHD among Lebanese women aged 40 years and above.

II.3.4 Communication affichée

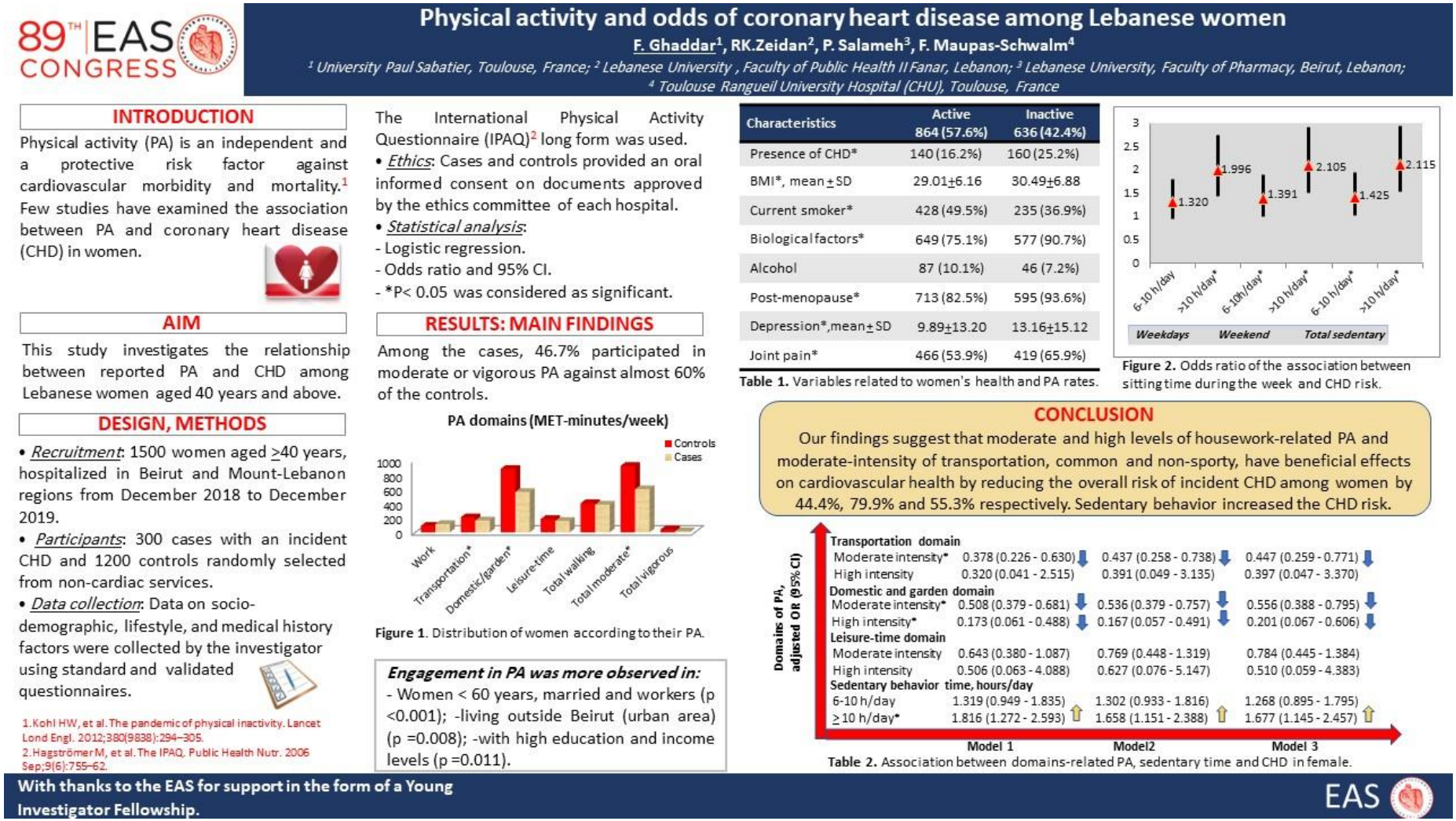

Figure 7. Ghaddar F et al. Physical activity and odds of coronary heart disease among Lebanese women. European Atherosclerosis Society 2021.

II.3.5 Conclusion

Notre étude fournit des preuves que l'inactivité physique est un problème majeur de santé publique au Liban. Les résultats ont montré que plus de la moitié des patientes coronariennes (53.3%) avaient une AP faible ou nulle. L'exercice avait un impact significatif sur certains FdRCVs et subséquemment sur la MC chez les femmes. Les femmes actives étaient moins susceptibles de développer une HTA, un diabète sucré, une dyslipidémie, une obésité et une détresse psychologique par rapport à celles inactives. Ce qui est généralement recommandé par les Centers for Disease Control, l'American Heart Association et l'American College of Sports Medicine. (319)

Nous avons également distingué les effets du comportement sédentaire de l'AP, bien qu'ils soient souvent considérés comme réciproques, mais le temps sédentaire n'est pas simplement l'absence d'AP. De nombreuses femmes libanaises non coronariennes ont démontré une AP suffisante, conformément aux directives actuelles, mais leur mode de vie sédentaire était très élevé. De plus, les femmes engagées dans une AP modérée à vigoureuse liée aux travaux ménagers/jardinage ou une activité d'intensité modérée liée au transport présentaient un profil de risque de MC athérogène moins élevé que celles qui n'en pratiquaient pas, entraînant une réduction potentielle de 44.4%, 79.9% et 55.3%, respectivement. En revanche, les femmes qui restaient assises pendant de longues périodes (>10 h/jour) au cours de la semaine étaient associées à un risque accru d'environ 68% de MC par rapport à celles qui restaient assises < 6 h/jour. Ces résultats soulignent l'effet bénéfique d'une AP facilement accessible, ainsi que le bénéfice du jardinage, cette activité étant en effet considérée comme un élément du régime méditerranéen, protectrice contre les MCV, intéressant les femmes vivant en milieu rural et n'ayant pas l'habitude de se rendre dans les centres sportifs. Nous avons également illustré les rapports de cotes pour les associations conjointes du temps sédentaire et de l'AP avec la MC.

Dans notre revue, nous notons que plusieurs études confirment l'association entre l'AP et la diminution du risque de MC, notamment chez les femmes, avec une dose-réponse non linéaire. L'exercice, quelle que soit sa durée et sans seuil minimum, peut être associé à une meilleure santé CV, y compris concernant la mortalité toutes causes confondues. Ainsi, la réduction d'un comportement sédentaire et la pratique de l'AP minimale recommandée peuvent suffire à réduire le risque de MC.

L'AP devrait être davantage proposée comme thérapeutique non médicamenteuse préventive par les médecins, en particulier chez les femmes en transition ménopausique. Des efforts

continus sont nécessaires pour mettre en oeuvre des programmes éducatifs qui amélioreraient la pratique d'une AP à tous les niveaux, y compris les écoles et le lieu de travail. Cela encourageraint les femmes actuellement inactives, nombreuses au Liban, à augmenter même modestement leur pratique physique et ainsi permettraient d'améliorer leur santé notamment CV.

III. Qualité de vie et facteurs de risque de maladie coronarienne chez les femmes libanaises hospitalisées

III.1 Introduction

L'identification des FdRCVs chez les les femmes est utile à améliorer leur santé par une prévention primaire et secondaire mieux adaptées. Actuellement, une attention particulière est accordée à la qualité de vie des patients, et au lien entre qualité de vie et maladie, dont la compréhension permettrait de d'envisager de nouvelles pistes de prise en charge des patients en prévention secondaire. (320,321) Ainsi l'évaluation de la qualité de vie peut être considérée comme un moyen d'évaluer la santé des individus.

La QVLS est un concept multidimensionnel qui fait référence au fonctionnement physique, mental, émotionnel et social d'un individu.

La littérature scientifique a montré que, bien que les femmes aient une espérance de vie plus longue, le temps de vie passé sans incapacité physique (28) paraît plus court que chez les hommes, ce qui suggére qu'il existe une différence entre les sexes avec une qualité de vie moins bonne, selon les indicateurs de mesure, chez les femmes que chez les hommes (cf revue générale, chapitre II.2.3.b « Qualité de vie »). L'identification de facteurs qui diminuent la qualité de vie des patients paraît nécessaire et utile à la prise en charge médicale des patients atteints de maladies chroniques afin d'assurer l'adoption de modes de vie adaptés au sein de la population cible. (322) Actuellement la prévalence des principaux FDRs de coronaropathie est en augmentation continue en Moyen-Orient, (12), mais on ne sait peu sur l'association entre la qualité de vie et la MC parmi les femmes libanaises.

III.2 Objectifs de l'étude

Ce travail vise à étudier l'association de la qualité de vie à la présence de FdRCVs, et la gestion de ces FDRs 3 mois après l'hospitalisation.

Le but de ce travail, actuellement en cours de réalisation, est de suggérer les prédicteurs possibles de la qualité de vie des femmes libanaises après 40 ans, en considérant une variété de domaines et en utilisant un instrument de qualité de vie spécifique à la maladie. Nous souhaitons par ailleurs évaluer si une modification d'un mode de vie, induite par les recommandations

médicales, pourrait améliorer les FdRCVs des femmes et leur qualité de vie. Ce travail pourrait être utile à mieux guider certains éléments de prévention secondaire des MCV chez la femme.

III.3 Résultats

Ghaddar F et al. Quality of life and coronary heart disease risk factors among Lebanese hospitalized women. Nouvelle Société Francophone d'Athérosclérose (NSFA), n° 14.6. 2021.

Ghaddar F et al. Quality of life and coronary heart disease risk factors among Lebanese hospitalized women. Nouvelle Société Francophone d'Athérosclérose (NSFA) congress 2021 (Communication affichée animée).

III.3.1 Abstract

14.6 Quality of life and coronary heart disease risk factors among Lebanese hospitalized women

14.6 Quality of life and coronary heart disease risk factors among Lebanese hospitalized women

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Background and purpose - To date, little is known about the impact of quality of life (QOL) on coronary heart disease (CHD) risk factors among Lebanese women. This study sought to compare the QOL in female patients with and without CHD and to evaluate their lifestyle changes at 3 months hospital discharge.

Methods - We conducted a case-control study among Lebanese hospitalized women in six hospitals in Beirut and Mount-Lebanon areas. QOL was measured using the 12-item Short Form (SF12v1) questionnaire administered face to face and by telephone to the study group (1200 controls and 300 cases) at admission and 3 months post-discharge, respectively.

Results - CHD patients presented lower Physical (PCS) (29.93 ± 10.76 vs. 35.17 ± 12.47) and Mental component summary scores (MCS) (44.01 ± 13.63 vs. 46.66 ± 13.16) than control groups. Higher age (β= -1.896), dwelling in Bekaa (in comparison with Beirut, β= -1.807), having hypertension (β= -2.245), diabetes (β= -1.542), or joint pain (β= -2.908), menopausal status (β= -2.621), higher sedentary time (β= -4.448) and presence of CHD (β= -1.217) were found to be significantly correlated to a lower PCS; whereas employment (β= 3.348) and higher physical activity (β= 5.394) were significantly associated with higher PCS. On another hand, family history of CHD (β= -1.621), higher sedentary time (β= -1.316) and increased stress (β= -0.650) were found to be significantly correlated to a lower MCS; whereas higher educational level (β= 1.073) and higher physical activity (β= 1.104) were significantly associated with higher MCS. At 3 months of follow-up, significant improvements in lifestyle habits were noted between the two study groups.

Conclusion - QOL was lower in CHD patients and was affected by many lifestyle and risk factors that should be considered by healthcare professionals when implementing effective public health interventions, especially in the most vulnerable groups. Significant improvement in QOL could be observed within 3 months.

Keywords- Coronary heart disease, quality of life, SF-12, female population, risk factors.

