VALIDATION OF THE HEALTH BELIEFS RELATED TO CARDIOVASCULAR DISEASE (HBCVD) SCALE AND FACTORS ASSOCIATED WITH HEALTH-PROMOTING BEHAVIOUR AMONG SINGLE MOTHERS IN KELANTAN

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by

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LIST OF SYMBOLS

<	Less than
>	More than
≥	More than and equal to
=	Equal to
%	Percentage
ρ	Probability value
β	Beta coefficient
n	Sample size
df	Degree of freedom
χ^2	Chi-square
r	Pearson correlation coefficient @ Rho
t	*t* value for *the t-test*

LIST OF ABBREVIATIONS

AIC	Akaike information criterion
BIC	Bayesian information criterion
BMI	Body mass index
CAD	Coronary artery disease
CFA	Confirmatory factor analysis
CFI	Confirmatory factor index
CHD	Coronary heart disease
CR	Composite reliability
CVD	Cardiovascular diseases
CVI	Content validity index
DM	Diabetes Mellitus
FVI	Face validity index
HBCVD	Health beliefs related to CVD
HBM	Heath belief model
HPB	Health-promoting behaviour
HPLP II	Health Promoting Lifestyle Profile II
HPM	Health promotion model
I-CVI	Item-level content validity index
I-FVI	Item-level face validity index
IHD	Ischemic heart disease
IR	Interpersonal relationship
MI	Myocardial infarction
ML	Maximum likelihood
MLR	Robust maximum likelihood estimator
MOH	Ministry of Health
MPSS	Multidimensional perceived social support
MT	Menopausal transition
NCD	Non-communicable diseases
OR	Odds ratio
RMSEA	Root means square error of approximation
S-CVI	Overall content validity index

SD	Standard deviation
SRMR	Standardised root means square residual
TLI	Tucker-Lewis index
WDD	Women Development Department
WHO	World Health Organization
WLSMV	Mean and variance adjusted weighted least square
WRMR	Weighted root mean square residual

LIST OF APPENDICES

VALIDASI SKALA KEPERCAYAAN KESIHATAN BERKAITAN PENYAKIT KARDIOVASKULAR DAN FAKTOR BERKAITAN DENGAN TINGKAH LAKU MEMPROMOSIKAN KESIHATAN DALAM KALANGAN IBU TUNGGAL DI KELANTAN

ABSTRAK

***Latar belakang**:* Penyakit kardiovaskular adalah punca utama kematian di kalangan wanita, dengan ibu tunggal berisiko lebih tinggi disebabkan oleh kekurangan psikososial. Kepercayaan terhadap pencegahan penyakit mempengaruhi risiko penyakit kardiovaskular dan tingkah laku mempromosikan kesihatan secara signifikan.

Objektif: Kajian ini bertujuan untuk menterjemah dan mengesahkan skala kepercayaan kesihatan berkaitan penyakit kardiovaskular (HBCVD), menentukan markah purata subskala tingkah laku mempromosikan kesihatan, dan menilai hubungan antara kepercayaan kesihatan, faktor sosiodemografi dan klinikal, serta sokongan sosial yang dirasai dengan tingkah laku mempromosikan kesihatan dalam kalangan ibu tunggal di Kelantan.

Kaedah: Kajian ini dijalankan dari Mei 2023 hingga April 2024 dan terdiri daripada dua fasa. Fasa pertama melibatkan proses menterjemah dan mengesahkan skala HBCVD. Proses terjemahan ke hadapan dan ke belakang dijalankan oleh empat orang penterjemah. Proses pengesahan dilakukan oleh panel pakar dan kumpulan sasaran untuk memperoleh Indeks Kesahan Kandungan (CVI) dan Indeks Kesahan Muka (FVI). Kebolehpercayaan konstruk menggunakan analisis pengesahan faktor (CFA) dilakukan di kalangan 275 responden menggunakan anggaran kebolehjadian maksimum yang kukuh. Sementara itu, kebolehpercayaan dalaman diuji berdasarkan

kebolehpercayaan komposit (Raykov's rho). Seterusnya, Fasa dua adalah satu kajian keratan lintang yang melibatkan 242 responden yang dipilih secara rawak dari empat daerah di Kelantan. Pembolehubah tidak bersandar terdiri daripada faktor-faktor sosiodemografi, profil klinikal, kepercayaan kesihatan berkaitan dengan penyakit kardiovaskular, dan sokongan sosial yang dirasai. Pembolehubah bersandar adalah jumlah markah tingkah laku mempromosikan kesihatan. Data kemudiannya dianalisa menngunakan analisis deskriptif dan regresi linear berganda untuk penilaian menyeluruh terhadap faktor-faktor penentu tingkah laku mempromosikan kesihatan.

Keputusan: Indeks Kesahan Kandungan (CVI) dan Indeks Kesahan Muka (FVI) masing-masing bernilai 0.91 dan 0.96. Pekali faktor setiap item adalah boleh diterima (>0.4), dan indeks kesesuaian dari model analisis pengesahan faktor akhir menghasilkan kesesuaian model yang baik [SRMR = 0.054, RMSEA = 0.060 (90% CI: 0.050, 0.070, CFI = 0.931, TLI = 0.920]. HBCVD-M menunjukkan kebolehpercayaan yang baik, dan struktur dalaman sesuai dengan model, dengan julat kebolehpercayaan komposit di antara 0.745 - 0.902. Markah keseluruhan tingkah laku mempromosikan kesihatan yang diperoleh oleh responden adalah 118.03 (19.2). Markah purata (SD) tertinggi adalah bagi perkembangan rohani, 22.46 (3.70), dan untuk hubungan antara individu, 22.05 (3.67), dan markah terendah didapati bagi aktiviti fizikal, 15.09 (4.62). Tanggapan keterukan (larasan **β** = 1.60; 95% CI: 0.68, 2.53; $p < 0.001$), dan sokongan sosial yang dirasai (larasan **β** = 0.63; 95% CI: 0.37, 0.90; $p < 0.001$), berkaitan secara positif dengan tingkah laku mempromosikan kesihatan. Selain itu, tahap pendidikan (larasan **β** = -10.36; 95% CI: 16.06,4.67; $p < 0.001$) dan tanggapan faedah (larasan **β** = -1.43; 95% CI: -2.37,-0.48; $p < 0.001$) berkaitan secara negatif dengan tingkah laku mempromosikan kesihatan.

