Article

Public Perception of the Risk of Heart Disease and Their Willingness to Pay for Its Diagnosis in Malaysia

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Abstract: In Malaysia, heart disease is a major non-communicable disease and a leading cause of morbidity and mortality. Individuals need to understand the risk factors of heart disease, including health-related behaviors. This study was done to determine the perceived risks of heart disease and to estimate the willingness to pay (WTP) for its diagnosis. One-way analysis of variance was used to determine the significance of mean differences among the other demographic variables, followed by Tukey's post hoc test to determine the differences between groups. The Spearman Rho test was employed to determine the correlations between participants' perceived heart disease risk and their WTP for its diagnosis. The Perception of Risk of Heart Disease Scale (PRHDS) mean score of participants with a family history of heart diseases (25.32 ± 2.81; $n = 556$) was significantly higher than those who did not have such a family history (22.14 ± 3.42; $n = 761$; $p = 0.04$). The participants with a family history of heart disease showed a greater WTP for diagnostic tests compared with those without a family history. The participants who were ready to spend within the range of Ringgit Malaysia (RM) 1-RM1000 were willing to pay for diagnostic testing of heart diseases based on their family history and socioeconomic background. This study demonstrated a higher perception of the risk of heart disease in people with a family history of heart disease, who also demonstrated a greater WTP for diagnostic tests. Individuals ready to spend up to RM 1000 were willing to pay for diagnostic testing for heart diseases. The individuals with a family history of heart disease perceived a higher risk of heart disease and were willing to pay to improve life expectancy per year. Hence, the information on family history can be used as a tool for the holistic approach to educate individuals on their risk factors for heart disease and encourage them to do early screening for cardiovascular diseases.

Keywords: perceived risk; willingness to pay; diagnostic testing; heart diseases

1. Introduction

The substantial burden of heart disease and its complications are the major reasons for the rise in global healthcare costs [1]. In particular, cardiovascular diseases in the Asian population are rising and are a major public health challenge [2,3]. Cardiovascular complications have a negative impact on the quality of life of the patients and affect their physical and psychosocial well-being [3]. In Malaysia, heart disease is a major non-communicable disease leading to higher morbidity and mortality, devastating to individuals, societies, and economics [4]. With an aging population, the prevalence of heart disease in Malaysia is expected to increase [5]. Regulating potentially modifiable risk factors, including a sedentary lifestyle, obesity, and hypertension, along with the existing advanced screening methods to diagnose heart disease, will help to reduce the

prevalence of heart disease [6]. Management of modifiable risk factors and early diagnosis is extensive responsibility of people [6]. For the effective management and prevention of heart disease-related complications, individuals need to understand the risk factors of heart disease, including health-related behaviors which influence their cardiovascular health [7].

A growing body of evidence from recent research suggested a positive relationship between the perception of risk and health behaviors in patients with chronic illnesses [8,9]. The perception of risk is one of the core theoretical constructs of health behaviors, which could motivate the individual to undertake self-care activities [10]. Increasing risk perceptions of any disease are critical determinants of health behavior and will positively impact health outcomes [11].

Although chronic diseases such as heart disease are among the most common, and their management is costly of all health problems, it is one of the most preventable health issues. An early health screening for heart disease and its associated risk factors is an effective strategy to identify the risk of heart disease and reduce the chances of preventing further complications among high-risk individuals [12]. A more stringent screening for heart disease will be helpful in managing health behaviors and risk factors, such as diet quality, physical activity, smoking, body mass index, blood pressure, total cholesterol, or blood glucose. This is an important aspect of lowering the risk of cardiovascular disease in a population at risk.

Prevention encompasses health promotion activities that encourage healthy living and limit the initial onset of chronic diseases. Prevention of non-communicable diseases, especially heart disease, embraces early diagnosis of at-risk populations. The value of screening tests is an important element of cost-conscious care [13], and the results from such tests have an impact on healthcare decision-making and subsequent health outcomes [14]. Willingness to pay (WTP) is a standard economic measure for health interventions, which may provide information on how people value health benefits for health services such as health care screening [15]. The contingent valuation method is a widely used approach among stated-preference techniques for eliciting WTP if prices do not exist or do not reflect actual costs of medical services that are not supplied by a market mechanism [16,17]. A higher perceived risk of any disease has a positive association with an increased willingness to take screening tests or pay.