III.3.2 Communication affichée animée

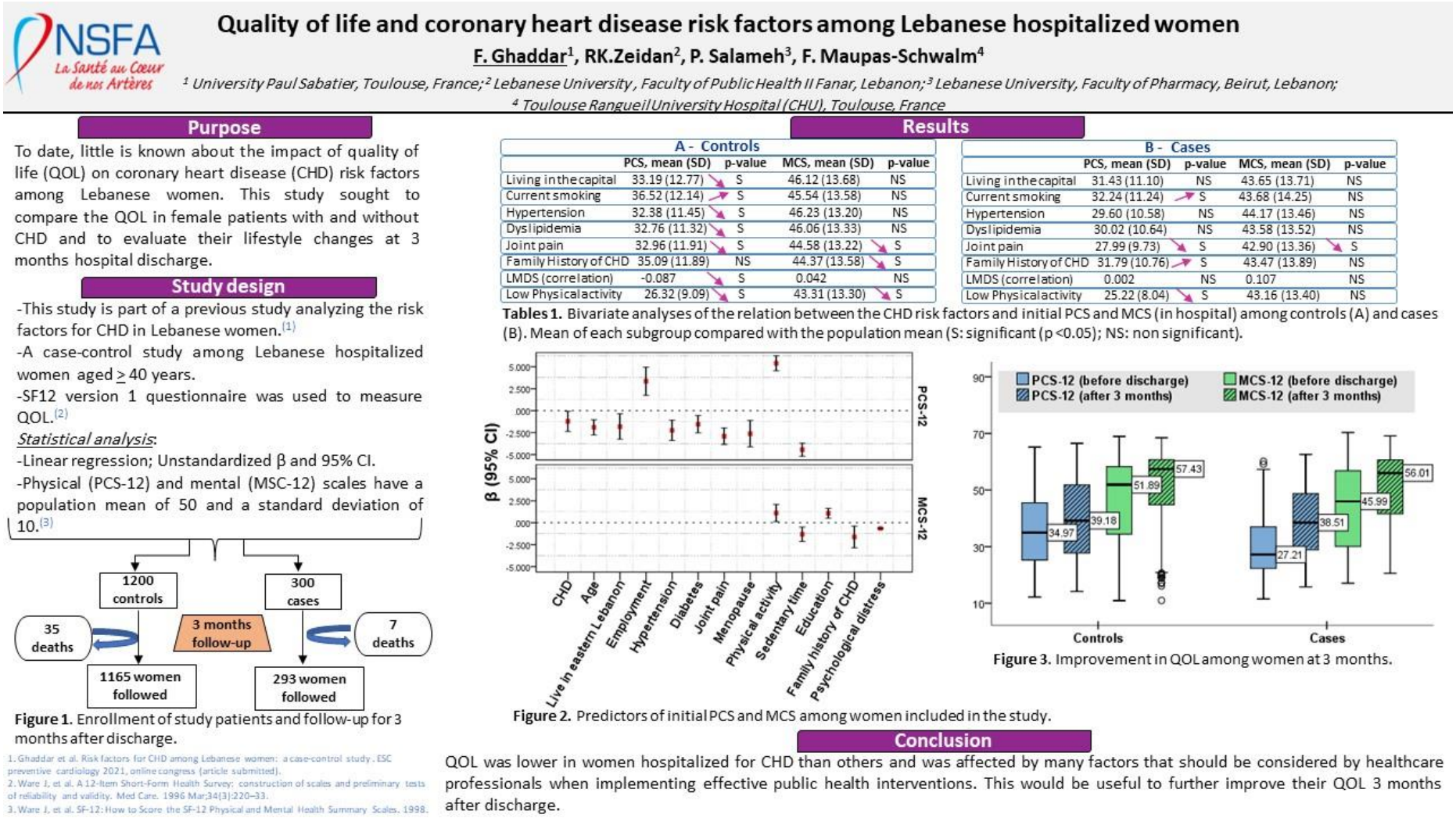

Figure 8. Ghaddar F et al. Quality of life and coronary heart disease risk factors among Lebanese hospitalized women. Animated poster, Nouvelle Société Francophone d'athérosclérose 2021.

III.3.3 Conclusion

Nos résultats préliminaires rapportent l'impact défavorable de la MC sur la qualité de vie liée à la santé des femmes libanaises. Les patientes coronariennes présentaient des scores de santé physique et mentale inférieurs à celles des groupes témoins. De même, l'existence de FdRCVs chez les femmes non coronariennes semble être associée à des scores inférieurs à la valeur moyenne de 50 trouvée dans une population générale pour le PCS et le MCS, en début d'hospitalisation.

Les facteurs constatés pour expliquer la plus mauvaise qualité de vie de la santé physique chez les femmes libanaises étaient la présence de MC, le vieillissement, la vie dans l'Est du Liban, l'hypertension, le diabète sucré, les douleurs articulaires, le statut ménopausique et le mode de vie sédentaire. Alors nos résultats montrent que l'activité professionnelle et l'AP sont associés à une meilleure santé physique. D'autre part, les antécédents familiaux de MC, les troubles sédentaires et le stress ont été identifiés comme les principaux prédicteurs d'une mauvaise qualité de vie en santé mentale ; tandis que l'éducation et l'AP améliorent l'état de santé mentale des femmes libanaises.

Les résultats préliminaires de ce travail sont que des changements potentiels de mode de vie semblent utiles à améliorer la qualité de vie des patientes. À 3 mois de suivi, des améliorations significatives des 2 scores de qualité de vie ont été notées entre les deux groupes d'étude par rapport à avant l'hospitalisation. Cette évolution représente une amélioration moyenne du score physique de 13% environ pour les patientes hospitalisées pour une autre cause qu'un problème cardiaque et plus importante, de 20%, pour les patientes admises pour une MC. Le score mental a aussi augmenté d'environ 10% pour les groupes témoins et cas.

En conclusion, la qualité de vie des patientes hospitalisées paraît impactée selon les résultats des questionnaires administrés en début d'hospitalisation. Ceci est probablement en rapport avec leur pathologie quelle qu'elle soit, ce qui semble très logique et en accord avec le gain sur la qualité de vie noté 3 mois après leur prise en charge hospitalière. Toutefois, les scores de qualité de vie physique des femmes coronariennes de cette étude restent inférieurs à ceux de la population générale, même si on note une augmentation à 3 mois de l'hospitalisation. Ainsi, une prise en charge dédiée de ces patientes, par exemple par une période de réadaptation fonctionnelle systématique suivant l'hospitalisation, orientée sur la modification des habitudes de vie et la reprise d'une AP régulière, pourrait s'intégrer dans une stratégie de prévention secondaire efficace en termes de santé publique.

Chapitre 5. Discussion et perspectives

I. Discussion

Nous ne rentrerons pas dans les détails des différents résultats de chaque partie de notre travail déjà commentés précédemment (cf pages 70, 122 et 128). En synthèse, notre travail a permis de mieux caractériser les FDRs de la MC chez les femmes libanaises. Ce travail trouve son intérêt dans l'augmentation de la MC chez les femmes jeunes et préménopausées au Liban. Par ailleurs, en dehors de FDRs classiques des MC, nous avons montré que les douleurs articulaires communes non rhumatismales sont associées à la MC. Il s'agit donc d'un FDR des MC chez nos patientes, qui comme toutes les douleurs musculo-squelettiques (323), qui augmente avec l'âge. Ce FDR semble anodin et est probablement négligé par les femmes, alors qu'il pourrait être un signal d'alarme médical pour elles et leurs médecins traitants visant à améliorer la prévention primaire des MC s'il était mieux pris en compte. Par ailleurs, nous avons montré l'effet délétère, au plan CV, de la sédentarité chez les femmes libanaises et trouvé qu'une AP même modérée et pouvant être réalisée dans un cadre familial (jardinage, activités ménagères), était bénéfique sur la santé. Ainsi, les femmes qui privilégient le couple vertueux, alimentation méditéranéenne, AP modérée, semblent être mieux protégées contre la MC.

Nous avons pu constituer, au cours de notre travail, une base de données assez conséquente. Celle-ci pourra être utilisée secondairement pour des études visant à identifier les facteurs associés à la non-adhérence des patientes coronaires aux thérapies prescrites après leur sortie de l'hôpital, et à déterminer les taux de prescription des médicaments recommandés par les lignes directrices pour la prévention secondaire de la MC et les facteurs associés à la non-adhérence. Cela permettra de développer des processus de sortie innovants et rentables qui réduisent les complications post-hospitalières évitables et orienter les efforts nécessaires pour accroître le respect des directives par les professionnels de la santé.

Enfin, nos résultats pourraient être bénéfiques pour le développement de programmes de promotion de la santé et de campagnes d'éducation des patientes visant à optimiser les stratégies de prévention et à améliorer la santé cardiaque des femmes arabes, en particulier libanaises. Les programmes de santé publique devraient développer davantage d'interventions spécifiques au genre pour répondre aux besoins des groupes défavorisés, en particulier les femmes en transition ménopausique, pour traiter et gérer ces FDRs.

Nous pouvons discuter les forces et limites méthodologiques de notre travail.

Dans l'étude cas-témoin réalisée, les principaux points forts de notre travail sont, en dehors de la cohérence de nos résultats avec d'autres études, (324–327) l'utilisation d'un échantillon relativement large (1500 patientes dont 300 coronariennes) et d'un support disposant de différents questionnaires préalablement validés et fiables qui nous a permis d'étudier différents types de facteurs liés à la santé cardiaque, aux comportements, à l'adhésion aux traitements pharmaceutiques et non pharmaceutiques recommandés et aux changements de mode de vie. De plus, la sélection aléatoire des contrôles a minimisé davantage les biais associés, tandis que le choix d'un rapport contrôle/cas = 4:1 a augmenté la puissance de notre étude. Enfin, l'utilisation de cas incidents de MC peut également éviter les biais de survie, car le rappel des expositions passées peut être plus précis parmi les cas nouvellement diagnostiqués. Selon nos connaissances, l'évaluation à 3 mois de la décharge hospitalière que nous avons réalisée, est le premier travail visant à évaluer les prédicteurs de la qualité de vie chez les femmes adultes libanaises dans un contexte de « vie réelle », dont les avantages ont été détaillés dans un papier récent. (328) De plus, cette évaluation à distance, par appel téléphonique, est une stratégie pratique, utile et est cohérente avec d'autres études. (329–331)

Néanmoins, notre étude présente certaines limites qui doivent être signalées. Compte tenu de la conception cas-témoin de l'étude, il peut être difficile d'attribuer une causalité aux associations observées entre les FDRs et le développement de MC chez les femmes. De plus, la plupart des FDRs ont été autodéclarés, introduisant la possibilité d'un biais de classification de la patiente comme exposée ou non à ces FDRs. Un biais de rappel potentiel[1] et la désirabilité sociale[2], pendant les entretiens en face à face et téléphoniques, ne peuvent être exclus. Néanmoins, une étude précédente suggére la fiabilité et la validité des auto-déclarations parmi la population libanaise. (332) L'utilisation d'entretiens téléphoniques pour suivre les patientes à 3 mois pose une difficulté pour la collecte de données objectives.

Bien que notre étude ait montré des résultats intéressants et que nous ayons pris en compte de nombreux FDRs pour diminuer la confusion potentielle, il existe toujours une possibilité de confusion résiduelle due à des facteurs non mesurés. Les réponses sur la consommation d'alcool (légère, modérée et élevée) sont probablement faussées par la non-réponse due à l'interdiction religieuse de cette consommation. Les données sur d'autres facteurs susceptibles d'influencer le développement de MC chez les femmes, tels que les antécédents de complications de la grossesse, l'accès des patientes aux soins de santé, la relation médecin-

[1] Un biais de mémorisation surtout pour l'exposition des patientes non coronariennes aux FDRs.
[2] La surdéclaration des comportements sains et la sous-déclaration des comportements négatifs en raison de la désirabilité sociale pourraient avoir entraîné un biais d'information.

patiente et la mesure de la connaissance par les patientes des valeurs biologiques normales (333,334) n'ont par exemple pas pu être été recueillies. En effet, le recueil de ces données risquait de complexifier l'entretien et pouvait allonger davantage sa durée. De plus, certaines de ces questions auraient nécessité un échange avec les médecins traitants.

Par ailleurs, certains des facteurs utilisés pourraient nécessiter une évaluation plus approfondie, comme la consommation d'alcool qui pourrait être évaluée plus précisément quantitativement (quantité consommée en grammes) ou par rapport à des seuils définis pour les femmes. La mesure de l'AP aurait pu être réalisée de manière plus objective avec une utilisation de podomètres ou d'accéléromètres, le régime alimentaire aurait pu être évalué quantitativement, le facteur socio-économique aurait pu être précisé par la relève des niveaux professionnels des travailleuses et des conditions de l'environnement de travail, enfin la pollution pourrait être évaluée plus précisément par la mesure des matières particulaires. L'intérêt de notre travail de thèse est d'envisager des orientations plus adaptées à une prise en charge de prévention des MC des femmes, étant donné que les femmes sont sous-représentées dans les essais cliniques concernant les maladies CVs. (22) Avec de vastes études non mixtes telles que les « Women's Health Study » et « Women's Health Initiative », la participation des femmes a considérablement augmenté ; cependant, dans les essais mixtes, les femmes représentent en moyenne moins d'un tiers de tous les participants, (100) malgré la nécessité soulignée par l'Institut de médecine et l'Agence pour la qualité des soins de santé d'une parité dans le recrutement des femmes dans les essais cliniques sur les MCV. Cette nécessité est aggravée par l'absence de présentation de données désagrégées sur le sexe, ce qui limite les preuves disponibles et met le clinicien au défi de définir l'innocuité et l'efficacité spécifiques au sexe. (335)

L'attention portée aux caractéristiques et aux disparités entre les sexes améliorera la conscience, la prévention, la reconnaissance, et le traitement et son impact sur la MC chez les femmes. Combler le fossé de l'inclusion des femmes dans les travaux de recherche contribuera à clarifier la pathophysiologie coronarienne ; identifier les stratégies de diagnostic optimales ; le mode de vie efficace, les interventions pharmacologiques et invasives ; explorer les sous-populations de femmes socialement défavorisées en raison de leur appartenance ethnique, de leur niveau socio économique ou de leur niveau de scolarité. (59,335) Les campagnes médiatiques et éducatives et les politiques de santé publique et gouvernementales ciblant les femmes, en particulier celles qui ne sont peut-être pas convaincues qu'elles sont à risque, peuvent ainsi être efficaces pour promouvoir leur santé cardiaque, en mettant en œuvre des

interventions visant à sensibiliser les patientes à leurs symptômes souvent minimes, à améliorer leur AP dans le contexte de la population des pays en développement et à souligner l'importance des changements de mode de vie dans la prévention primaire et secondaire des coronaropathies.