Kesimpulan: Skala Kepercayaan Kesihatan Berkaitan Penyakit Kardiovaskular versi Bahasa Melayu adalah sah dan merupakan intrumen yang boleh dipercayai untuk mengukur kepercayaan kesihatan dikalangan ibu tunggal. Secara kesuluruhan, markah untuk tingkah laku mempromosikan kesihatan adalah sederhana. Pengetahuan tentang faktor-faktor yang mempengaruhi dalam kajian ini boleh menyumbang kepada peningkatan penglibatan dalam tingkah laku mempromosikan kesihatan dan seterusnya mengurangkan morbiditi dan mortaliti berkaitan penyakit kardiovaskular.

Kata Kunci:Penyakit kardiovaskular, kepercayaan kesihatan, tingkah laku mempromosikan kesihatan,validasi, ibu tunggal

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ABSTRACT

Background: Cardiovascular disease (CVD) is the leading cause of death among women, with single mothers at higher risk due to psychosocial disadvantages. Belief in illness preventability significantly influences CVD risk and health-promoting behaviours (HPB).

***Objective*:** The current study aimed to translate and validate the health beliefs related to the cardiovascular disease (HBCVD) scale, determine the mean scores of HPB subscales, and assess the relationships between health beliefs, sociodemographic and comorbidities, and perceived social support with HPB among single mothers in Kelantan.

Methodology*:* The study comprised two phases from May 2023 to April 2024. Phase one involved the translation and validation of the HBCVD scale. The forward and backward translation process was conducted by four translators. The validation process was performed by expert panels and a potential target population to obtain a Content Validity Index (CVI) and Face Validity Index (FVI). Construct validity using Confirmatory Factor Analysis (CFA) was conducted among 275 respondents using a robust maximum likelihood estimator. Meanwhile, the internal consistency reliability was examined based on composite reliability (Raykov's rho). Subsequently, phase two was a cross-sectional study which involved 242 respondents who were randomly selected from four districts in Kelantan. The independent variables included sociodemographic factors, clinical profile, health beliefs related to CVD and perceived

social supports. The dependent variable was the total HPB score. The data was then subjected to descriptive analysis and multiple linear regression for comprehensive evaluation of the predictors for HPB.

***Results**:* The CVI and FVI were 0.91 and 0.96, respectively. The factor loadings of each item were acceptable (> 0.4), and the fit indices from the final model of CFA resulted in a good model fit [SRMR = 0.054, RMSEA = 0.060 (90% CI: 0.050, 0.070, CFI = 0.931, TLI = 0.920]. The HBCVD-M showed good reliability, and the internal structure fit the model, with composite reliability ranging from 0.745 - 0.902. The total HPB score obtained by the respondents was 118.03 (19.2). The highest mean (SD) score was noted for spiritual growth, 22.46 (3.70), and for interpersonal relationships, 22.05 (3.67), and the lowest score was revealed in physical activity, 15.09 (4.62). Notably, perceived severity (adjusted **β** = 1.60; 95% CI: 0.68, 2.53; $p < 0.001$) and perceived social support (adjusted $\beta = 0.63$; 95% CI: 0.37, 0.90; $p < 0.001$) were positively related to HPB. In addition, educational level (adjusted **β** = -10.36; 95% CI: 16.06, 4.67; $p < 0.001$) and perceived benefits (adjusted **β** = -1.43; 95% CI: -2.37, -0.48; $p < 0.001$) were negatively related with HPB.

***Conclusion**:* The Malay version of HBCVD is a valid and reliable tool for measuring health beliefs among single mothers in Kelantan. Overall, the scores for HPB were moderate. Recognising the influential factors identified in the study could contribute to higher engagement in HPB and subsequently help reduce morbidity and mortality related to CVD.

Keywords: Cardiovascular disease, health beliefs, health-promoting behaviour, validation, single mothers

CHAPTER 1

INTRODUCTION

1.1 Overview of cardiovascular disease

Cardiovascular disease (CVD) encompasses a range of heart and blood vessel conditions, including coronary heart disease (CHD), cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism (WHO, 2021). CVD are chronic diseases that progressively evolve during life and stays asymptomatic for a long period (Francula-Zaninovic & Nola, 2018). As a result, CVDs have turned into silent killers since many people do not recognise their symptoms until they impede the heart and arteries (Frąk *et al.*, 2022). CVD can arise from a variety of causes. Some of them are invariable (age, gender, genetic background), while others are variable, meaning they can be affected (smoking, physical inactivity, bad eating habits, raised blood pressure, type 2 diabetes, dyslipidemia, obesity) (Francula-Zaninovic & Nola, 2018).

Coronary artery disease (CAD), atherosclerosis, and arterial hypertension (AH) are the leading causes of CVD (Francula-Zaninovic & Nola, 2018). CAD is a common heart disorder characterized by constriction or blockage of major blood channels known as coronary arteries. CAD is generally caused by plaque formation within the vessel wall's intima, which is characterized as a fatty material forming inside the intima in conjunction with severe inflammation, particularly if the inflammation is continuous. As a result, it becomes difficult to give adequate blood, oxygen, and nutrients to the cardiomyocytes. As a result, atherosclerotic plaque may dissolve or rupture, causing thrombosis and subsequently a vascular closure, leading to myocardial infarction, stroke, limb ischemia, and death (Frąk *et al.*, 2022). AH is among the most prevalent CVDs. AH is a significant risk factor for peripheral vascular

disease, myocardial infarction, stroke, and renal failure even though it rarely or never exhibits symptoms. The most important guidelines state that AH is diagnosed when a patient's diastolic blood pressure (DBP) is ≥90 mm Hg after a repeat examination, and/or their systolic blood pressure (SBP) in the office or clinic is ≥140 mm Hg (Frąk *et al.*, 2022).

It is particularly important to target those factors contributing to the development of atherosclerosis, as it serves as a common pathway in the pathophysiology of CVD Atherosclerosis comprises intimal thickening due to the accumulation of lipid-laden macrophages and aggregation and proliferation of smooth muscle cells that lead to atheroma plaque formation. This pathogenic process occurs in the arteries and aorta, which subsequently causes disease due to a decrease in or absence of blood from the stenosis of the blood vessels. Endothelial dysfunction has been stated as an important cause of the processes leading to coronary artery disease (CAD) and atherosclerosis. Subsequently, inflammatory and oxidising factors release enzymes that modify lipoproteins. These modified lipoproteins will lead to the formation of atherosclerotic plaques. Other factors contributing to the pathogenesis of atherosclerosis are epigenetic factors. This mechanism results in DNA methylation and demethylation, as the key processes in regulating the expression of inflammatory cytokines and chemokines in atherosclerosis (Frąk *et al*., 2022). The atheroma plaque formation is shown in Figure 1.1.

