
PUBLIC HEALTH RESEARCH

Underestimation of Cardiovascular Risk among Peri and Post-Menopausal Women

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ABSTRACT

Received	26 August 2020
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Introduction	Perimenopausal and postmenopausal women are at high risk to develop cardiovascular diseases, yet most of women in this group have inaccurate perception regarding their risk of getting the cardiovascular diseases. The aim of this study is to determine accuracy of self-perception on cardiovascular risk and its associated factor among perimenopausal and postmenopausal women attending primary care clinic.
Methods	This study is a cross sectional study involving 292 peri and post- menopausal women who attended outpatient clinic in Universiti Sains Malaysia Hospital from May to August 2015. A Bahasa Malaysia version of Perception of Risk of Heart Disease Scale was used to assess participants' perception on their cardiovascular risk. The risk perception was assessed based on sociodemographic factor, clinical characteristics and actual cardiovascular risk based on the Framingham Risk Score 2008.
Results	A total of 265 patients responded. Mean age of the participants were 57.4 ± 7.87 . Five percent perceived themselves in moderate cardiovascular risk group, 81.9% inaccurately perceived their cardiovascular risk and 48.7% underestimate their risk. Diabetes mellitus (AOR 447.535, 95% CI 116.35,1721.40, $p < 0.001$), age (AOR 1.122 , 95% CI 1.05, 1.20, $p = 0.001$) and systolic blood pressure (AOR 1.043, 95% CI 1.01, 1.07, $p < 0.004$) were associated with underestimation of cardiovascular risk. (AOR 0.96, 95% CI 0.94, 0.99, $p = 0.002$).
Conclusions	A significant proportion of participants inaccurately perceived their cardiovascular risk and almost half underestimated their risk. More health education need to be done among this group of patients.
Keywords	Cardiovascular - Risk - Perception - Perimenopausal - Postmenopausal.

INTRODUCTION

Cardiovascular diseases (CVD) are still the major cause of morbidity and mortality worldwide as well as in the Asia Pacific region.¹ The World health organization estimates that the NCD deaths are projected to increase by 15% globally between 2010 and 2020. The greatest increases will be in South-East Asia, Africa, and the Eastern Mediterranean, where they will increase by over 20%.²

The post-menopausal state had been identified by many studies as one of the risk factors for cardiovascular disease. Multiple studies have suggested that the menopausal period and its related hormonal changes itself were the main factors that influence this cardiovascular risk changes.^{3,4,5} Women who were in the transitional period towards the menopause or the peri-menopausal state had started to show increase cardiovascular risk in an almost similar trend as seen in post-menopausal women.⁶

These women must be aware of their risk so that they are proactive in taking steps to reduce their risk of having cardiovascular disease. Although the psychological determinacy for personal behavioral changes to reduce the related risk is poorly understood, personal self-perception is postulated to significantly give impact toward persons' behavioral changes.⁷ Therefore, understanding the nature of risk perception would be an important element to modify the subsequent behavioral changes.

The objective of this study is to determine the accuracy of self-perception on cardiovascular risk in comparison with actual cardiovascular risk among peri-menopausal and post-menopausal women.

METHODS

This study used a cross-sectional survey method. Ethical approval was obtained from Universiti Sains Malaysia (USM JEPeM/140392). The study was carried out in a primary care clinic in Hospital Universiti Sains Malaysia from May 2015 till August 2015.

Based on the single proportion formula a sample of 292 participants was calculated. Patients were included in the study if they were women aged 48 years old and above had not been diagnosed with a stroke, transient ischemic attack or any other cardiovascular disease, had no cognitive problems or mental disease and were willing to participate in the study. All participants provided their written informed consent.

The Perception of Risk of Heart Disease Scale (PRHDS) was used to assess an individual's perception of the likelihood to develop heart disease.⁸ PRHDS is among a few self-reported questionnaires to measure the perception of cardiovascular risk using multiple items in this case 20 items.

Response options were rated on a four-Likert scale ranging from strongly agree to strongly disagree. The original author described that the total score of this questionnaire was proposed to categorize the person into a continuum from low to high perception of cardiovascular risk which was grouped into unknown risk, risk and dread risk. The "unknown risk" was further explained as reflecting hazards judged to be unobservable, unknown, new and delayed in their manifestation of harm whereas the "dread risk" is defined as reflecting perceived lack of control, dread, catastrophic potential, and fatal consequences. For the "risk" term, it was defined as reflecting a hazard that has few, moderate, known outcomes and consequences.⁹ Based on this, "unknown risk", "dread risk" and "risk" were then equally categorized into perceived low risk, perceived moderate risk and perceived high risk respectively.⁸

The three subscales of dread risk, risk, and unknown risk had internal consistency values ranging from 0.68 to 0.80. The total scale alpha was 0.80. Evidence of the instrument's stability over time was supported by subscale test-retest reliabilities ranging from 0.61 to 0.76. Construct validity was documented with a positive correlation between PRHDS and the Health Promotion Lifestyle Profile II ($r = 0.20$ to 0.39).