Une des perspectives de ce travail de recherche sera de poursuivre le travail abordé sur la qualité de vie des patientes libanaises avec et sans MC et à évaluer les changements du mode de vie après 3 mois d'hospitalisation. Les facteurs associés au déclin de la santé physique et mentale des femmes libanaises seront examinés. Ce travail permettra d'envisager l'étude de la qualité de vie comme moyen d'évaluation de la santé CV des femmes et de l'intérêt de sa connaissance dans la prévention secondaire. (320,321) En outre, la modification du mode de vie a été recommandée comme traitement de première intention pour prévenir la progression du syndrome métabolique vers la MC. (336) Compte tenu de l'augmentation épidémique attendue des MC, nous pensons que cette étude pourrait donner un aperçu de la qualité de vie des femmes atteintes de MC dans cette région de manière utile à une amélioration de leur prise en charge.

II. Conclusion et perspectives

Notre étude améliore la compréhension globale de l'association entre les FDRs, le mode de vie et la MC des femmes libanaises. Elle pourrait servir de préambule à l'organisation d'études épidémiologiques nationales, plus vastes, à l'avenir permettant de mieux généraliser nos résultats. Ces études pourraient envisager l'utilisation de modèles permettant d'établir le lien de causalité entre les différents FDRs et la MC, ainsi que la relation entre la co-occurrence de FDRs et la sévérité de la MC chez les femmes.

De plus, d'autres FDRs de MC, très spécifiques aux femmes (diabète gestationnel, pré-éclampsie, accouchement prématuré, ...), n'ont pas été évalués dans cette étude. Ainsi, une des perspectives de futures études épidémiologiques serait de prendre en compte un éventail plus large de FDRs autres que les FDRs plus traditionnels pour améliorer la compréhension de la pathogénie plus spécifique des MC chez les femmes.

Nos résultats suggèrent que des stratégies visant à promouvoir l'AP chez les femmes pourraient se substituer aux effets négatifs de la sédentarité. L'application d'une telle démarche à la prévention des MC au Liban pourrait faire l'objet de recherches futures.

Nous avons tenté de percevoir si un changement de mode de vie pouvait avoir été, en partie, réalisé par les femmes 3 mois après leur sortie de l'hôpital. Mais cette évaluation concerne un temps court après la décharge hospitalière, et constater un changement ne signifie pas qu'il sera durable. De futures études, centrées sur ce sujet pourraient permettre d'améliorer la prévention secondaire des MCs chez les femmes.

La MC n'étant pas une maladie « exclusivement masculine », il convient d'envisager des mesures mieux adaptées aux femmes pour améliorer leur prise en charge médicale. Les efforts de prévention des MC doivent commencer dès le plus jeune âge et porter sur les FDRs actuellement négligés qui affectent les femmes.

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ANNEXE 1

Vascular Health and Risk Management

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ORIGINAL RESEARCH

Noncardiac Lebanese hospitalized adult patients' awareness of their coronary artery disease risk factors

This article was published in the following Dove Press journal:
Vascular Health and Risk Management

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Background: Noncommunicable diseases are the leading cause of death in Lebanon, with cardiovascular diseases accounting for almost half of the annual deaths.

Purpose: We aimed to determine awareness of noncardiac Lebanese hospitalized patients for their coronary artery disease risk factors, their level of adherence to medications or lifestyle modifications, and assess factors associated with awareness.

Materials and methods: A cross-sectional study was conducted in 14 hospitals with a total of 382 patients. Levels of awareness were evaluated by the comparison of self-report with measurements and laboratory test results. Healthy behaviors and adherence to treatment were evaluated. Factors associated with better awareness were studied using multivariate regressions, while adherence to treatments and healthy lifestyle were described for the different risk factors and in the Framingham Risk Score categories.

Results: Our work revealed a moderate-to-high level of awareness (58.7% for overweight/obesity, 75% for hypertension, 85.7% for diabetes, and 86.4% for dyslipidemia) among patients for most cardiovascular risk factors, but a low-to-moderate level of adherence for some interventions such as physical exercise, weight loss, and smoking cessation.

Conclusion: The results emphasize on the importance of educational campaigns on healthy habits and screening to improve early diagnosis, increase patients' awareness of their risk factors, and, therefore, optimize primary prevention.

Keywords: coronary artery disease, risk factors, awareness, adherence, cardiovascular risk score

Introduction

Cardiovascular diseases (CVDs) are the leading cause of mortality worldwide, with around 17.7 million deaths in 2015, representing 31% of global mortality. Among CVD deaths, 7.4 million are due to coronary heart disease (CHD). More than three-quarters of CVD deaths occur in low- and middle-income countries,[1] such as Lebanon.[2] Overall, coronary artery disease (CAD) is increasing in the Middle East and Eastern Mediterranean countries due to the westernization of dietary habits, urbanization, technologic progress, and the reduction of physical activity. Multiple factors contribute to the pathogenesis of CVD. Although some factors are not modifiable (age, sex, and genetic predisposition to atherosclerotic disease), others, such as smoking, poor weight control, high blood pressure (HBP), diabetes, and dyslipidemia, can be modified or controlled.[3] The likelihood of someone developing a cardiovascular event depends on a combination of risk factors (RFs) rather than the presence of one RF[4]: the Framingham Risk Score (FRS) is a gender-specific algorithm used to estimate the 10-year cardiovascular risk (CVR) of an

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individual and classifies patients into low- (<10%), intermediate- (10%–20%), and high (>20%)-risk groups.[5,6]

Awareness has been described as a prior knowledge of the status of cardiovascular risk factors (CVRFs). According to the Health Belief Model, an individual must perceive his or her health to be at risk or be susceptible to risk to take preventive action.[7] The general awareness of chronic diseases including CVDs and their RFs can be a precondition for success in prevention and control of these diseases. This knowledge will inform individuals on healthy attitudes to adopt (diet, weight management, physical activity, and so on) and to be proactive in reducing their own lifetime risk by decreasing their exposure to modifiable CVRFs.[4] The World Health Organization (WHO) has emphasized the role of health promotion and disease prevention as the most cost-effective approaches to contain the CVD epidemic.[8] Efforts to raise awareness of CVRF stress the importance of health promotion and disease prevention as important arenas to improve the quality of care and to contain the cost of health care in the Arab world. Many studies have shown low levels of patients awareness for their CVRFs.[9,10] One of the main challenges in controlling heart disease is the lack of self-care, such as nonadherence to medications, unhealthy diet, and sedentary lifestyle, which leads to frequent hospitalizations.[10]

To our knowledge, few studies were conducted in Lebanon to assess public awareness of a particular CVRF[11,12] or to make comparisons between urban and rural populations.[13] In this context, our study was designed to measure the awareness of noncardiac hospitalized Lebanese patients about their coronary RFs (hypertension [HTN], dyslipidemia, diabetes, and excess weight), the adherence level to their treatments, and correlates of better adherence, and to identify factors associated with lack of awareness; we also calculated an FRS for each participant to assess compliance to healthy lifestyle behaviors among high-risk individuals.

Materials and methods

Study design

A cross-sectional study was conducted in the two most populated Lebanese regions: Beirut and Mount-Lebanon. A list of all public and private hospitals in both governorates was obtained from the Ministry of Public Health.[14] All hospitals were contacted, and 14 of 34 hospitals accepted to participate in the study, giving a participation rate of 41%.

Compliance with ethical standards

Data collection was done in the following 14 hospitals: Sahel General Hospital, Al Zahraa University Hospital, Saint George Hospital University Medical Center, Hopital Dr S. Serhal, St Joseph Hospital - Raymond & Aida Najjar Medical Center, Hopital Hayek, Governmental Hospital Of Beirut Quarantine, Beirut Governmental University Hospital, Central Military Hospital, Hotel Dieu de France, Makassed, Mount Lebanon Hospital, Hopital Libanais, and Hopital Notre Dame Maritime. Before the interview, patients were informed about the objectives of the study and asked to give an oral consent. An ethical approval was obtained from all participating hospitals; they also approved of the verbal informed consent process used in our study.

Study population

The subjects enrolled were noncardiac Lebanese patients aged between 30 and 74 years who were hospitalized in the following services: general medicine, surgery, orthopedics, and maternity (recently given birth). Participants were considered as "cardiac" if a history of heart disease was indicated in their patient file (including myocardial infarction, stroke, unstable/stable angina, heart failure, cardiac arrhythmias). In addition to cardiac patients, those suffering from cancer, mental health problems, under chronic steroid treatment, unable to participate in an interview, as well as pregnant women were excluded.

Sample size

Sample size was calculated using Epi-info7, assuming a CI of 95% and a margin of error of 5%. In the absence of baseline data, we used an expected HTN awareness of 53% (according to results from a previous study published in 2014).[12] The minimal sample size necessary consisted of 382 subjects.

Data collection

Once approval was received from the ethics committee of each participating hospital, visits were scheduled with the hospital's administration. On visit days, a list of patients was administered to the investigator who chose a random sample to interview. Eligible patients who gave their consent to participate in the study were enrolled (Figure 1). Data collection took place from January to July 2017, using face-to-face interviews.

Survey instrument

The questionnaire used was inspired from the Healthy Heart Questionnaire[15] and included different sections. Section 1 contained questions about the different metabolic RFs (ie, HTN, diabetes, overweight/obesity, and dyslipidemia). In this section, participants were asked whether they have a

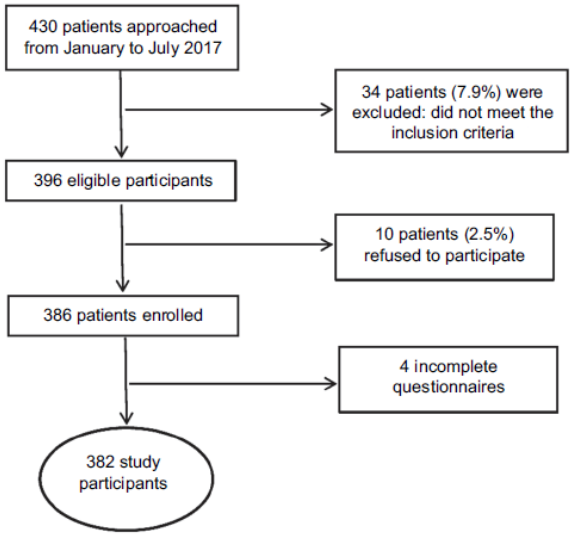

Figure 1 Patient flowchart.

personal or a family history of the RFs, whether they are on any medication related to the factor (if so, we asked about their adherence), and whether they are adopting appropriate preventive behaviors. In section 2, we asked details about behavioral RFs such as smoking and physical activity. Section 3 assessed sociodemographic characteristics, and the last section was reserved for the results of the last laboratory tests regarding fasting blood glucose and lipid panels. Finally, two blood pressure measurements were taken using a blood pressure monitor as recommended by JNC7 (seventh report of the joint national committee).[16] The average of these two measurements was then used for the analysis. The survey instrument was first tested on 5% of the study population (20 subjects) and the necessary modifications were made subsequently.

Outcomes assessment

The presence of HTN, diabetes, and dyslipidemia was defined based on patient's self-report, the medications used, and laboratory results obtained from the patient's hospital records; the overweight/obesity status was defined as a body mass index (BMI) exceeding 25 kg/m^2;[8] "Lack of physical activity" was based on the following: 1) patients answering "No" to question "Do you exercise regularly?", and 2) patients exercising less than 30 minutes for at least 5 days/week.[17]

Patients were considered hypertensive if they answered "yes" to the question "Have you ever been told by a doctor or healthcare professional that you have HBP?" or if they were taking antihypertensive medications, or those with a BP >140/90 mmHg, according to the current guidelines of Cardiology/European Atherosclerosis Society.[16] Hypertensive patients were considered as aware of their HTN if they answered "yes" to first question.