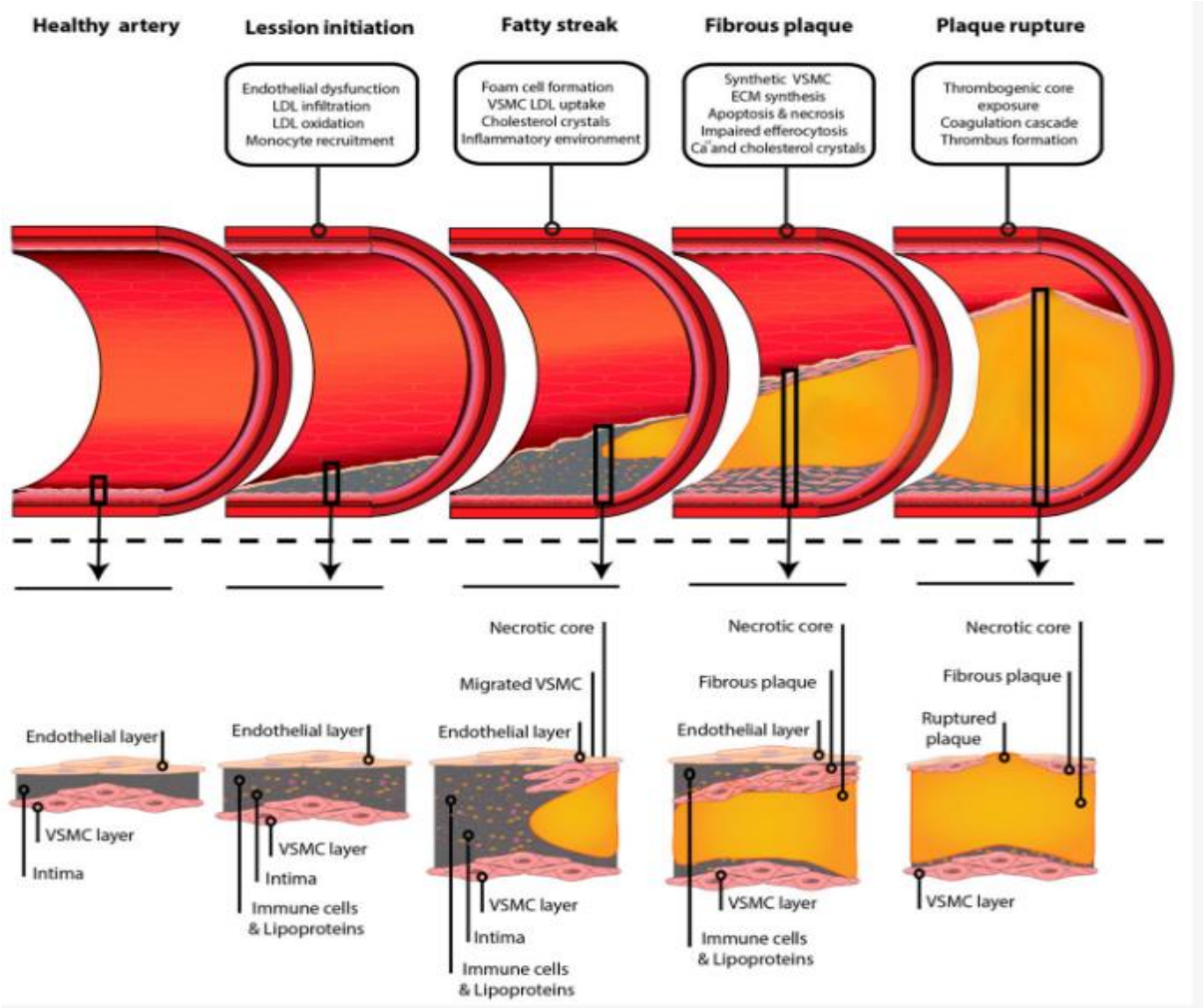


Figure 1.11 Schematic representation of atheroma plaque formation from a healthy artery to plaque rupture (Source: Jebari-Benslaiman *et al.*, 2022)

1.2 CVD burden in women

CVD is the leading cause of death among women globally, which contributed to 35% of total mortality in 2019. In 2019, there were an estimated 275·2 million cases of CVD in women worldwide. Even though dramatic declines in the mortality of heart disease for men and women have been observed for the past three decades, a recent finding reported a stagnation in the trends of incidence and mortality from CHD, especially among younger women (< 55 years) (Garcia *et al.*, 2016). Over the past 30 years, the age-standardized mortality of CVD in women has decreased internationally,

with most of this fall occurring in nations with a high Socio-demographic Index. The global age-standardized prevalence of CVD in women was estimated at 6403 cases per 100000. North Africa and the Middle East, high-income North America, Eastern Europe, and Central Asia had the highest age-standardized prevalence of CVD (Vogel *et al.*, 2021).

In Malaysia, CVD has remained the leading cause of death among women for the past two decades. A study conducted among patients with acute coronary syndrome (ACS) between 2006 and 2010, comprising 13,591 individuals, revealed that nearly a quarter (24%) of the patients were women. These women exhibited more risk factors, were less likely to undergo interventions, and had higher mortality rates compared to men (Lu *et al.*, 2014). According to the latest data from The Department of Statistics, ischemic heart disease (IHD) was the primary cause of female mortality in 2021 (DOSM, 2021). It is approximately 2.5 times more prevalent as a cause of death among Malaysian women compared to all cancers combined. Age-standardized rates of CVD and all cancers combined among women have shown a decline since 2000. However, the prevalence of cardiovascular-related diseases such as diabetes mellitus (DM) (17.5%), hypertension (30.3%), and hypercholesterolemia (47.7%) has increased significantly, according to the National Health and Morbidity Survey (NHMS) 2015 (Ministry of Health Malaysia, 2015).

Currently, the alarming trend is the rise of CVD incidence among young women. Despite the decrease in overall mortality rate among young women, the lowest rate of decline in CVD mortality was observed in individuals younger than 50 years of age. In certain cases, there has been an increase in CVD-related hospital admissions as well as mortality in younger women. The possible cause for this condition was partly due to delay in diagnosis and less aggressive management of CVD treatment in women

(Srivaratharajah & Abramson, 2019). Sex-related differences in clinical presentation and comorbidities can predispose to the different approaches and gaps in using guideline-recommended care. Therefore, sex-specific strategies are urgently needed to account for these factors to provide optimal care for women (Vogel *et al.*, 2021). Hypertension, DM, obesity, a sedentary lifestyle, and smoking are the possible causes that contribute to IHD in young women. Thus, it is important to raise awareness and concern regarding this issue to increase the high index of suspicious CVD occurrence in young women, start appropriate treatment, and aggressively address and treat the associated risk factors (Levit, Harmony R & Hochman, 2011).