The Perception of Risk of Heart Disease Scale (PRHDS) questionnaire was originally in English. A Malay version was produced for this study after undergoing forward and backward translation. It was then validated by the researcher for internal consistency reliability and exploratory factor analysis. The Malay version of the scale however only uses 16 out of 20 items. 4 items from the original questionnaire were dropped due to low communality and factor loading. This decision was made after a discussion with two experts in the area. The item analyses were satisfied for this 16-item with the Cronbach's alpha ranged from 0.714 to 0.720.

The final total scoring for this study ranged from 16 to 64. The range score for each component of the perceived cardiovascular perception was then adjusted based on the original questionnaires. The range score for unknown risk (perceived low cardiovascular risk) group was 16-31, 32-47 for risk (perceived moderate cardiovascular risk) group and 48 to 64 for dread risk (perceived high cardiovascular risk) group.

Sociodemographic attributes, including age, sex, marital status, education level, menopausal status, and monthly income were collected. Medical characteristics, including diagnosis of premature menopause, hypertension, hyperlipidemia and diabetes mellitus; smoking status and treatment for hypertension were also collected.

Participants were examined for weight, height, waist circumference and blood pressure measurement. The blood pressure measurement was carried using standard digital blood pressure machine Omron which was calibrated on schedule. The height and weight of the participants were measured by using a calibrated "Seca" scale, with participants wearing clothing without shoes. (BMI was calculated as weight in kg divided by the square of height in meter (kg/m^2), which was done later via SPSS version 22). The waist circumference was measured using stretch resistant-measuring tape over bare stomach at the midpoint between the lower margin of last palpable rib and superior border of iliac crest. Measurement was performed while the participants stand with feet together and arm at the side and were done at the end of normal expiration. The measurement was repeated twice and then recorded in the participants' case report form.

The biochemical profile, including fasting blood sugar and fasting lipid profile results were those from within the last six months and were extracted from participants' online medical records. If no recent blood investigation was available, the participants were given a follow up at 2 weeks for blood taking. They were asked to fast overnight and fasting lipid profile and fasting blood sugar were taken the next day.

The actual cardiovascular risk was calculated using the Framingham risk score (FRS) version 2008 which take into consideration participants' age, systolic blood pressure in treated or untreated individual, smoking status, total cholesterol, and HDL-cholesterol level and diagnosis of diabetes.

Descriptive statistics, the mean, standard deviation (SD), and percentage, were used to describe the participants' sociodemographics and study variables. Simple and multiple logistic regression statistics were used to determine associated factors for the inaccurate perception of cardiovascular risk. All statistical analyses were performed using SPSS Statistics (SPSS Inc., Chicago, US) version 20.

RESULTS

A total of 292 women were recruited, however only 265 fully responded and hence, the response rate was 90.8%. Those 27 participants who were dropped from the study did not have complete data in their case report form. The mean age of the participants involved in this study was 57.4 ± 7.20 . Overall, 73.2% of the participants were already in the post-menopausal state. The majority of the participants were Malay 96.6% with more than three quarters were married (79.6%). Nearly half of the participants (46.4%) have an educational level up to secondary school whereas 3.8% of the participants never attend school at all. 59.2% of the participants were having a household income of more than RM 5000 per month (Table 1).

Overall, more than half of the participants had at least one cardiovascular-related diseases such as diabetes mellitus (45.3%), hypertension (69.4%), and dyslipidemia (72.8%). Only one participant was a smoker. There were two participants (0.8%) with premature menopause. Mean BMI for participants in this study was $28.3 \pm 4.52 \text{ kg}/\text{m}^2$ whereas mean waist circumference was $87.2 \pm 11.51 \text{ cm}$. Mean for fasting lipid profile were $3.5 \pm 1.15 \text{ mmol}/\text{L}$ for LDL, $1.4 \pm 0.32 \text{ mmol}/\text{L}$ for HDL and $1.5 \pm 1.10 \text{ mmol}/\text{L}$ for TG (Table 1).

Table 1 The socio-demographic and clinical characteristics of 265 participants.