Patients were considered as dyslipidemic if they answered "yes" to the question "have you ever been told by a doctor or healthcare professional that you have high blood lipids?" Or "yes" to question "are you currently taking lipid-lowering medications?" Or those with an abnormally high blood lipid concentration based on the lipid profile tested during hospitalization: hypercholesterolemia (total cholesterol >200 mg/dL), hypoHDLemia (high-density lipoprotein cholesterol <40 mg/dL), hypertriglyceridemia (triglycerides >150 mg/dL), hyperLDLemia (low-density lipoprotein cholesterol >130 mg/dL) according to the current National Cholesterol Education Program guidelines.[18] Hyperlipidemic patients were considered as aware of their dyslipidemia if they answered "yes" to first question.

Blood sugar was measured either by the hospital's professional team (fasting blood sugar [FBS]) or directly by the interviewer (random blood glucose [RBS]). Patients were considered as diabetic if they answered "yes" to the question "have you ever been told by a doctor or healthcare professional that you have high blood sugar?" or those who were taking antidiabetic medications, or those with FBS >126 mg/dL (after 8 hours of fasting), or RBS >200 mg/dL, according to International Diabetes Federation guidelines and WHO recommendations.[19] Diabetic patients were considered as aware of their diabetes if they answered "yes" to first question.

Participants suffering from any of these RFs were considered to be aware of their RFs if they had been informed by a doctor or health professional that they had the RFs.

Adherence to prevention interventions for each RF was described among patients who were aware of their RFs. Hypertensive patients who were aware of their HTN were asked if they were taking antihypertensive medications; if so, we asked them about their adherence using the following question: "Do you take your antihypertensive pills regularly and on time?"; patients were considered adherent if they replied to the question by "yes". They were also asked if they were trying to reduce their salt intake, if they exercised regularly (and the amount and intensity of activities), if they quit smoking (among hypertensive smokers), and if they were trying to lose weight (among overweight/obese hypertensive patients).

Diabetic patients who were aware of their diabetes were asked if they were taking antidiabetic medications (and

whether it was done regularly and on time), if they were trying to reduce their sugar intake, if they exercised regularly (and the amount and intensity of activities), if they quit smoking (among diabetic smokers), and if they were trying to lose weight (among overweight/obese diabetic patients).

Patients suffering from dyslipidemia and who were aware of their condition were asked if they were on lipid-lowering drugs (and if they were adherent to the treatment), if they were trying to reduce their fat intake, if they exercised regularly (and the amount and intensity of activities), if they quit smoking (among smokers), and if they were trying to lose weight (among overweight/obese patients). Finally, overweight/obese participants were asked if they were taking preventive measures such as reducing their salt, sugar, and fat intakes, if they were exercising regularly (with the amount and intensity of activities), if they were still smoking (among smokers), and if they were trying to lose weight in order to prevent complications.

A comparison in the adherence to healthy behaviors was done between the different CVR groups obtained using the FRS Classification.[6]

Statistical analysis

Data were entered and analyzed using SPSS, version 21. A *P*-value <0.05 was considered significant. Categorical variables were described using frequencies and percentages, and continuous variables using means (±SD). An appropriate bivariate analysis was performed for each explanatory variable with the awareness of HTN, diabetes, dyslipidemia, and excess weight considered as dependent variables. For continuous variables, independent-samples *t*-test was used for the comparison of two samples, and ANOVA test for more than two samples. For categorical variables, chi-square and Fisher's exact tests were used.

Multivariate logistic regressions were carried out for two dependent variables: awareness of HTN and awareness of excess weight, using a forward method and including in the models the independent variables that were associated with the dependent variables with a *P*-value <0.20 in the bivariate analysis. Multivariate analyses for diabetes and dyslipidemia were not done due to insufficient sample size regarding these two RFs.

Results

Demographic characteristics

This survey included 382 patients with an average age of 56.41±13.32 years and a slight female predominance (52.1%). In terms of age groups, the highest percentage was in patients aged 60–75 (47.1%vs 21.2% and 31.7% for age groups 30–44 and 45–59, respectively) recruited mostly from Mount-Lebanon (66.5%). Only 22.8% achieved a university level (Table 1).

Prevalence and awareness of CVRFs

Among studied parameters, the most common RF was insufficient regular physical activity (85.1%) and the least prevalent was diabetes (31.2%). The prevalence of other RFs is presented in Figure 2. The level of awareness was the highest in dyslipidemia (86.4%), followed by diabetes (85.7%); 75% of hypertensive patients were aware of their HTN and only 58.7% were aware of their obesity or overweight (Figure 3).

Factors associated with awareness of major RFs

Table 2 shows the association of different factors with the awareness of the presence of HTN, diabetes, dyslipidemia,

Table 1 Baseline characteristics of study participants (n=382)

Characteristics	N (%)
Age (mean ± SD)	56.41±13.32
Age groups, years	
30–44 years	81 (21.2)
45–59 years	121 (31.7)
60–75 years	180 (47.1)
Sex	
Male	183 (47.9)
Female	199 (52.1)
Province of residence	
Mount Lebanon	254 (66.5)
Beirut	77 (20.2)
North/Akkar	22 (5.8)
South Lebanon	20 (5.2)
Bekaa	9 (2.4)
Marital status	
Married	289 (75.7)
Divorced/widowed /not married	93 (24.3)
Employment status	
Full time	145 (38.0)
Part time	6 (1.6)
Unemployed	147 (38.5)
Retired	84 (22)
Educational level	
Illiterate	54 (14.1)
Primary education	142 (37.2)
Secondary education	99 (25.9)
University	87 (22.8)
Monthly income	
<500 USD	69 (18.1)
500–1000 USD	174 (45.5)
1000–2000 USD	90 (23.6)
2000–3000 USD	36 (9.4)
>3000 USD	13 (3.4)

Note: Categorical variables are described as frequencies (percentages).

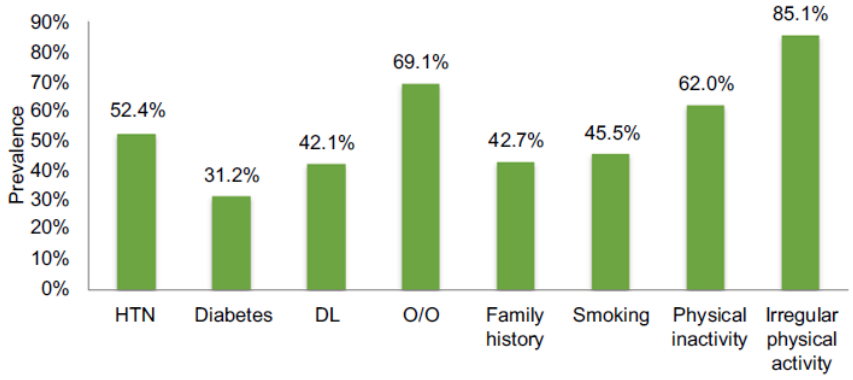

Figure 2 Prevalence of biologic, behavioral, and nonmodifiable risk factors in the study population.
Abbreviations: DL, dyslipidemia; HTN, hypertension; O/O, overweight/obesity.

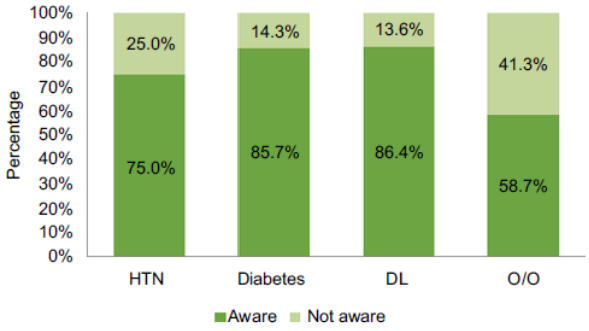

Figure 3 The awareness of various risk factors.
Abbreviations: DL, dyslipidemia; HTN, hypertension; O/O, overweight/obesity.

and excess weight. The awareness of hypertensive patients (150 subjects) varies significantly with age and sex, where subjects over 60 years and women were the most conscious. In addition, patients with dyslipidemia (85.9% vs 64.4%), high BMI (83.9% for obese vs 67.9% for normal weight or underweight), or a family history of HTN (81.8% vs 60.3%) were significantly more conscious ($P<0.05$). Awareness of the diabetic status (102 subjects) was significantly associated with the presence of dyslipidemia (91.3% vs 78%, $P=0.041$) and a family history of diabetes (92.7% vs 70.3%, $P=0.001$), whereas awareness of dyslipidemia (86.4%) was significantly higher with age (42.9% vs 89.6% for age groups 30–44 and 60–75 years, respectively, $P=0.013$) and with the presence of HTN (91.1% vs 76.9%, $P=0.034$). Awareness of overweight/obese patients (155 subjects) was significantly decreased with age (76.8% vs 48.8% for age groups 30–44 and 60–75 years, respectively), but increased in women (64.8% vs 52.9% in men), and the level of education (67.2% vs 55.9% for secondary/higher education and illiterate, respectively). Having a family history of HBP (64.1% vs 50.9%) and being employee was significantly associated with awareness of overweight/obesity (65.7% vs 63.9% or 40% for employees and nonemployees or retired, respectively).

Two multivariable regressions on HTN and obesity awareness are presented in Table 3. Age appeared to be positively associated with the awareness of hypertensive status (adjusted odds ratio [aOR]: 1.083, 95% CI: 1.057–1.110), with each year increasing the odds of being aware by 8%; overweight people were also more aware of their HTN (aOR: 3.661, 95% CI: 1.977–6.781). The place of residence was also significantly associated, with patients living outside Beirut and Mount-Lebanon being associated with lower odds of awareness (aOR: 0.409, 95% CI: 0.172–0.974). Respondents suffering from hyperlipidemia or having a family history of HTN were 2.089 times (95% CI: 1.278–3.415) and 3.180 times (95% CI: 1.848–5.471), respectively, more likely to report this CVRF. In the second regression, younger participants (aOR: 0.963, 95% CI: 0.945–0.981) and female patients (aOR: 2.002, 95% CI: 1.259–3.183) were the most aware of their excess weight.

Adherence to treatments and risk prevention interventions

The majority of patients with HTN, diabetes, and dyslipidemia and aware of their RFs were taking medications (92.7%, 99%, and 99%, respectively), and were taking their medication on time (85.6%, 89.9%, and 83%, respectively), while the rest were not adherent due to forgetfulness, the side effects, by personal choice, or due to the cost of drugs. As for preventive measures taken to reduce their risk of CVD, 78% of hypertensive patients and 71% of the overweight were reducing their salt intake. Similarly, a reduction in sugar intake was noted among 89.2% of diabetics and 69% of overweight patients;

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Table 2 Awareness status of the main RFs according to the sociodemographic characteristics and other factors of the participants and presenting these RFs