1.3 Risk factors for CVD in women

There are a lot of risk factors contributing to CVD in women, which can be divided into well-established risk factors, sex-specific risk factors and under-recognized risk factors. Improving women's cardiovascular health and lowering premature mortality still depend heavily on early detection and management of cardiovascular risk factors.

1.3.1 Well-established risk factors

The well-established risk factors, also known as traditional atherosclerotic CVD risk factors, encompass hypertension, DM, dyslipidemia, obesity, unhealthy diet, sedentary lifestyle, and smoking or tobacco use. Among women aged over 60, the prevalence of hypertension is higher compared to men, increasing their susceptibility to acute myocardial infarction (MI). Women with DM face a three-fold higher risk of fatal CAD than non-diabetic women and are less likely to undergo revascularisation during MI compared to diabetic men (Garcia *et al.*, 2016). During the menopausal transition (MT), women experience elevated total cholesterol and low-density

lipoprotein (LDL) cholesterol levels, contributing significantly to the population-attributable risk for MI. The prevalence of obesity and sedentary lifestyles is higher in women compared to men. Obesity raises the risk of CAD by 64% in women and 46% in men. In regions where women's participation in physical activities is limited due to social or religious norms, sedentary lifestyles among women are more prevalent. The risk of MI associated with tobacco smoking or the use of electronic cigarettes is similar for both women and men (Vogel *et al.*, 2021).

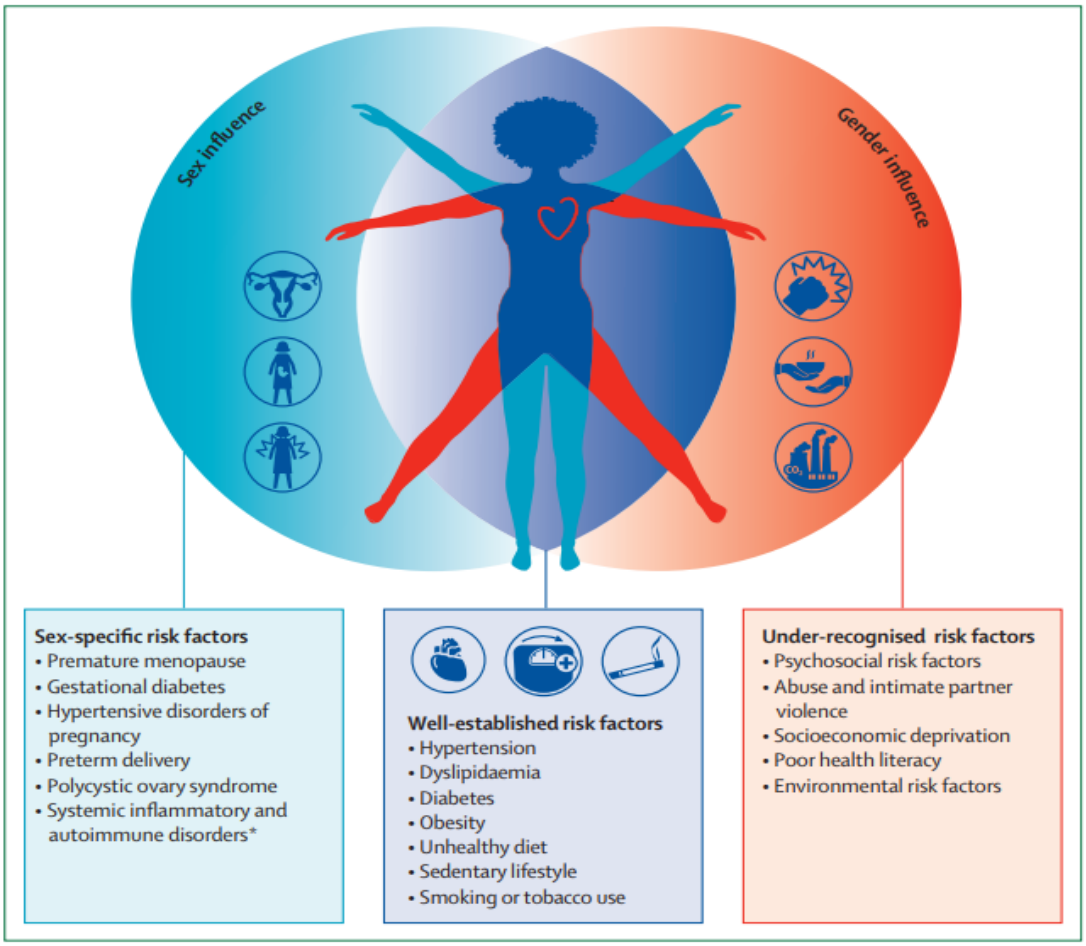
1.3.2 Sex-specific risk factors

Sex-specific risk factors referred to the non-traditional atherosclerotic CVD risk factor. It can be further divided into pregnancy-related conditions (preterm delivery, hypertensive pregnancy disorders, gestational diabetes mellitus), autoimmune diseases (rheumatoid arthritis and systemic lupus erythematosus), premature menopause and polycystic ovary syndrome. Pregnancy complications and maternal placental syndromes (preeclampsia, placental infarction, and abruption) are indicated as early signs of endothelial dysfunction, which predisposed to the elevated risk for cardiovascular events in the short and long term. Women with any manifestation of this syndrome had a 19% higher risk for CVD as compared to women with normal pregnancy, and the risk increased by up to 40% for those who manifest more than one manifestation of the syndrome. Premature ovarian dysfunction, reproductive therapies, and possibly infertility can also be used to identify young women who may be at increased risk of future cardiovascular events (Srivaratharajah & Abramson, 2019).

1.3.3 Under-recognized risk factors

Under-recognized risk factors are also important determinants for CVD that receive less concern and focus from individuals as well as health professionals.

Psychosocial risk factors, abuse and intimate partner violence, socio-economic deprivation, poor health literacy, and environmental risk factors are the under-recognized risk factors that appear to contribute to CVD in women. Those risk factors disproportionately affect women as compared to men. Depression and anxiety are associated with increased risk for CVD morbidity and mortality. In addition, psychosocial disadvantages (e.g., unemployment, chronic stress, insufficient social support, and bereavement or widowhood) are more common in women than in men, which contributes to increased depression and anxiety. The direct effect (chronic stress) and indirect effect (mental health problems or modification of health behaviour) of abuse increase CVD risk in women. Furthermore, health literacy is required for women to participate in self-care for CVD, including treatment adherence and behavioural changes to lower risk. Other than that, socio-economic deprivation (low income, low levels of education, living in disadvantaged areas) exposed women to chronic stress and depression and influenced unhealthy behaviour (smoking, unhealthy diet and low physical activity), thus increasing CVD risk (Vogel *et al.*, 2021). Figure 1.3 illustrates the overall risk factors for CVD in women.