Characteristic	Mean (SD)	N (%)
Age (years)	57.4 (7.20)	
Marital status		
Single		4 (1.5%)
Married		211 (79.6%)
Widow/Divorce		50 (18.9%)
Educational level		
Not attending school		10 (3.8%)
Primary school		49 (18.5%)
Secondary school		123 (46.4%)
College and universities		83 (31.3%)
Occupation		
Public sector		120 (45.3%)
Private sector		14 (5.3%)
Self employed		15 (5.7%)
Housewife		116 (43.8%)
Monthly household income		
< RM 3000		66 (24.9%)
RM 3000- RM 5000		42 (15.9%)
> RM 5000		157 (59.2%)

Menopausal status		
Yes		194 (73.2%)
No		71 (26.8%)
Premature menopause		2 (0.8)
Diabetes mellitus		120 (45.3)
Hypertension		184 (69.4)
Dyslipidaemia		193 (72.8)
Smoking		1 (0.4)
BMI (kg/m ²)	28.3 (4.52)	
Waist circumference (cm)	87.2 (11.51)	
LDL (mmol/L)	3.5 (1.15)	
HDL (mmol/L)	1.4 (0.32)	
TG (mmol/L)	1.5 (1.10)	

Nearly half of the participants 49.1% were in a high actual cardiovascular risk group, followed by 34.3% in low risk and moderate actual cardiovascular risk group 16.6%. However, 87.5% perceived themselves at moderate cardiovascular risk, followed by 8.3% at low risk and 4.2% at high risk. Only 18.1% of the participants accurately perceived their cardiovascular risk and the rest

81.9% have inaccurately perceived their cardiovascular risk. The inaccurately perceived cardiovascular risk can be divided into two subgroups which were those who underestimate their risk which was 48.7% and those who overestimate their risk which consisted of 33.2% of all participants (Table 2).

Table 2 Comparison between self-perception and actual cardiovascular risk

Self-perception	Actual cardiovascular risk N (%)			
	Low risk	Moderate risk	High risk	Total
Low risk	5 (1.9)	4 (1.5)	13 (4.9)	22 (8.3)
Moderate risk	82 (30.9)	38 (14.3)	112 (42.3)	232 (87.5)
High risk	4 (1.5)	2 (0.8)	5 (1.9)	11 (4.2)
Total	91 (34.3)	44 (16.6)	130 (49.1)	265 (100)
Self-perception of cardiovascular risk	N (%)			
Accurate	48 (18.1)			
Inaccurate	217 (81.9)			
Underestimation	129 (48.7)			
Overestimation	88 (33.2)			

Table 3 and 4 showed the result of factors associated with underestimation of cardiovascular risk using simple and multiple logistic regression. Multiple logistic regression showed a significant association between underestimation of cardiovascular risks with diabetes mellitus, elderly age, and higher systolic blood pressure. Diabetic participants were found to have 447.53 times higher odds compared to non-diabetic to underestimate their cardiovascular risk after adjusting to age and systolic blood pressure. However, the confidence

interval for this factor is large which could be due to relatively smaller number of patients with diabetes compare to other medical condition. Those with 1 year increased in age were found to have 88% higher odds to underestimate their cardiovascular risk after other factors were adjusted. This study also found that participants with 1 mmol increase in systolic blood pressure had 96% greater odds to underestimate their cardiovascular risk after adjusting for other variables.

Table 3 Associated factors for underestimation of cardiovascular risk by simple logistic regression

Variable	Regression coefficient (b)	Crude Odds Ratio ^a (95% CI)	Wald statistic	p-value
Marital status				
Married	0			
Single	-0.86	0.423 (0.04, 4.13)	0.55	0.459
Widowed	1.09	2.961 (1.53, 5.75)	10.29	0.001
Monthly household income				
>RM 5000	0	1		
RM 3000 – RM 5000	-1.67	0.188 (0.09, 0.41)	17.62	< 0.001

< RM 3000	-1.27	0.281 (0.15, 0.52)	16.62	< 0.001
Post-menopausal	1.01	2.739 (1.54, 4.88)	11.71	0.001
Diabetes mellitus	5.69	294.462 (93.417, 928.179)	94.20	< 0.001
Hypertension	1.23	3.427 (1.95, 6.03)	18.28	< 0.001
Dyslipidaemia	2.04	7.697 (3.89, 15.25)	34.22	< 0.001
Family history of hypertension	- 0.42	0.658 (0.40, 1.20)	2.57	0.109
Age	0.101	1.106 (1.06, 1.15)	22.250	< 0.001
Systolic blood pressure	0.027	1.027 (1.01, 1.05)	10.02	0.002

Table 4 Associated factors for underestimation of cardiovascular risk by multiple logistic regression

Variable	Regression coefficient (b)	Adjusted Odds ^a Ratio (95% CI)	Wald statistic	p-value
Diabetes mellitus	6.10	447.535 (116.35,1721.40)	78.86	< 0.001
Age	0.115	1.122 (1.05, 1.20)	11.86	0.001
Systolic blood pressure	0.043	1.043 (1.01, 1.07)	8.309	0.004

^a Forward and backward LR Multiple Logistic Regression model was applied.