Characteristics	Awareness of hypertension	P	Awareness of diabetes	P	Awareness of dyslipidemia	P	Awareness of overweight	P
	Not aware/aware 50 (25%)/150 (75%) n (%)/n (%)		Not aware/aware 17 (14.3%)/102 (85.7%) n (%)/n (%)		Not aware/aware 16 (13.6%)/102 (86.4%) n (%)/n (%)		Not aware/aware 109 (41.3%)/155 (58.7%) n (%)/n (%)	
Age, mean ± SD	57.5±12.7/62.2±10.7	0.021*	63.1±12.9/61.9±10.6	0.679	55.5±15.6/62.7±9.8	0.090	60.5±12.2/53.8±13.6	<0.001*
Age groups, years		0.029*		0.835		0.013*		0.002*
30–44	8 (40)/12 (60)		2 (20)/8 (80)		4 (57.1)/3 (42.9)		13 (23.2)/43 (76.8)	
45–59	19 (33.3)/38 (66.7)		4 (13.3)/26 (86.7)		4 (11.8)/30 (88.2)		31 (38.3)/50 (61.7)	
60–75	23 (18.7)/100 (81.3)		11 (13.9)/68 (86.1)		8 (10.4)/69 (89.6)		65 (51.2)/62 (48.8)	
Sex		0.027*		0.881		0.978		0.05*
Male	31 (32)/66 (68)		9 (14.8)/52 (85.2)		7 (13.5)/45 (86.5)		64 (47.1)/72 (52.9)	
Female	19 (18.4)/84 (81.6)		8 (13.8)/50 (86.2)		9 (13.6)/57 (86.4)		45 (35.2)/83 (64.8)	
Province of residence		0.162		1		0.690		0.397
Beirut/Mount Lebanon	43 (23.6)/139 (76.4)		15 (14.3)/90 (85.7)		15 (14.6)/88 (85.4)		98 (42.2)/134 (57.8)	
All other regions	7 (38.9)/11 (61.1)		2 (14.3)/12 (85.7)		1 (6.7)/14 (93.3)		11 (34.4)/21 (65.6)	
Monthly salary per individual		0.725		0.888		0.810		0.462
Lower third	18 (24)/57 (76)		6 (12.5)/42 (87.5)		6 (16.2)/31 (83.8)		41 (43.2)/54 (56.8)	
Middle third	22 (27.8)/57 (72.2)		8 (15.1)/45 (84.9)		7 (13.2)/46 (86.8)		47 (43.5)/61 (56.5)	
Higher third	10 (21.7)/36 (78.3)		3 (16.7)/15 (83.3)		3 (10.7)/25 (89.3)		21 (34.4)/40 (65.6)	
Marital status		0.393		1		0.764		0.772
Married	40 (26.5)/111 (73.5)		13 (14.3)/78 (85.7)		11 (12.8)/75 (87.2)		82 (40.8)/119 (59.2)	
Divorced/widowed/not married	10 (20.4)/39 (79.6)		4 (14.3)/24 (85.7)		5 (15.6)/27 (84.4)		27 (42.9)/36 (57.1)	
Employment status		0.155		0.908		0.065		0.002*
Employed	21 (31.3)/46 (68.7)		5 (16.1)/26 (83.9)		9 (23.1)/30 (76.9)		35 (34.3)/67 (65.7)	
Unemployed	16 (18.4)/71 (81.6)		7 (14.6)/41 (85.4)		3 (6)/47 (94)		35 (36.1)/62 (63.9)	
Retired	13 (28.3)/33 (71.7)		5 (12.5)/35 (87.5)		4 (13.8)/25 (86.2)		39 (60)/26 (40)	
Educational level		0.948		0.341		0.073		0.016*
Illiterate	8 (22.9)/27 (77.1)		6 (21.4)/22 (78.6)		0/18 (100)		15 (44.1)/19 (55.9)	
Primary education	20 (25.6)/58 (74.4)		4 (9.1)/40 (90.9)		5 (10.9)/41 (89.1)		51 (51.5)/48 (48.5)	
Secondary/university	22 (25.3)/65 (74.7)		7 (14.9)/40 (85.1)		11 (20.4)/43 (79.6)		43 (32.8)/88 (67.2)	
Smoking status		0.772		0.525		0.695		0.256
Current smoker	19 (24.1)/60 (75.9)		6 (14.6)/35 (85.4)		7 (17.1)/34 (82.9)		43 (35.8)/77 (64.2)	
Ex-smoker	8 (21.6)/29 (78.4)		5 (20.8)/19 (79.2)		2 (10)/18 (90)		17 (44.7)/21 (55.3)	
Never smoker	23 (27.4)/61 (72.6)		6 (11.1)/48 (88.9)		7 (12.3)/50 (87.7)		49 (46.2)/57 (53.8)	
Diabetes		0.935		–		0.142		0.470
No	27 (24.8)/82 (75.2)		–/–		11 (18)/50 (82)		67 (39.6)/102 (60.4)	
Yes	23 (25.3)/68 (74.7)		–/–				42 (44.2)/53 (55.8)	
Hypertension		–		0.227	5 (8.8)/52 (91.2)	0.034*	53 (45.3)/64 (54.7)	0.238
No	–/–		6 (21.4)/22 (78.6)		9 (23.1)/30 (76.9)		56 (38.1)/91 (61.9)	
Yes	–/–		11 (12.1)/80 (87.9)		7 (8.9)/2 (91.1)			

Hyperlipidemia		<0.001*		0.041*		–	0.986
No	36 (35.6)/65 (64.4)		11 (22)/39 (78)		–/–		62 (41.3)/88 (58.7)
Yes	14 (14.1)/85 (85.9)		6 (8.7)/63 (91.3)		–/–		47 (41.2)/67 (58.8)
BMI categories		0.038*		0.275		0.365	–
Underweight/normal	17 (32.1)/36 (67.9)		1 (4.2)/23 (95.8)		7 (20.6)/27 (79.4)		–/–
Overweight	19 (31.7)/41 (68.3)		7 (17.9)/32 (82.1)		4 (10.8)/33 (89.2)		–/–
Obese	14 (16.1)/73 (83.9)		9 (16.1)/47 (83.9)		5 (10.6)/42 (89.4)		
Family history for CAD		0.870		0.880		0.494	0.532
No	26 (24.5)/80 (75.5)		9 (13.8)/56 (86.2)		9 (15.8)/48 (84.2)		45 (39.1)/70 (60.9)
Yes	24 (25.5)/70 (74.5)		8 (14.8)/46 (85.2)		7 (11.5)/54 (88.5)		
Family history for HTN		0.001*		–		–	0.033*
No	25 (39.7)/38 (60.3)		–/–		–/–		56 (35.9)/100 (64.1)
Yes	25 (18.2)/112 (81.8)		–/–		–/–		
Family history for diabetes		–		0.001*		–	0.683
No	–/–		11 (29.7)/26 (70.3)		–/–		52 (42.6)/70 (57.4)
Yes	–/–		6 (7.3)/76 (92.7)		–/–		57 (40.1)/85 (59.9)
Family history for dyslipidemia		–		–		0.251	0.174
No	–/–		–/–		10 (17.2)/48 (82.8)		77 (44.3)/97 (55.7)
Yes	–/–		–/–		6 (10)/54 (90)		32 (35.6)/58 (64.4)

Notes: Categorical variables are described as frequencies (percentages). *Level of significance ($P<0.05$).
Abbreviations: BMI, body mass index; CAD, coronary artery disease; HTN, hypertension; RF, risk factor.

also, fat intake was reduced among 84.3% of dyslipidemic and 74.8% of overweight patients. However, only half of the patients with RFs stopped smoking. Overweight or obese subjects were trying to lose weight in 61.3% of cases. Most patients had poor adherence to either general or regular physical activity for 30 minutes at least 5 days/week, with, respectively, 32% and 12% among hypertensive, 26.5% and 10.8% among diabetics, 35.3% and 14.7% among dyslipidemic, and 33.5% and 11% among overweight/obese patients (Figure 4).

CVRs and healthy behaviors

Around half of the patients in the study (158 subjects, 41.4%) had a high CVR compared to other groups (moderate: 95 subjects, 24.9%, and low risk: 129 subjects, 33.8%) based on the classification of FRS.[6] Among the high CVR patients, the healthy behaviors that were most pursued were diets with low intakes of salt, sugars, and fats (71.5%, 69%, and 72.2%, respectively). Only 17.7% of these patients had regular physical activity and 36.5% were trying to lose weight among overweight and obese patients. The comparison between the adhesion to healthy behaviors and different risk groups did not show any significant results (Table 4).

Discussion

Our study was designed to assess Lebanese patients' awareness of their CVRFs and their level of adherence to treatment and to healthy behaviors in public and private hospitals of Beirut and Mount-Lebanon. The majority of causes of heart attacks and strokes are usually the presence of a combination of RFs.[1] Our analysis examined the awareness of six CVRFs: HBP, high cholesterol, diabetes, physical inactivity, and overweight/obesity. We found that awareness ranged from 58.7% for overweight status to 86.4% for dyslipidemia, with an adherence level to prevention insufficient for regular physical activity (10.8%–14.7%) and trying to lose weight (33.3%–61.3%); satisfactory for other interventions such as taking medications on time (83%–89.9%) and healthy diet (69%–89.2%) among patients who have at least one RF and aware of this.

Lack of consciousness was analyzed in many previous studies, where it was shown that many patients were unaware of the CVRF they had.[9,20] Interestingly, our results showed high level of awareness for most RFs, especially for diabetes (85.7%) and dyslipidemia (86.4%). This was higher than the percentages reported in China by Wang et al (64.1%)[21] and He et al (11.6%)[22] studies assessing awareness of diabetes and dyslipidemia, respectively, and higher than the rates of NHANES and CHARLS studies in the USA and China

Table 3 Multivariable predictors on the awareness of hypertension and obesity

Variables	Awareness of HTN aOR (95% CI)	*P*-value	Awareness of O/O aOR (95% CI)	*P*-value
Age, years	1.083 (1.057–1.110)	<0.001*	0.963 (0.945–0.981)	<0.001*
Sex				
Female (vs male)			2.002 (1.259–3.183)	0.003*
Province of residence				
Other regions (vs Beirut/Mount Lebanon)	0.409 (0.172–0.974)	0.043*		
Employment status		0.026*		
Employed (reference)	1			
Unemployed	1.363 (0.764–2.432)	0.295		
Retired	0.543 (0.266–1.106)	0.092		
Hyperlipidemia				
Presence (vs absence)	2.089 (1.278–3.415)	0.003*		
BMI categories		<0.001*		
Underweight/normal (reference)	1			
Overweight	1.253 (0.662–2.369)	0.488		
Obese	3.661 (1.977–6.781)	<0.001*		
Family history for HTN				
Presence (vs absence)	3.180 (1.848–5.471)	<0.001*		

Note: *Level of significance ($P<0.05$).
Abbreviations: aOR, adjusted odds ratio; BMI, body mass index; HTN, hypertension; O/O, overweight/obesity.

where awareness reached 73.3% and 19.6% for dyslipidemia, respectively.[23] One possible explanation for these discrepancies is that we restricted our study to hospitalized patients only. The high rate of awareness concerning dyslipidemia could also be due to the missing laboratory data for most patients (245 patients [64.1%]).

Nearly 75% of subjects were aware of their HTN, which is higher than that reported by Matar et al study (53%) of 2014 in Lebanon,[12] which could be explained by several factors: first, the higher average age of our study population (56.41±13.32 years vs 42.9±15.8 years, respectively), which may be related to a higher probability of consciousness in these patients as higher age was noted as an associated factor to awareness. In fact, older participants could have more often come into contact with health systems. On the other hand, our sample consisted of hospitalized patients, which was not the case in their study. In addition, a difference between the places of residence of participants, where our study was concentrated in urban areas only, in which patients have better access to care compared to rural areas.[13] When compared with adjacent countries, such as Turkey[24] and Palestine,[25] Lebanon had a higher awareness (75%vs 40.7% and 51%). These differences may be explained by several factors, such as higher level of socioeconomic development, older age of Lebanese population, and higher ratio of physicians to the general population.

However, the awareness on obesity/overweight was 58.7%, lower than the other RFs in our study, but still higher than the previous studies such as Andrikopoulos et al in Greece (24.4%)[26] and Sarriff et al in Malaysia (47.6%),[27] because the survey took place in urban areas without representatives from rural areas where awareness regarding health issues is likely to be lower. Similarly, women were significantly more aware of their overweight because women are generally more self-conscious about their physique than men, in line with other studies already conducted in Lebanon.[28]

Generally, adequate awareness of CVD and their RFs may help reduce the population's exposure to modifiable RFs and thereby contribute to prevention and control strategies. Awareness will help in molding the modifiable RFs in themselves and in those around them, as besides age, race, gender, and family history, all other RFs are modifiable. It was reassuring to see that our results obtained for adherence levels to treatment and prevention interventions were higher than those reported in another study conducted in Jordan, showing values of 20.9% and 72% for adherence to dietary regimes and drug treatments, respectively, but were lower for cessation smoking (70%), and approximately similar for adoption of regular physical activity (16%).[29] Demographic, social, and cognitive factors, interactions between health care providers and patients, health system characteristics, medications involved, and overall patient

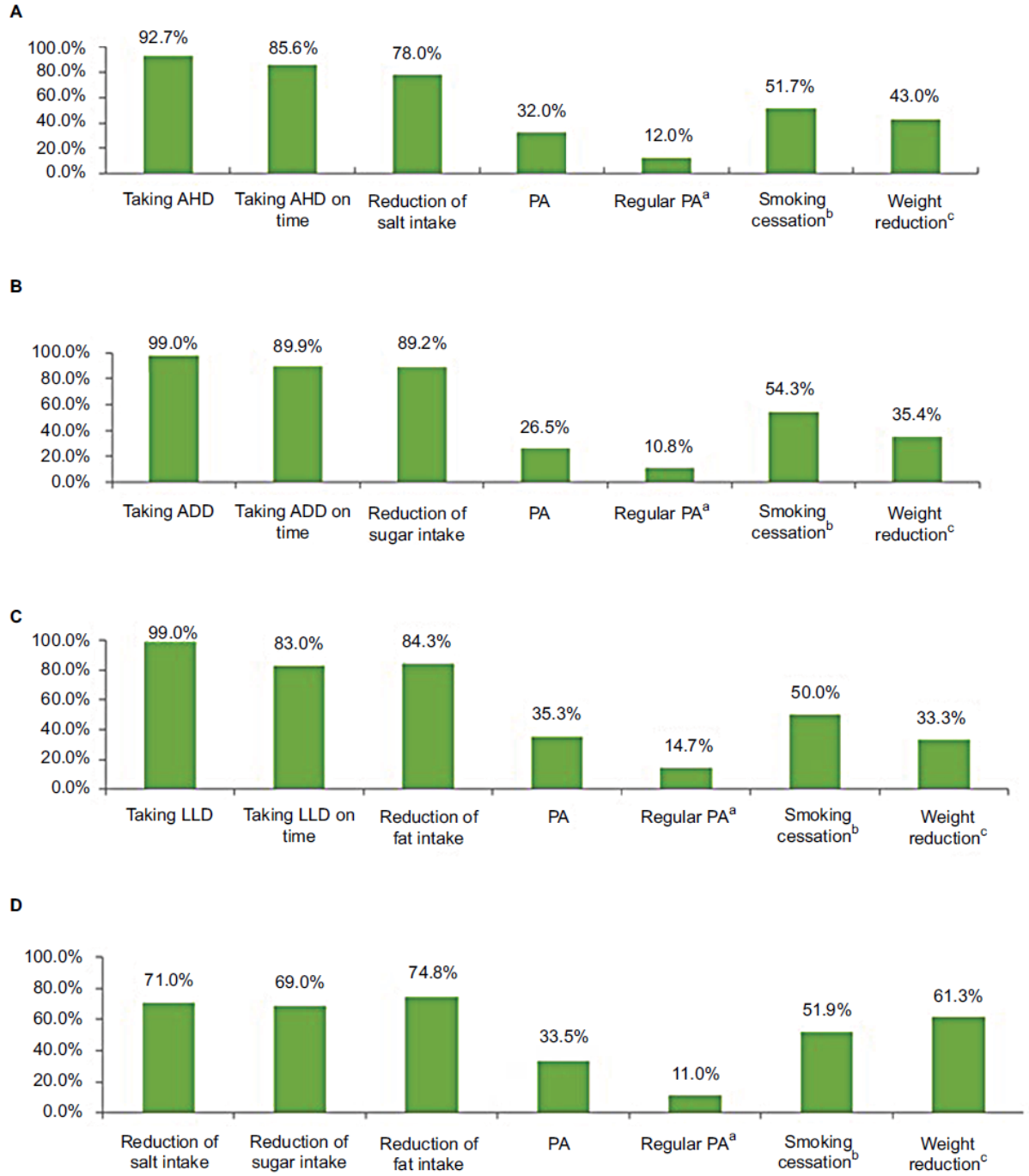

Figure 4 Adherence to treatment and prevention interventions.