*Systemic inflammatory and autoimmune disorders are not sex-specific risk factors, but women are disproportionally affected by these conditions

Figure 1.22 Risk factors for CVD in women (Source: Vogel *et al.*, 2021)

1.4 Marital status and CVD outcome

Marital status is a crucial social factor linked to human health and longevity, with married adults generally exhibiting better health outcomes than their unmarried counterparts (Kim, Lee & Park, 2018). This advantage in health among married individuals can be attributed to several factors. Firstly, healthier individuals may be more likely to enter and maintain marriages, while less healthy individuals may be prone to remaining unmarried, separated, or divorced. Secondly, marriage provides benefits such as increased economic resources, social support, and healthier lifestyle

behaviours, known as the "marriage protection effect". Thirdly, marital dissolution, such as divorce or widowhood, is a significant stressor that can impact health negatively by affecting immunological, hormonal, and neural control systems, rendering divorced or widowed individuals more vulnerable to poor health outcomes (Kim, Lee & Park, 2018).

In addition, marital status has been identified as a significant factor influencing the risk of CVD and CVD-related mortality. Research indicates that individuals who are unmarried, including those who are divorced, widowed, or have never married, experience a higher rate of cardiovascular complications compared to their married counterparts. Furthermore, the quality of marriage and marital satisfaction significantly affect cardiovascular risk. Psychosocial and socioeconomic factors, along with other acute stressors, may influence the correlation between marital status and CVD outcomes, yet the precise mechanisms remain incompletely elucidated (Dhindsa *et al*., 2020).

A single episode of divorce during one's lifetime was notably linked with acute MI among women but not among men. Conversely, a history of two or more divorces demonstrated a significant association with incident acute MI in both genders, even after adjusting for variations such as in age and ethnicity (Dupre *et al.,* 2015). A population-based study revealed a surge in MI rates shortly after divorce among women. Over time, the risk diminished partially among men but persisted among women (Kriegbaum *et al.*, 2013). Women who were unmarried or not cohabiting with a partner exhibited a comparable risk of developing CVD but faced a significantly elevated risk of CVD mortality compared to their married or cohabiting counterparts (relative risk 1.39) (Floud *et al.,* 2014). The association between marital status and increased CVD risk is depicted in Figure 1.4. By taking into account the marital status

of patients, healthcare providers can more precisely identify individuals at elevated risk of CVD than traditional risk factors might suggest. This will also offer avenues for intervention, including offering enhanced support for medication adherence, providing counselling for mental health, or facilitating participation in support groups to assist in managing stress.

Based on the 2010 Population and Housing Census of Malaysia, three specific criteria are used to define the term single mothers (Kementerian Pembangunan Wanita, 2015). The description of each criterion is as follows:

1. Women who are widowed, divorced, or separated from husbands and are the main providers of their households; and having children who are not married yet and living in the same households
2. Women who are the main providers for the family and the husband are not capable of working because of sickness, having children who are not married yet, and living in the same households
3. Single women who are the main providers and obtain custody of someone's children or have a child out of wedlock

Our study primarily examined the first category of single mothers, as only a small number of those in categories two and three were registered with Kelantan's Women Development Departments (Women Development Department, 2023). The majority of registered single mothers under WDD received government financial aid for single mothers. Aside from that, single mothers who were not qualified for financial aid but wanted to participate in the scheduled programs or activities organised by WDD were also registered. This situation might limit the number of our study respondents from single mothers of higher income groups.

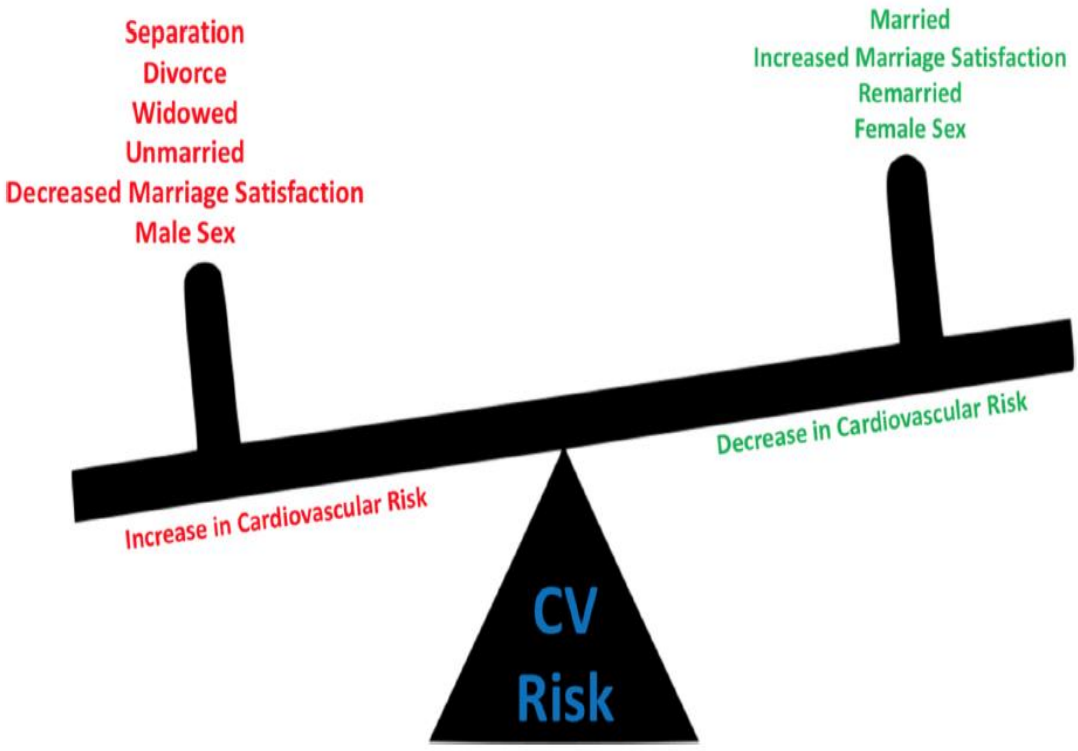


Figure 1.33 The association between marital status and heightened risk of CVD is indicated by red (Source: Dhindsa *et al*., 2020)

1.5 Women perceptions of CVD

CVD affects both men and women equally; however, greater concern about CVD is placed more on men. Even though men develop CVD at an earlier age as compared to women, the incidence of CVD in women rapidly increases in trend and matches male counterparts after the menopausal period (MOH, 2016). The perception of CVD is one of the important health problems among women globally, including in South-East Asia. Many women still have a low awareness of CVD risk factors and a low perception of developing and incorporating the disease. This, in turn, will subsequently reduce the probability of women's participation and engagement in healthy lifestyle behaviour (Rajadurai *et al.*, 2012).