Multicollinearity and interaction term were checked and not found.

Hosmer-Lemeshow test, (p=0.035), classification table (overall correctly classified percentage = 93.6%) and area under the ROC curve (97.6%) were applied to check the model fitness.

DISCUSSION

This study found that nearly half of the participants (49.1%) have a high risk of cardiovascular risk with the lowest proportion having moderate cardiovascular risk (16.6%). The rest 34.3% were in the low cardiovascular risk group. This was similar to other studies done locally and internationally.¹⁰

However, when compared to a few more studies done among women, the findings were reversed.^{11,12} The reason behind these significant differences might be due to a younger age group of participants involved in the studies. Our study involved older women with a mean age of 57.4, while studies with the reversed findings involved women with a mean age between 40-50 years old. Other than that, these studies were done at the community level which may include healthy women with no underlying medical illness. The younger age criteria, as well as lesser associated medical illness, would contribute to a larger proportion of women in a lower actual cardiovascular risk group.¹³ The difference in the findings also supports the fact that age in itself is a non-modifiable, independent risk factor for cardiovascular disease.

There is an issue with the accuracy of the Framingham Risk Score in calculating the cardiovascular risk in the Asian population. A study which was published in 2015 among the Malaysian population has noted that FRS overestimated the cardiovascular risk in the Asian population especially women with high risk.¹⁰ However, the authors argued that the overestimation of the risk didn't take into consideration that the participants were already on treatment for their hypertension. The widespread use of medication and better blood pressure control could have led to a greater reduction in CV events and therefore, making it

appear that the tool had overestimated the risk. This is supported by an earlier study using population data set from the 2006 Malaysian National Health and Morbidity Survey (NHMS) which confirmed that the FRS and SCORE models, but not the WHO/ISH model can stratify cardiovascular risk in the Malaysian population. The study further concluded that FRS was better at calculating cardiovascular risk in women compared to the SCORE.¹⁴ In the absence of a better-validated tool to use, we feel that FRS 2008 is still appropriate to be used in this study to calculate the cardiovascular risk in our population.

The accuracy of cardiovascular risk perception in our participants was quite low. This study found that only 18.1% of the participants accurately perceived their cardiovascular risk and the rest 81.9% had inaccurately perceived their cardiovascular risk. Participants with an incorrect perception of cardiovascular risk can be further classified into an underestimation of risk which accounted for nearly half of the study sample (48.7%) whereas the rest 33.2% overestimated their risk. When compared to other studies, the percentage of the participants who inaccurately perceived their cardiovascular risk was higher in this study. Most of the studies assessing the cardiovascular risk perception among women had found that the percentage of incorrect perception regarding cardiovascular risk was around 51-60%.^{15,16}

Similar to studies have noted that those who inaccurately perceived their risk tended to underestimate their cardiovascular risk.^{15,16} In this study, 48.7% of the participants had underestimated their cardiovascular risk if compared to 33.2% who overestimated their cardiovascular risk. Other studies found the proportion of participants who

underestimated their risk range from 29% and up to 55% of the total participants. Meanwhile, those who overestimated their cardiovascular risk are lower with a range as low as 5% to 26% of the participants.^{16,17}

A local qualitative study showed that all categories of women (pre-menopause and post-menopause) perceived their risk to develop cardiovascular disease was low and assume that the disease is a "man's disease".¹⁸ When comparing the self-perception to actual cardiovascular risk, the perception that women are "protected" against heart disease was frequently encountered which led to the underestimation of the risk of heart disease among women. Women might not be aware that the cardioprotective effect of their gender is not long-lasting and diminished once they approached their menopausal state. This finally would leave the women with untreated risk factors which makes them highly susceptible to have cardiovascular disease.¹⁹ Furthermore, the clinical manifestation of ischaemic heart disease in women may be different from those commonly observed in men. This may account for the under-recognition of the disease.¹⁹

The high percentage of women who underestimate their cardiovascular risk is a very worrying finding. Perception of risk has an important impact on patient's risk-reducing behavior. Those who perceived that they are at low risk might not be as proactive in modifying their risk factors. Misconceptions seem to be common among primary care patients. Patients may adopt an active or passive role in cardiovascular disease prevention, depending on their ideas, perceptions, fears, and expectations. Knowing patients' fears and risk perceptions and bringing them into line with the actual risk seems a prerequisite for effective management. Involving the patients in decision making on the management of their risk factors may improve patients' satisfaction, well-being, and even lifestyle and health outcomes. Thus, it is important for effective cardiovascular risk management that the primary care physician has a clear view of patients' actual cardiovascular risk, their risk perceptions, and their preferences and expectations regarding risk management.