Notes: (**A**) Among hypertensive patients and aware of their hypertension. (**B**) Among diabetic patients and aware of their diabetes. (**C**) Among dyslipidemic patients and aware of their dyslipidemia. (**D**) Among overweight or obese patients and aware of their overweight. [a]Regular PA: ≥30 minutes, 5 days/week. [b]Smoking cessation among smokers. [c]Weight reduction among overweight/obese patients.

Abbreviations: ADD, antidiabetic drugs; AHD, antihypertensive drugs; LLD, lipid-lowering drugs; PA, physical activity.

health may explain the variations in adherence rates among different populations.

Data from European epidemiologic studies from recent years indicate improvement in the control of some modifiable RFs like HTN and dyslipidemia or decrease in smoking prevalence leading to reduced CVD risk assessed by Framingham and European Systemic Coronary Risk Evaluation systems, which can be perceived as success of different community prevention programs, communication policies, and extensive work of numerous scientific associations.[5] Thus,

Table 4 Description of healthy behaviors among different risk groups (n=382)

Healthy behaviors	Lower risk, n (%) 129 (33.8)	Intermediate risk, n (%) 95 (24.9)	High risk, n (%) 158 (41.4)
Reduction of salt intake	83 (64.3)	64 (67.4)	113 (71.5)
Reduction of sugar intake	84 (65.1)	58 (61.1)	109 (69)
Reduction of fat intake	97 (75.2)	77 (81.1)	114 (72.2)
Physical activity	51 (39.5)	30 (31.6)	64 (40.5)
Regular physical activity (≥30 minutes, 5 days/week)	21 (16.3)	8 (8.4)	28 (17.7)
Weight reduction among O/O patients	36 (51.4)	29 (42.6)	46 (36.5)
Smoking cessation among smokers	27 (49.1)	14 (35)	41 (51.9)

Abbreviation: O/O, overweight/obese.

we performed an analysis by stratifying according to the FRS categories to see if patients classified as having a high CVR followed healthy lifestyle habits, according to WHO recommendations.[8] But even in this group, healthy behaviors did not have high frequencies, and were not very different from those with low or moderate CVR. For this, there is a need for developing methods of changing the patients' attitude and practice in the prevention, treatment, and control of disease. Furthermore, the percentage of high CVR in our study was higher (41.4%) than that demonstrated by Fahs et al,[13] another study realized in Lebanon, where 13.9% of urban participants had an FRS of >20%, which could be explained by westernization of dietary habits, rapid or unplanned urbanization, technologic progress, and reduction of physical activity during work and leisure.[3]

Public health recommendations

The preventive health in Lebanon receives only sporadic attention in the context of medical visits for acute and chronic medical problems. On the basis of this study, emphasis should be placed on awareness of overweight and HTN for all age groups, both sexes, in persons with family histories, and especially those residents in rural areas. In addition, particular attention should be paid to lifestyle changes among Lebanese, targeting first those at high risk, to prevent and control the expected increase in the burden and mortality of CHD. Such an outcome underscores the importance of educational campaigns to healthy habits and screening as a strategy to improve early diagnosis, increase patients' awareness of RFs, and thus an effective primary prevention of CVD in general population. This could possibly reduce the burden of CAD in Lebanon.

Hence, appropriate actions should be done not only in Lebanon but in neighboring countries.[24,25] Several reports addressed this issue, among these, the world health report 2002,[8] which targets a healthier future worldwide and tries to reverse the epidemic of CVD. Among the recommendations that should be applied especially in Lebanon are the development of effective policies for the prevention of high risks to health, such as smoking, unhealthy diet, physical inactivity, and obesity; implementing new intervention programs targeting risk prevention, for all age groups, and especially for high-risk groups; and the improvement of data sources and systems to monitor key indicators relevant to CVD prevention.

Strengths and limitations of the study

This study has several strengths. It is the first study in Lebanon to assess awareness of CVRFs in a representative sample of noncardiac hospitalized patients, as well as their level of adherence to drug and non-drug treatments for biologic RFs and other prevention strategies. Also, the double measurement of BP reduced the "white coat" effect and the glucose measurement (RBS) provided values for all participants to measure their awareness. In addition, the level of awareness of different RFs was analyzed according to several social and demographic factors and the presence of other RFs. Nevertheless, like any epidemiologic investigation, our study has certain limitations that should be reported. First of all, the survey contains a selection bias because the sample was chosen among hospitalized patients, and the results of study could be generalizable on hospitalized patients of the regions of Beirut and Mount-Lebanon, but not on the general population. A more large-scale study with a larger sample size could be beneficial to the generalization of the results. The assessment of behavioral RF and preventive measures (such as physical activity, smoking cessation, and lowering intake of salt and sugar) were self-reported. Overreporting of healthy behaviors and underreporting of negative ones due to social desirability could have led to an information bias through possible misclassifications. Thus, one could expect that the real situation is even worse than the observed findings. A memory bias would also be present. Also, waist

circumference, which has been correlated with the development of CAD,[30] could not be measured for the majority of patients because of their inability to move. Finally, a classification bias of the dyslipidemia awareness would be present because lipid profile results were only obtained for 1/5 of all patients, which could have introduced an overestimation of the percentage of dyslipidemia' awareness.

Conclusion

Our study showed a satisfactory level of awareness in Lebanese patients for most CVRF, but a low and moderately high level of adherence for some prevention interventions such as exercise, testing weight loss, and smoking cessation. Although awareness, adherence, and control rates are better than other countries, they remain low and should be substantially improved.

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Authors contribution

Fatima Ghaddar contributed toward study conception and data collection. Rouba K Zeidan contributed toward study conception and project supervision. All authors contributed toward data analysis, drafting and revising the paper, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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ANNEXE 2

The purpose of this survey is to study cardiovscular and cerebrovascular diseases throughout Lebanon. We kindly ask you to answer as honestly and accurately as you can. There are no right and wrong answers. The questionnaire is voluntary and the data collected is strictly confidential. You agree to take part in this survey by completing questions below. Thank you for your time.

Abbreviated Mental Test Score (AMTS):

Scoring: A score of 1 is obtained for every correct answer given by the patient. When assessment is complete, total the score.

1. How old are you? ☐

2. What is the time (appropriate to the nearest hour)? ☐

3. Give the patient the following address to remind at the end of the test: ☐
"42 West Street"
This should be repeated by the patient to ensure he is properly heard

4. In which year are we? ☐

5. What is your address? Or what is the name of the hospital? ☐

6. Who are these two individuals? (View photos of Pope and Queen.) ☐

7. What is your date of birth? (Day and month are enough) ☐

8. What year did the World War begin? ☐

9. What is the name of the current king or president? ☐

10. Count back from 20-1. ☐

Total point /10

0 - 3 severe impairment
4-6 moderate impairment
> 6 Normal
Those who score >6 points will continue to interview.

Part I: Questions collected through an interview with the patients

I- Health status:

Cerebrovascular diseases:

1. Were you ever told by a physician that you had a stroke? No ☐ Yes ☐

2. Were you ever told by a physician that you had a transient ischemic attack (TIA), ministroke, or transient ischemic attack? No ☐ Yes ☐

If the answer was "yes" on questions 1 or 2**, please stop the interview**

If "No", continue.

	No	Yes
3. Have you ever had sudden painless weakness on one side of your body?		
4. Have you ever had sudden numbness or a dead feeling on one side of your body?		
5. Have you ever had sudden painless loss of vision in one or both eyes?		
6. Have you ever suddenly lost one half of your vision?		
7. Have you ever suddenly lost the ability to understand what people were saying?		
8. Have you ever suddenly lost the ability to express yourself verbally or in writing?		

Recent cardiovascular history

	No	Yes
9. Myocardial infarction		
10. Angiography or arteriography		
11. Stent / Percutaneous coronary intervention (PCI)		
12. Heart failure		
13. Coronary artery bypass graft surgery		
14. Pulmonary edema		
15. Extremity edema		
16. Renal failure		
17. Vascular obstruction		

If they answered "Yes" to "Heart failure", "Renal failure", or "Pulmonary edema", please stop the interview

Cardiovascular diseases: (Rose Angina Questionnaire)

RAQ angina pectoris (heart pain) questionnaire:

18. Do you ever have any pain or discomfort in your chest? No ☐ Yes ☐

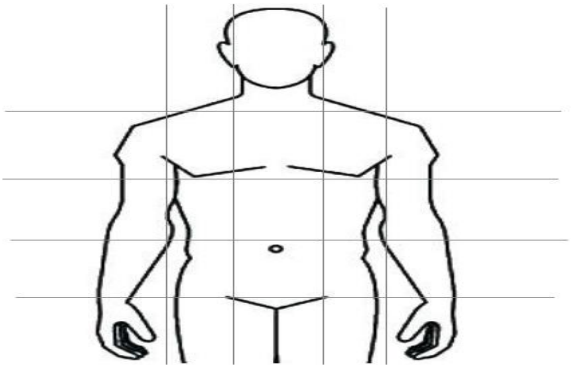
If "No", Have you ever had any pressure or heaviness in your chest? No ☐ Yes ☐

If "No", move to question 25

Did the pain/discomfort/pressure/heaviness in the chest occur for the first time in the last year? No ☐ Yes ☐

19. Where do you get this pain or discomfort? Please mark X on the appropriate places

Your right side



Your left side

20. When you walk at an ordinary pace on the level, does this produce the pain? No ☐ Yes ☐ Unable ☐

21. Do you feel this pain when you walk up or up the stairs or walk quickly? No ☐ Yes ☐ Unable ☐

If "no", move to question 25

22. When you get any pain or discomfort in your chest on walking, what do you do?
Stop ☐ Slow down ☐ Continue at same pace ☐ Not applicable ☐

23. Does the pain or discomfort in your chest go away if you stand still? No ☐ Yes ☐

24. How long does it take to go away? 10 minutes or less ☐ More than 10 minutes ☐

RAQ possible myocardial infarction (heart attack) questionnaire:

25. Have you ever had a severe pain in your chest lasting for half an hour or more? No ☐ Yes ☐
If Yes, ask the following question:
Did the pain occur for the first time in the last year? No ☐ Yes ☐

Family History:

26. Did/Does any of your first-degree relatives (mother, father, sister, or brother) suffer from any coronary heart disease? No ☐ Yes☐
If yes, specify:

Family relationship	**Type of disease**	**Age at occurrence**

27. Did any of your first-degree relatives (mother, father, sister, or brother) have a stroke? No ☐ Yes☐
If yes, specify:

Family relationship	**Type of disease**	**Age at occurrence**

28. Did any of your first-degree relatives (mother, father, sister, brother) have any of the cardiovascular risk factors (hypertension, diabetes, high cholesterol or high blood fats….)? No ☐ Yes☐
If yes, specify:

Family relationship	**Type of disease**	**Age at occurrence**

Chronic diseases:

29. When was the last time you checked your blood pressure, blood cholesterol, blood glucose and weight?

	Never checked before	**Unsure/ I do not know**	**Checked within the last 1-3 months**	**Checked within the last 4-6 months**	**Checked within the last 7-12 months**	**Checked more than 1 year**	**Values of last tests done**
Blood pressure							mmHg
Blood cholesterol							mg/dl
Blood glucose							mg/dl
Body weight							Kg

Have your doctor ever told you that suffer from:

30. Hypertension No ☐ Yes ☐

31. Diabetes No ☐ Yes ☐

If yes, how old were you when you first told you had diabetes?