In Malaysia, 68% of women believed that cancer is the main contributor to women's death in the country, based on findings from a survey done among 5000

Malaysian women. This study reported that most women were aware of CVD risk factors. Still, unfortunately, only 57% perceived that moderate weight loss helps reduce the risk of developing CVD (Rajadurai *et al.*, 2012). A similar finding was observed in the study assessing young women's knowledge and beliefs on CVD overseas, where the respondents were unrealistically optimistic about having a low risk for developing CVD in the future and believed CVD is not a threat to their personal health (Brown, 2011).

In a survey carried out three years apart among Singaporean women, there was only a small difference in the percentage of women's awareness of CHD (from 8% to 10%). Around half (53%) of women were not aware of the increased risk of getting heart disease after menopause, and 61% did not know that women often presented with atypical symptoms of acute MI than men. However, fortunately, the respondents have a positive attitude and a good perception of a healthy lifestyle. A majority (90%) of them acknowledged that exercise is good for CVD prevention, followed by stress reduction and cholesterol-lowering (Rajadurai *et al.*, 2012).

1.6 Problem statement

Five key domains significantly shape population health: inherent genetic traits, social determinants, environmental factors, behavioural habits, and access to high-quality healthcare (Franklin, Myers & Kokkinos, 2020). Worldwide, every nation is dealing with the increasing prevalence of non-communicable diseases (NCD), including CVD, as well as an increasing number of CVD-related mortality. Malaysia also deals with the same issues of the rising prevalence of NCD cardiovascular risk factors that afflict both gender groups (MOH, 2016). Despite this horrifying evidence, the good news is that more than 90% of the contributing risk factors are modifiable

risk factors. Hence, it is crucial to equally prioritise both genders in implementing preventive measures aimed at reducing CVD risk factors and alleviating the burden of CVD. The key to mitigating risk factors is positively modifying unhealthy behaviours by adopting and promoting healthier lifestyle choices (Kaminsky *et al.,* 2022).

CVD stands as the primary cause of mortality among women globally, including in Southeast Asia and Malaysia (Rajadurai *et al.*, 2012). Regrettably, single mothers face a 3.3 times higher risk of CVD compared to mothers in relationships, with low-quality marriages associated with adverse physical and mental health outcomes among women. Psychosocial factors such as depression and loneliness were found to be associated with CHD, which put single mothers at higher risk for CVD (Young, Cunningham & Buist, 2005; Thurston & Kubzansky, 2009).

Single mothers were identified as a vulnerable population that was susceptible to poor physical health, including debilitating chronic illnesses, poor mental and social health, and few social contexts that provided supporting social environments (Zakaria, Lazim & Hoesni, 2019). Research has shown that single mothers tend to engage in riskier health behaviours such as smoking. The percentage of regular smokers within the group of single mothers (46%) is twice as high as that among mothers who were in marital relationships (24%). Other than that, single mothers also pay little attention and concern for healthy dietary habits and are less active in physical activities than married mothers (Klärner, Gamper & Moor, 2022).

Moreover, belief in the preventability of illness emerged as a significant independent predictor of incident CHD in women. Nonetheless, approximately 43.4% of females exhibited a high risk of CVD but held a low perception of susceptibility (Rom Korin *et al.*, 2013; Alshaikh *et al.*, 2022). Lower risk perception of CVD and

misconception of CVD as a ‘man’s disease’ not only revolved around the general public or a majority of women but also involved healthcare professionals as well (MOH, 2016). Comprehending health beliefs is vital, as the propensity to engage in healthful behaviour is influenced by the accurate perception of susceptibility to CHD risk-reducing behaviour and the belief in the effectiveness of such behaviours (Gholizadeh *et al.*, 2009). One of the components of HPB is physical activity. However, women scored the lowest value in physical activity; 17.33 (3.89), which led to overweight and obesity (mean BMI = 28.53) (Shaahmadi *et al.*, 2019).

CVD would continue to jeopardise women’s health if left unattended or less concerned by the individual, especially those who live under psychosocial disadvantages, such as single mothers. Single mother tends to face a lack of social support (Muarifah, Widyastuti & Fajarwati, 2019), whereas a study found that social support helps predict HPB in women (Hurdle, 2001).

1.7 Rationale of the study

There is still limited study in Malaysia on the health beliefs on CVD and its association with the HPB, and limited tools or instruments are available to assess the beliefs on CVD among women (Mohd Azahar *et al.*, 2017). Although CVD among women predominantly manifests at a later age compared to men, there is growing evidence that CVD incidence is also increasing among young women, with a high risk of mortality. Realising the impact of health beliefs or perceptions to promote engagement in a healthy lifestyle, it is important to address this issue and have a valid tool for assessing the issues. Therefore, this study will provide a valid and reliable instrumental tool to assess health beliefs on CVD among single mothers and those who are at high risk.

Furthermore, the current study also investigated the relationship between perceived social support and HPB, where most studies found that single mothers are facing issues with a lack of social support. Understanding the possible determinants affecting HPB among single mothers lays the important groundwork for providing the necessary support and facilities to help them overcome the barriers.

This study will provide findings and evidence-based evidence that will allow for a better understanding and give more information on the beliefs that should be improved to prevent CVD risk. The study results will enable healthcare professionals to enhance the likelihood of individuals adopting healthier lifestyles by comprehending and influencing their perceptions and beliefs regarding CVD risk. Additionally, it can guide stakeholders in future planning efforts to provide sufficient information and promote public health initiatives focused on CVD in women.

1.8 Research questions

1. Is the Malay version of HBCVD scales a valid and reliable tool to assess the beliefs on CVD among single mothers in Kelantan?
2. What are the mean scores of HPB on CVD among single mothers in Kelantan?
3. Are there any relationships between sociodemographic characteristics, comorbidities, health beliefs and perceived social support with total HPB score on CVD among single mothers in Kelantan?

1.9 Objective

1.9.1 General objective

To study relationships between health beliefs related to cardiovascular disease (HBCVD) and other factors with HPB on CVD among single mothers in Kelantan.