Factors that were associated with underestimation of cardiovascular risk are diabetes mellitus, older age, and higher systolic blood pressure. This study revealed that participants with diabetes had 447.53 times higher odds compared to non-diabetic to underestimate their cardiovascular risk after adjusted to age and systolic blood pressure.

The association between underestimation of cardiovascular risk with diabetes which had been found in this study had been identified in a few other earlier studies. Multiples cross-sectional and qualitative studies amongst diabetic patients had shown that most of the diabetic patients were

unaware and did not relate their illness with an increase cardiovascular risk.^{16,20}

Older age as mentioned previously was another factor with underestimation of risk. Those with 1 year increased in age were found to have 88% higher odds to underestimate their cardiovascular risk after adjusting for other factors. This finding was consistent with several other studies.^{21,22} It was found that those age more than 50 years old were 3.5 times odds to underestimate their cardiovascular risk, whereas those age more than 45 years old were associated with underestimation with an odds ratio of 12.44.^{15, 21} These findings could be explained by the reluctance of the women in this study to commit themselves to be in higher cardiovascular risk groups due to cultural taboo as mentioned earlier. Other than that, there was a possibility that the women demonstrated minimization effect as a denial or defence mechanism to comfort themselves.²³

Another factor found to be associated with underestimation of risk in this study was higher systolic blood pressure. When comparing this finding with other studies, the results were quite conflicting. Most of the study did not mention directly regarding the patients' perception concerning systolic blood pressure, but more on the high blood pressure effect in general.

A series of focus group discussions amongst a low-income community in South Africa had found that most of the participants did not perceive that high blood pressure as one of the cardiovascular risks.²⁴ The study postulated that the absence of external symptoms might be contributing to the underestimation in their judgment.

It was also found in another study that, even women with established coronary heart disease, failed to identify high blood pressure (hypertension) can lead to CHD. This was illustrated in a study which found that that only 5% of the participants with hypertension thought that high blood pressure (hypertension) was the cause of their coronary heart disease.²⁵ In this study, the reason for underestimation among those with higher blood pressure could be due to a similar reason given in other studies which were participants' lack of knowledge regarding the disease. On top of that, there might be unaware of the risk due to the asymptomatic nature of high blood pressure.

However, contradicting findings were found by a few other studies. Prendergast et al found in his study that more than half of the participants (56%) had identified hypertension as one of the cardiovascular risk factors.²⁶ Meanwhile, it was also noted in another study that participants with underlying cardiovascular risk and hypertension had 1.86 times odds to be able to recognize that hypertension was associated with increased cardiovascular risk.²⁴ In addition, a qualitative study

in New England also showed that most of the participants thought that high blood pressure is a more serious problem compared to high cholesterol. They were able to recognize the complication of high blood pressure and viewed that the high blood pressure has a direct effect on a cardiac event.²⁷ Other factors that have been to be associated with underestimation of cardiovascular risk in other studies were unemployment, higher serum cholesterol level, male gender and higher educational level.^{15,21} The different findings between this study and the other three studies could be due to different socio-demographic of the participants involved.

Our study has several limitations. Firstly, this study was conducted in a single-center, therefore, it is possible that the findings may not reflect other peri- and postmenopausal women in the rest of the country. Secondly, this was a cross-sectional study, therefore a causal relationship between the factors cannot be concluded. Thirdly, there might be inaccuracy in the participants' answers regarding the perception of risk whereby participants' self-perception of low risk was due to the local taboo where one shouldn't tempt fate and say that they have a high risk of any disease.

CONCLUSION

Nearly half of the participants were in the high cardiovascular risk group. However, the majority of them perceived themselves to be at moderate cardiovascular risk. History of diabetes mellitus, increasing age and those with higher systolic blood pressure are the factors associated with underestimation of cardiovascular risk. More effort needs to be done to educate these women regarding their cardiovascular risk so that they can perform effective behavior modifications to prevent cardiovascular disease.

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