☐ I was _____ years old

☐ can't remember

32. Hypercholesterolemia No ☐ Yes ☐

33. Hypertriglyceridemia No ☐ Yes ☐

34. Arthritis? No ☐ Yes ☐

35. Psoriasis? No ☐ Yes ☐

36. Depression? No ☐ Yes ☐

37. Parodontitis? No ☐ Yes ☐

38. Other diseases you suffer from: ……..

39. How do you rate your cardiovascular health/risk before the event, from 0 (very bad) to 10 (excellent)? ……..

II. Medicine use: (LMAS score)

40. Have you ever taken any medicine **before hospitalization**? No ☐ Yes ☐

If "no", move to section III,

Do you take:	***No***	***Yes***	***If yes, specify the drug's name dose and duration***
41. Antihypertensive drugs			
42. Anti-diabetic drugs			
43. Cholesterol-lowering drugs			
44. Anticoagulant or antiplatelet drugs			
45. Others			

Factor	**Question**	**No**	**Yes**
Occupational	46. Do you forget to take your medication when you are busy (intensive work or travel)?		
	47. Do you forget to take your medication if you are invited to lunch or dinner?		
	48. Do you forget to take your medication?		
	49. Do you get late when it comes to buying your medication packs when they become empty?		
	50. Do you stop taking your medication if it forbids you from eating certain food that you love because of possible food-medication interaction?		
Psychological	51. Will you stop taking your medication, without your doctor's consultation, if your neighbor/relative took a prescription like yours for a long term and it caused them side effects?		
	52. Do you stop taking your medication without consulting your doctor if the laboratory tests show improvement during treatment period?		
	53. Do you stop taking your medication without consulting your doctor if you do not feel better during treatment period?		
	54. Do you stop taking your medication without consulting your doctor if you feel better during treatment period?		
Annoyance	55. Do you decide to stop some of your medications without consulting your doctor if you noticed that you are taking too many medications every day?		
	56. Do you stop your chronic treatment if you get bored of it?		
	57. Do you stop taking your medication in case of side effects?		
Economical	58. Do you stop taking your medication if your insurance does not cover it?		
	59. Will you stop buying your medication packs if you considered them expensive?		

60. How often do you have difficulty remembering to take all your medicine?
☐ Never/rarely ☐ Once in a while ☐ Sometimes ☐ Usually ☐ All the time

III - Hormone Replacement Therapy

61. Have you ever taken birth control pills? Yes □ No □
If yes, specify: Drug name ..... Duration ....

62. Have you reached menopause? Yes □ No □
If yes, how old were you?.....
Has your doctor given you medicines for this purpose? Yes □ No □
If yes, specify the name of the medicine ..... Duration and dose……

Did the medicine cause you any side effects? Yes □ No □
If yes, specify these symptoms ..... Duration……..
Were you still taking this medicine before your hospitalization? Yes □ No □

63. Have you had surgery to remove your ovaries? Yes □ No □
If yes, how old were you?.....
Has your doctor given you medicines for this purpose? Yes □ No □
If yes, specify the name of the medicine ..... Duration and dose……
Did this medicine cause you any side effects? Yes □ No □
If yes, specify these symptoms ..... Duration……..
Were you still taking this medicine before your hospitalization? Yes □ No □

IV- Questions about pollution

64. How many smokers are in your home? ……..
Does anyone smoke inside the house? Yes □ No □
If yes, for how many hours per day?……

65. How many smokers are in your workplace? .....
Are you exposed to this smoke? Yes □ No □
If yes, for how many hours per day?……
66. Is your current home close (100 meters or less) from a traffic jam? Yes □ No □
If yes, specify duration of residence (years): .....

67. Have you ever lived in a nearby house (100 meters or less) from a busy road with cars? Yes □ No □
If yes, specify duration of residence (years): .....

68. Have you ever lived in a nearby house (100 meters or less) from a generator? Or motor ? Yes □ No □
If yes, specify duration of residence (years): .....

69. How do you heat your house? Gas □ Firewood □ Gasoline □ Electricity □ Hot Air □ Centralized □

70. On what do you cook? Gas □ Firewood □ Electricity □ Other: .....

	Much	***Moderately***	***little***	***Never***
71. Are you exposed to toxic gases or smoke in your work or other?				
72. Do you think you live in a polluted area or exposed to pollution?				
73. Are you exposed to black smoke from cars or motor vehicles?				
74. Do you live or work in an area crammed with cars and condominiums?				
75. Do you live or work in a region covered by black clouds (pollution clouds) in summer?				
76. Are you exposed in your work or else to sand, dirt and dust?				

77. Do you live or work in an area crammed with factories? Yes □ No □
If yes, select the station and the distance: .....

78. Do you live or work near the power plant? Yes □ No □
If yes, select the station and the distance: .....

79. Do you drive a car? Yes □ No □

80. How many hours per day do you spend on a vehicle (your car or bus ...)? …..... hour

81. Are the vehicle's windows usually closed or open? Yes □ No □

V- Cigarettes Smoking:

82. Are you a cigarette smoker? Yes and I still am ☐ I tried and quit ☐ No ☐
If your answer is No, please move to the section number VI
83. If your answer is "Yes" or "I tried and quit", give the following details:

Number of cigarettes per day	***Number of years of smoking***

84. Age at smoking initiation: ……Year
85. If you quit smoking, since how many years: …….. Year

86. If you are still smoking, have you ever tried to quit before?
□ Yes, for how long? _____ days / weeks / years
□ No, never tried but I would consider
□ No, never tried and never will

87. Are you seriously thinking of quitting smoking?
□ Yes, within the next 30 days □ Yes, within the next 6 months □ No, not thinking of quitting

VI- Waterpipe smoking:

88. Are you a water pipe smoker? Yes and I still am ☐ I tried and quit ☐ No ☐
If your answer is No, please move to the section number VII
89. If your answer is "Yes" or "I tried and quit", give the following details:

Number of water pipe per day	***Number of years of smoking***

90. Age at water pipe smoking initiation: ……Year
91. If you quit smoking water pipe, since how many years? …….. Year
92. If you are still smoking, have you ever tried to quit before?
□ Yes, for how long? _____ days / weeks / years
□ No, never tried but I would consider
□ No, never tried and never will

93. Are you seriously thinking of quitting smoking?
□ Yes, within the next 30 days □ Yes, within the next 6 months □ No, not thinking of quitting

VII- Alcoholic beverages (beer, whiskey, wine, vodka ...):

94. Do you drink alcohol? Yes, currently □ No, never □ Yes, but previously □
If you answered no, go to the next section VIII

95. How old were you when you had your first drink? ..... Year

96. Did you drink alcohol in the past 12 months? Yes □ No □

97. You drink alcohol: Every day □ Occasionally □ Never □.
Type: □ beer □ wine □ whiskey □vodka □ others……
Quantity: ……. glasses/ day
……. glasses/ week
……. glasses/ month

VIII- Questions about nutrition (LMDS)

Types of food	***Never***	***Twice a week or less***	***Three to six times a week***	***at least once a day***	***At all meals***
98. Thyme man'ouche, cheese man'oucheh					
99. Tabbouleh, fattouch, vegetables or salad (tomatoes, cucumber, lettuce…..).					
100. Stew					
101. Fast food (hamburger, cheeseburger, pizza)					
102. French fries or other fried foods					
103. Olive oil					
104. Food with grains like beans, lentils or chickpeas					
105. Fish or sea food					
106. All kinds of meat (beef or chicken)					
107. Processed meat (Mortadella, hot dog…)					
108. White bread					
109. Whole grain bread (brown bread)					
110. Rice and pasta					
111. Cooked vegetables (eggplant, squash….)					
112. Fruits					
113. Sweets (cake, ice cream, chocolate…)					
114. Full fat milk and dairy products					
115. Skimmed milk and dairy products					
116. Soft drinks (Pepsi, Seven up, Cola…)					
117. Fruit juice					
118. Coffee, tea or Nescafe					

Dietary Habits

	Yes	***No***	***Sometimes***
119. Do you eat more when you are nervous or when facing a problem			
120. Do you follow a particular diet			
121. Do you eat low-carb foods (Diet)			
	A lot	***Moderately***	***Little***
122. Salt intake			
123. Sugar intake			
124. Lipids intake			
125. Drinking water			

IX- Questions about physical activity (IPAQ) and sedentary life scale.

- *Job-related physical activity*

126. Do you currently have a job or do any unpaid work outside your home? No ☐ Yes ☐

127. During the last 7 days, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.
____ days per week ☐ No vigorous job-related physical activity
If No, Skip to question 129

128. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work? _____ hours per day _____ minutes per day

129. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.
_____ days per week ☐No moderate job-related physical activity

If No, Skip to question 131

130. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work? _____ hours per day _____ minutes per day

131. During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.
_____ days per week ☐No job-related walking

If No, skip to next part

132. How much time did you usually spend on one of those days walking as part of your work?
_____ hours per day _____ minutes per day

- *Transportation physical activity*

133. During **the last 7 days,** on how many days did **you travel in a motor vehicle** like a train, bus, car, or tram?
_____ days per week ☐No traveling in a motor vehicle

If No, Skip to question 135

134. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle? _____ hours per day _____ minutes per day

135. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**? _____ days per week ☐ No bicycling from place to place

If No, Skip to question 137

136. How much time did you usually spend on one of those days to **bicycle** from place to place?
_____ hours per day _____ minutes per day

137. During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time to **go from place to place**? _____ days per week ☐No walking from place to place

If No, Skip to next part

138. How much time did you usually spend on one of those days **walking** from place to place?
_____ hours per day _____ minutes per day

❖ *Housework, house maintenance and caring for family*

139. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**? _____ days per week ☐No vigorous activity in garden or yard

If No, Skip to question 141

140. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard? _____ hours per day _____ minutes per day

141. Again, think about only those physical activities that you did for at least 10 minutes at a time. During **the last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**? _____ days per week ☐No moderate activity in garden or yard

If No, Skip to question 143

142. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard? _____ hours per day _____ minutes per day

143. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home?**
_____ days per week ☐No moderate activity inside home

If No, Skip to next part

144. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home? _____ hours per day _____ minutes per day

❖ *Recreation, sport, and leisure-time physical activity*

145. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time in **your leisure time**?
_____ days per week ☐ No walking in leisure time

If No, Skip to question 147

146. How much time did you usually spend on one of those days **walking** in your leisure time?
_____ hours per day _____ minutes per day

147. Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming in **your leisure time**? _____ days per week ☐No vigorous activity in leisure time

If No, Skip to question 149

148. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time? _____ hours per day _____ minutes per day

149. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in **your leisure time**?
_____ days per week ☐No moderate activity in leisure time

If No, Skip to next part

150. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time? _____ hours per day _____ minutes per day

❖ *Time spent sitting:*

151. During **the last 7 days**, how much time did you usually **spend sitting** on a **weekday**? _____ hours per day _____ minutes per day

152. During **the last 7 days**, how much time did you usually **spend sitting** on a **weekend day**? _____ hours per day _____ minutes per day

Sedentary Scale:

Please estimate how many hours and minutes you spend sitting each day in the following situations:

- *on a week day :*

153-whilst travelling to and from places: _____ hours per day _____ minutes per day
154-while at work: _____ hours per day _____ minutes per day
155-while watching TV: _____ hours per day _____ minutes per day
156-while using a computer at home: _____ hours per day _____ minutes per day
157-your leisure time, not including TV (e.g. visiting friends, movies, dining out etc.): _____ hours per day _____ minutes per day

- *on a weekend day:*

158-whilst travelling to and from places: _____ hours per day _____ minutes per day
159-while at work: _____ hours per day _____ minutes per day
160-while watching TV: _____ hours per day _____ minutes per day
161-while using a computer at home: _____ hours per day _____ minutes per day
162- your leisure time, not including TV (e.g. visiting friends, movies, dining out etc.): _____ hours per day _____ minutes per day

X- Psychological distress (BDS-22)

Think about your psychological status in the past few weeks and answer the appropriate sign:

	Never	***Sometimes***	***Often***	***Always***
163. You feel despaired				
164. You think life has no meaning				
165. You feel empty				
166. You feel on the edge				
167. You feel you don't recognize yourself				
168. You isolate yourself				
169. You lost the desire to learn				
170. You lack enthusiasm				
171. I don't know what I want				
172. Your ideas are puzzled				
173. You have constipation or diarrhea				
174. You have stomach cramps				
175. You have stomach heartburn				
176. You find it difficult to relax				
177. You get angry for ridiculous reasons				
178. Your mood changes for tiny matters				
179. You are in a bad mood				
180. You have memory troubles				
181. You have difficulty concentrating				
182. You don't know what values to adopt				
183. You have panic attacks.				
184. You worry about little things				

XI- Quality of life (SF-12)

185. In general, would you say your health is:
□ Excellent □ Very good □ Good □ Fair □ Poor

*The following questions are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?*

186. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.
□ Yes, limited a lot □ Yes, limited a little □ No, limited at all

187. Climbing **several** flights of stairs.
□ Yes, limited a lot □ Yes, limited a little □ No, limited at all

*During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?*

188**. Accomplished less** than you would like. □ Yes □ No

189. were limited in the **Kind** of work or other activities □ Yes □ No

*During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?*
190**. Accomplished less** than you would like. □ Yes □ No

191. Did work or activities **less carefully than usual activities** □ Yes □ No

192. During the **past 4 weeks**, how much **did pain interfere** with your normal work (including work outside the home and housework)?