1.9.2 Specific objectives

Phase 1

1. To translate and validate the HBCVD scale into the Malay language

Phase 2

1. To determine the mean scores of HPB on CVD among single mothers in Kelantan
2. To determine the relationships between sociodemographic characteristics, comorbidities, health beliefs related to CVD and perceived social support with total HPB score on CVD among single mothers in Kelantan

1.10 Research hypotheses

1. The Malay Version of the HBCVD scale is a valid and reliable questionnaire to measure the health beliefs related to CVD among single mothers in Kelantan
2. There are significant relationships between sociodemographic characteristics, comorbidities, health beliefs related to CVD, and perceived social support with total HPB score among single mothers in Kelantan.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview of single mothers

Worldwide, single parenting is a common occurrence. Notably, the United States has the greatest proportion of single-parent households in the world, accounting for over 25% of all families with children under the age of 18 (US Census Bureau, 2021). Meanwhile, in the United Kingdom, there are three million single-parent families (ONS UK, 2021), comprising 15% of the total family count. Most single-parent households are led by mothers, although there has been a rise in the number of single-father households over time (ONS UK, 2021). Similarly, in Malaysia, the number of single mothers is increasing trend. According to Malaysia's latest population and housing census, the total number of single mothers (widowed, divorced, or permanently separated) is 940,735 individuals. In addition, the general divorce rate for males and females is 6.5 and 7.0 per 1000 married males and females aged 18 and over, respectively. The majority of divorces occurred at the age of 30-34 years old (23.4%), followed by age 25-29 years old (19.4%) (DOSM, 2018).

Single parenting is attributed to either the death of a spouse or divorce. In the early days, the most common reason for single parenting was a partner's death. However, in Malaysia, despite spousal death being one of the leading causes, many are also related to spousal abandonment or divorce, as is common in Western countries (Abdul Talib *et al.*, 2020). Accidental pregnancies and single parenting by choice are key contributors to the increase in the number of single parents. The Ministry of Women, Family, and Community Development (Kementerian Pembangunan Wanita, 2015) defines single mothers as women who are unmarried, separated or divorced,

widowed, or whose husbands are unable to work and have unmarried children living with them.

According to the most recent data from Malaysia's Department of Statistics, the number of Muslim divorces reported in 2022 was 46,138, an increase of 45.8% from 31,650 in 2021. The crude divorce rate (CDR) increased from 1.5 (2021) to 2.2 (2022) per thousand Muslim population. Meanwhile, non-Muslim divorces rose 36.4%, from 12,286 in 2021 to 16,752 in 2022. As a result, the CDR for non-Muslims increased from 1.1 (2021) to 1.3 (2022) per thousand non-Muslim people. CDR refers to the number of divorces per 1,000 population of Muslims or non-Muslims. In 2022, Kelantan had the highest general divorce rate (GDR) for both males and females, with 13.7 divorces per thousand married males aged 18 and over and 12.2 divorces per thousand married females aged 16 and up. Meanwhile, Sabah reported the lowest GDR for both sexes (DOSM, 2023b). GDR refers to the number of males or females divorces per 1,000 population of married males or females aged 16 or 18 years and over.

Single mothers face stressful psychological, physical and emotional needs alone while concurrently attending to their children's needs (Rafiah, Hamid & Salleh, 2013). Studies and analyses tailored to the needs of single mothers and women are necessary. Their increasing population in Malaysia indicates that a growing proportion of families are headed by women alone. Within the academic setting, a debate on single-motherhood in Malaysia is not a popular topic, therefore discourses on the subject are scarce, and there is little significant survey research available. The majority of relevant studies focus on population research topics (Rafiah, Hamid & Salleh, 2013). The lived reality of single mothers is crucial to investigate in light of potential discrimination caused by deep sociocultural institutions around them. These structures

may shape policies and practices related to the provision of official support for citizens. If the condition of women in this group is not investigated, they may be excluded from the enjoyment of rights and advantages of development (Rafiah, Hamid & Salleh, 2013).

2.2 Single mothers' health challenges

Single mothers confront numerous challenges that demand considerable dedication. The increasing prevalence of households led by single women cannot be viewed merely as individual matters, as these mothers are responsible for nurturing and socialising the future generations of a nation (Jusoh & Latada, 2020). A local study investigating the single parenting experience found various issues related to single mothers in Malaysia, such as psychological concerns, conflicts between work and family responsibilities, financial constraints, and the parenting process (Hamid & Salleh, 2013). Another study conducted during the COVID-19 pandemic identified emotional and psychological well-being, financial strain, and additional roles as challenges that single mothers face (Jusoh & Latada, 2020). Furthermore, they encounter difficulties caring for, educating, disciplining their children, and establishing and maintaining social support networks (Mulia, 2020). Single mothers dealt with shame & inferiority complex, anxiety, anger, as well as guilt and frustration. The changes in the marital status, whether it is due to divorce, separation, death, or loss of a partner, have led to dual responsibility or double roles as a provider and caregiver simultaneously. Later, it will affect the household and work demands and time management (Hamid & Salleh, 2013).

Single parents, especially single mothers, are a socially and economically vulnerable group susceptible to various physical and mental health challenges. A study

conducted in South Korea comparing the quality of life between single mothers and married mothers revealed that single mothers experienced elevated levels of stress, depressive symptoms, and alcohol-related problems in comparison to their married counterparts (Kim & Kim, 2020). These findings indicate that single mothers generally experience poorer mental health and a lower quality of life than married mothers (Kim & Kim, 2020). Another study investigating the influence of stress and social support on the association between single-parent status and depression discovered that single mothers exhibited a higher likelihood of experiencing depressive episodes within a 12-month period and reported elevated levels of chronic stress. Moreover, they reported reduced levels of perceived social support, social engagement, and frequency of interaction with friends and family compared to married mothers (Cairney *et al.*, 2003). Recent research also indicates that single mothers experience less happiness and more feelings of sadness, stress, and fatigue in parenting compared to partnered mothers, particularly among those who are unemployed (Meier *et al.*, 2016). A study examining cumulative stress among single mothers in Germany highlighted various factors contributing to their stress levels. These included low maternal parenting self-efficacy beliefs, the presence of at least one child with a disability, diminished levels of perceived social support, embarking on a new partnership, and the age of the youngest child (Sartor, Lange & Tröster, 2023a).