□ Not at all □ A little bit □ Moderately □ Quite a bit □Extremely

*These questions are about how you have been feeling during **the past 4 weeks**.*
For each question, please give the one answer that comes closest to the way you have been feeling.
*How much of the time during **the past 4 weeks...***

193. Have you felt calm & peaceful?
□ All of the time □ Most of the time □ A good bit of the time □ Some of the time □ A little of the time □ None of the time

194. Did you have a lot of energy?
□ All of the time □ Most of the time □ A good bit of the time □ Some of the time □ A little of the time □ None of the time

195. Have you felt down-hearted and blue?
□ All of the time □ Most of the time □ A good bit of the time □ Some of the time □ A little of the time □ None of the time

196. During **the past 4 weeks,** how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc.)?

□ All of the time □ Most of the time □ Some of the time □ A little of the time □ None of the time

XII- About CVDRF…

197. Have you ever undertaken any preventive practices for CHD?

□ None □ Exercise, if Yes, Duration _____ □ Dietary salt restriction
□ Dietary fat restriction □ Dietary sugar restriction □ Weight control
□ Stress reduction □ Reduced smoking □ Medications
□ Home remedies □ Others_____

198. How would you describe your weight? □ Underweight □ Normal □ Overweight □ Obese

199. Are you presently trying to lose weight, gain weight or neither?
□ Lose weight □ Gain weight. (Proceed to next section) □ Neither. (Proceed to next section)

200. Which of the following are you doing to lose weight? ***(READ LIST)***
□ Dieting □ Exercising □ Skipping meals
□ Taking diet pills □ Attending weight control programs □ Other (specify) _____

201. Why would you like to lose weight? **(DO NOT READ LIST)**
□ To become more attractive □ to improve general health
□ To decrease the risk of heart attack □ to maintain an acceptable level of blood pressure
□ To slow down the hardening of the arteries □ to decrease the risk of getting diabetes
□ Other (specify) _____

XIII-General questions:

202. Age: …….. years
203. Marital status: Married ☐ Single ☐ Widow/Divorced ☐
204. Educational level:
☐ Primary or less
☐ Elementary
☐ Secondary
☐ University
☐ Masters
☐ Doctorate
205. Do you work? Yes ☐ No ☐ Retired ☐
If yes, what type of work? ……..

206. Where do you live most days of the year? …….. Governorate:……..

207. Is the region a: big city? ☐ village? ☐ in between? ☐
How long have you lived in your current house? …… years
How many people live in your household (including you)? ……..

208. Income of the house per month:
☐ Less than 500,000 L.L.
☐ 500,000 – 1,000,000 L.L.
☐ 1,000,000 – 2,000,000 L.L.
☐ 2,000,000 – 4,000,000 L.L.
☐ more than 4,000,000 L.L.

209.Phone number? +961 - _ _ - _ _ _ _ _ _

Part II: Questions collected from the patient files

Anthropometric Measurement

210. Weight……..Kg
211. Height: …….Cm
212. Waist size: ……. Cm

Blood Pressure :

213. Systolic 1…….. (mmHg)	Diastolic 1……. (mmHg)
214. Systolic 2…….. (mmHg)	Diastolic 2……. (mmHg)

215. Heart rate ……

Glycemic Profile:

216. Glycemia: ……..
217. HBA1C: ……..

Lipid profile:

218. Total Cholesterol: …….
219. HDL: ……
220. LDL: ……
221. Triglyceride: ……..

Cardiology profile:

222. CRP: …….
223. Hémoglobine: ……
223.1. Hématocrite: ……..
224. Troponine: ……..
225. CK-MB: ……..
SGPT: …….. SGOT: ……

From the CORONARY patients' file (only) during their hospitalization:

226. Which type of coronary artery disease was diagnosed by the doctor?
☐ Chronic coronary artery disease / Stable angina.
Acute coronary syndrome:
a-☐ ST segment elevation myocardial infarction (STEMI).
b-☐ Non ST elevation myocardial infarction (Non STEMI) / Unstable angina.
☐ Other: ……

227. According to the type of CAD diagnosed, what was the treatment received?

I -Non pharmacologic treatment

☐ Coronary Angioplasty or PCI
☐ CABG
☐ Medical treatment
☐ Laser revascularization
☐ External enhanced counter pulsation (EECP)
☐ Others: ……

II- pharmacologic treatment (during hospitalization)

	Drug therapy	**Dose**
Anti-Thrombotic therapy	A- Anticoagulant therapy : ☐Heparin injection (or unfractionated heparin) ☐Heparin low molecular weight Lovenox (enoxaparin), Fragmin (dalteparin),Innohep (tinzaparin) ☐Warfarin ☐ Direct thrombin inhibitors: DTIs (Lepirudin (Refludan); argatroban; Bivalirudin (Angiomax, hirudin); Dabigatran (Pradaxa))	
	B- Antiplatelets therapy: ☐Aspirin ☐Clopidogrel ☐Dipyridamole ☐Glycoprotein IIb/IIIa inhibitor (Abciximab, tirofiban, Eptifibatide…)	
C- Thrombolytic therapy:	☐Streptokinase ☐Urokinase ☐tPA (Tissue plasminogen activator): Alteplase, Retaplase, Tenecteplase	
D- Antianginals therapy:	☐Beta blockers [atenolol (Tenormin), betaxolol (Kerlone), acebutolol (Sectral)] ☐Nitrates [Nitroglycerin (Nitrostat; Nitromist), Isordil] ☐ACE Inhibitors (angiotensin converting enzyme inhibitors): benazepril (Lotensin)…. ☐Calcium channel blocker (CCB): amlodipine (Norvasc),….	
E- Lipid lowering drugs :	☐Statins ☐Fibrates ☐Niacin ☐Ezetimibe	
	F- Others:……..	

228. According to the type of CAD diagnosed, what was the treatment prescribed **after discharge**, for secondary prevention?

Name of medicines	***Dose***	***Duration***

Part III: Questionnaire 3 months after discharge:
from the same patients already interviewed (coronary and non-coronary); (filled by phone)

After your coronary heart disease, your coronary heart operation and/or your discharge:

A- Lifestyle changes:

	Yes	No
1. Have you been informed by a health professional about the necessary lifestyle changes to do after the event?		
If yes, who gave you the info: □ physician □ nurse □ pharmacist □ other		
2. Have you lost weight with lifestyle changes?		
3. Have you reduced your lipid levels with lifestyle changes?		
4. Have you reduced your blood glucose levels/diabetes with lifestyle changes?		
5. Have you increased your exercise habits?		
6. Have you reduced your stress level with lifestyle changes?		
7. Have you changed your smoking habits?		
8. Have you made any dietary changes?		
9. Have you reduced your blood pressure level with lifestyle changes?		
10. Do you take now all your medicines regularly and on time? **If No**, why not? _____		

B- Quality of life (SF-12)

11. In general, would you say your health is:
□ Excellent □ Very good □ Good □ Fair □ Poor

*The following questions are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?*

12. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.
□ Yes, limited a lot □ Yes, limited a little □ No, limited at all

13. Climbing **several** flights of stairs.
□ Yes, limited a lot □ Yes, limited a little □ No, limited at all

*During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?*

14**. Accomplished less** than you would like. □ Yes □ No

15. were limited in the **Kind** of work or other activities □ Yes □ No

*During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?* 16**. Accomplished less** than you would like. □ Yes □ No 17. Did work or activities **less carefully than usual activities** □ Yes □ No
18. During the **past 4 weeks**, how much **did pain interfere** with your normal work (including work outside the home and housework)? □ Not at all □ A little bit □ Moderately □ Quite a bit □Extremely
*These questions are about how you have been feeling during **the past 4 weeks**.* *For each question, please give the one answer that comes closest to the way you have been feeling.* *How much of the time during **the past 4 weeks...*** 19. Have you felt calm & peaceful? □All of the time □Most of the time □A good bit of the time □ Some of the time □A little of the time □ None of the time 20. Did you have a lot of energy? □ All of the time □ Most of the time □ A good bit of the time □ Some of the time □ A little of the time □ None of the time 21. Have you felt down-hearted and blue? □ All of the time □ Most of the time □ A good bit of the time □ Some of the time □ A little of the time □ None of the time
22. During **the past 4 weeks,** how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc.)? □ All of the time □ Most of the time □ Some of the time □ A little of the time □ None of the time

C- <u>LMAS scale:</u>

Factor	Question	No	Yes
Occupational	23. Do you forget to take your medication when you are busy (intensive work or travel)?		
	24. Do you forget to take your medication if you are invited to lunch or dinner?		
	25. Do you forget to take your medication?		
	26. Do you get late when it comes to buying your medication packs when they become empty?		
	27. Do you stop taking your medication if it forbids you from eating certain food that you love because of possible food-medication interaction?		
Psychological	28. Will you stop taking your medication, without your doctor's consultation, if your neighbor/relative took a prescription like yours for a long term and it caused them side effects?		
	29. Do you stop taking your medication without consulting your doctor if the laboratory tests show improvement during treatment period?		
	30. Do you stop taking your medication without consulting your doctor if you do not feel better during treatment period?		
	31. Do you stop taking your medication without consulting your doctor if you feel better during treatment period?		
Annoyance	32. Do you decide to stop some of your medications without consulting your doctor if you noticed that you are taking too many medications every day?		
	33. Do you stop your chronic treatment if you get bored of it?		
	34. Do you stop taking your medication in case of side effects?		
Economical	35. Do you stop taking your medication if your insurance does not cover it?		
	36. Will you stop buying your medication packs if you considered them expensive?		

Thank you for your participation

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TITRE : Les facteurs de risque de la maladie coronarienne chez les femmes libanaises : une étude cas-témoins
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LIEU ET DATE DE SOUTENANCE : Toulouse, le vendredi 14 octobre 2022

Résumé

Ce travail vise à déterminer les facteurs de risque (FDRs) de maladie coronarienne (MC) de femmes Libanaises et à évaluer le lien entre MC et activité physique/sédentarité. Au cours d'une étude cas-témoin prospective, menée à Beyrouth et au Mont-Liban, nous avons inclus 1500 patientes de 40 ans ou plus. Les facteurs sociodémographiques, l'activité physique et la sédentarité, et les FDRs cardiovasculaires ont été collectées. Nous mettons en évidence une association positive entre la MC et certains FDRs. De plus, les douleurs articulaires banales, fréquentes chez la femme ménopausée, sont associées aux MC, tandis qu'une activité physique régulière, au moins modérée, facilement accessible (travaux ménagers/jardinage, transport) semblaient réduire significativement les événements coronariens.

Ces résultats soulignent la nécessité d'interventions de prévention dédiées aux femmes pour une amélioration de leur santé cardiovasculaire.

Mots-clés : Maladie coronarienne, Femmes, Facteurs de risque, Vieillissement, Activité physique

DISCIPLINE : Épidémiologie

INTITULÉ ET ADRESSE DU LABORATOIRE

Unité 1048 ou I2MC - Institut des Maladies Métaboliques et Cardiovasculaires, Toulouse

TITLE

Risk factors for coronary heart disease among lebanese women: a case–control study

ABSTRACT

This work aims to determine the risk factors (RFs) for coronary heart disease (CHD) in Lebanese women and to assess the association between CHD and physical activity/sedentary lifestyle. In a prospective case-control study, conducted in Beirut and Mount Lebanon, we included 1500 female patients aged 40 years or older. Sociodemographic factors, physical activity and sedentary lifestyle, and CVRFs were collected. We showed a positive association between CHD and some RFs. In addition, common joint pain, which is frequent in postmenopausal women, was associated with CHD, while regular, at least moderate, easily accessible physical activity (housework/gardening, transportation) appeared to significantly reduce CHD events.

These findings underscore the need for dedicated prevention interventions for women to improve their cardiovascular health.

Keywords: Coronary heart disease, Women, Risk factors, Aging, Physical activity