Psychiatric disorders, particularly depression, have shown higher prevalence rates among single mothers in comparison to married mothers. A comparative study assessing the influence of economic challenges on depression in single mothers, as opposed to married women, found that, according to the Centre for Epidemiologic Studies-Depression Scale (CES-D), the prevalence of depression among single mothers was 33%, while it stood at 8% among married women. This indicates a

markedly elevated prevalence of depression among single mothers ($p < 0.001$) (Kim, Choi & Kim, 2018). In a population-based study involving single mothers with young children, findings revealed that around 30% of single mothers ($n = 517$) reported symptoms of depression or anxiety, while 37% reported experiencing general stress—double the prevalence observed in partnered mothers ($n = 6408$; $p < 0.0001$). Adjusted regression models confirmed that single mothers were approximately twice as likely to report symptoms of depression or anxiety (OR 1.9, CI95% 1.4–2.5) (Liang, Berger & Brand, 2019). Additionally, a cross-sectional study conducted in Singapore revealed that single mothers from diverse ethnic backgrounds were at an increased risk for mood disorders. The study suggested that the responsibilities associated with sole parenting and the potential scarcity of resources, both social and economic, likely contributed to the association between single motherhood and mood disorders (Subramaniam *et al.*, 2014).

In addition to psychological issues, single mothers also face a heightened risk of chronic illnesses such as CVD, DM, and hypertension. This condition was related to unhealthy lifestyle behaviour. A recent study examining the impact of lone parent households on cardiovascular health, assessed through the Life's Simple 7 (LS7) cardiovascular health metric, found that in women, the mean LS7 scores were lower in single mothers 8.2(2.2) compared to partnered mothers 9.0(2.2) ($p < 0.05$) (Stokes *et al.*, 2021). The LS7 analysed smoking, BMI, physical activity, nutrition, total cholesterol, glycohemoglobin, and blood pressure. There were significant differences between coupled and single parents in terms of smoking, physical activity, glycohemoglobin levels, and blood pressure. 15.0% of paired parents were active smokers, comparable to 26.6% of single parents, whereas 82.8% of partnered and 69.3% of single parents had never smoked. Interestingly, 69.4% of coupled parents

and 58.4% of single parents had optimum physical activity ratings, whereas 16.9% and 25.0% had inadequate physical activity scores (Stokes *et al.*, 2021). A different study examining the risk of CVD in single mothers discovered that these women had higher rates of hypercholesterolemia, hypertension, and elevated C-reactive protein. Compared to paired mothers, they also had higher rates of current smoking, being overweight or obese, and being physically sedentary. A CVD event (MI, CHF, or stroke) was 3.3 times more likely to occur in lone or single mothers (Young, Cunningham & Buist, 2005).

A local study evaluating the incidence and determinants of CVD risk factors among inhabitants of urban community projects in Malaysia indicated that diabetes and obesity were most prevalent among divorced people, with rates of 13.4% and 67.2%, respectively. Additionally, hypertension was most common among the widowed and divorced (Amiri *et al.*, 2014). A similar pattern was identified in a study assessing self-reported modifiable CVD risk factors among older persons. The prevalence of hypertension was considerably greater among those who were single, separated, divorced, or widowed (Chan *et al.*, 2021). Another study focusing on nutritional status and health profiles among single mothers reported an overall prevalence of hypertension and diabetes of 28% and 18%, respectively (Sakinah *et al.*, 2017). Furthermore, a study on the prediction of CVD risk found that the mean 10-year CVD risk was high among widows/widowers (Su *et al.*, 2015).

2.3 CVD and HPB among single mothers

Among men and women worldwide, CVD is the leading cause of death. The common belief that women are naturally immune to IHD unfortunately leads to an underestimating of their risk of heart disease (Khaw *et al.*, 2023). One thing that is still

not completely understood is that, although women are protected against cardiac events during their reproductive years, this protection wanes after menopause, making women who have untreated risk factors more vulnerable to MI, heart failure, and sudden cardiac death. Moreover, IHD's clinical manifestations in women may differ from those generally observed in men, which furthers the illness's underrecognition (Khaw *et al.*, 2023).

According to Centers for Disease Control and Prevention (CDC) data on women and heart disease, heart disease is the leading cause of mortality for women in the United States. In the year 2021, it accounted for the demise of 310,661 women, equating to approximately 1 in every 5 female deaths (CDC, 2024). In Malaysia, cardiovascular and circulatory disorders emerged as the leading causes of premature death among both genders, primarily attributed to IHD and cerebrovascular diseases (stroke). Ischemic heart disease ranks as the top cause of years of life lost (YLL) for both sexes, accounting for 17.7% of the total (Khaw *et al.*, 2023).

In comparison to men, women have higher rates of conventional or traditional risk factors such as obesity, diabetes, and hypertension. There are additional sex-specific risk factors for CVD that are either specific to women or have a higher prevalence than the traditional risk factors. These factors contribute to CVD risk through mechanisms involving inflammation, autonomic dysregulation, and disruption of the hypothalamic-pituitary-adrenal (HPA) hormonal axis. As a result, there is an increase in the occurrence of MI, heart failure, stroke, and CVD-related mortality due to the development of a pro-atherogenic and pro-thrombotic environment (Mehta *et al.*, 2022).

There are two types of CVD risk factors: modifiable (controllable) and non-modifiable (uncontrollable). Risk variables that could not be changed were those that

could not be avoided or controlled. For instance, growing older, gender, ethnicity, menopause, genetic predisposition, and heredity. Conditions that can be changed or avoided by changing one's lifestyle were considered modifiable risk factors (Buttar, Li & Ravi, 2005). Among these are conditions like diabetes, high blood pressure (hypertension), high cholesterol, obesity, overweight, poor diet, inactivity, and smoking.

A large cohort of 29,972 patients from 52 countries across Asia, Europe, the Middle East, Africa, Australia, North America, and South America participated in a landmark case-control study by Yusuf *et al.* (2004) to examine the relationship between putative risk factors and acute MI. Two-thirds (66%) of the global risk of heart attack is caused by an abnormal blood lipid ratio (apolipoprotein B to apolipoprotein A1) and cigarette smoking, according to the results of the INTERHEART case-control research. These two risk factors are the most important ones for MI.

Seven other risk factors were also found to be associated with MI: diabetes, hypertension, abdominal obesity (waist-to-hip ratio), psychosocial variables (stress and depression), inadequate daily intake of fruits and vegetables, inactivity, and alcohol use. According to the authors' findings, these nine variables together predict 90% of men's and 94% of women's global heart attack risks. They stressed that evaluating these nine characteristics may predict most heart attacks regardless of age, sex, geography, or ethnic background. To stop the premature death and disability linked to MI, Yusuf *et al.* (2004) proposed that comparable health promotion techniques be used globally. The idea that CVD can be averted by lifestyle modifications is strongly supported by the INTERHEART trial.