There is a growing challenge of heart disease cases in Malaysia, and therefore an understanding of the Malaysian population's risk perception of heart disease and their preferences for the prevention of heart disease through early screening is important. This information is vital to determine health behaviors and better prevent or manage heart disease in this region. Considering the direct health care cost and cultural and economic backgrounds of the Malaysian population, it is essential to assess their perception of heart disease and WTP for early screening.

The contingent valuation method to find our WTP for heart disease screening is a practical approach to describe peoples' preferences. It will be more useful in the context of resource allocation decisions by studying the potential purchasing behavior of a specific group of people. As there is a huge demand for public healthcare services in Malaysia, the outcome of this study will be useful for the public and private healthcare sectors to set appropriate user fees and develop co-payment schedules for the people. Moreover, there are no reports from Malaysia on how WTP for such screening influences the individual's participation in such a screening program. Hence, the present study aims to determine the perception of the risk of heart disease and the correlation between the perceived risk of heart disease (PRHDS) and the WTP for the diagnosis of heart disease among Malaysian adults.

2. Materials and Methods

2.1. Ethics Statement

The study was reviewed and approved by the International Medical University-Joint Committee on Research and Ethics (BP I-01-12 (47) 2015).

2.2. Study Design and Sample Size

A cross-sectional study was conducted in four Malaysian states, Perak, Pulau Pinang, Sarawak, and Johor, located respectively in the north, west, east, and south of Malaysia [18]. A required sample size of 1037 was identified using Raosoft software; power 80%, distribution of response 50%, with a 95% confidence interval and a 5% margin of error. As the sample size should be larger to get a higher confidence level, a total of 1532 people were approached to participate during the study period. The convenience sampling method was applied. All study participants selected for this study met the inclusion criteria and were ≥18 years of age.

Confidentiality and anonymity were maintained throughout this study. All participants read, understood, and signed a written consent form.

2.3. Study Instruments

A structured self-administered questionnaire was given with anonymity. The questionnaire consisted of 3 parts: Part 1: Socio-demographic details: age, gender, ethnicity, employment status, monthly income, and family history of heart disease. Part 2: A standardized Perception of the Risk of Heart Disease Scale (PRHDS), consisting of 20 items that had already undergone internal consistency, test-retest reliability, and construct validity, was used [19]. This questionnaire aimed to measure the individual's risk perception of developing heart disease. The participants used a 4-point Likert Scale (strongly disagree = 1, strongly agree = 4) for each statement. Reverse scoring of negative-response items was done. Higher scores on the PRHDS indicated a higher perception of the risk of developing heart disease [20]. Part 3: Contingent valuation was done to describe the value of healthcare service. This method is applied to estimate the value of the service, i.e., screening of heart disease. The study participants were asked to directly report their WTP to obtain the screening test for heart disease to determine the amount of money in Malaysian Ringgit that participants were willing to pay per year. The participants were also asked whether they were willing to pay for cardiovascular diseases (CVD) risk diagnostic tests by answering Yes/No. WTP for diagnosing risks of heart disease was classified into three categories.

- Category 1 (WTP1): WTP only for diagnostic testing of heart disease
- Category 2 (WTP2): WTP to check for the next ten years' risk of cardiovascular events
- Category 3 (WTP3): WTP to improve life expectancy per year

2.4. Validity and Reliability of the Study Tool

A pilot study was undertaken to identify challenges before employing the full survey. The sample size of the pilot study was 30 people who met the inclusion criteria. Convenience sampling was done. The Cronbach's alpha for PRHDS was 0.78. The data from the pilot study were not used in the final analysis.

2.5. Data Analysis

The Statistical Package for Social Sciences version 24 (SPSS V.24) (IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY, USA: IBM Corp), was used to perform quantitative analysis on the collected data. Analysis was performed through descriptive statistics, such as the frequencies for each of the demographic variables. An independent *t*-test was done to determine the significance of mean differences between genders, and a one-way analysis of variance was used to determine the significance of mean differences among the other demographic variables, followed by Tukey's post hoc test. The Spearman Rho test was employed to find out the correlations between the perceived heart disease risk of participants and their WTP for its diagnosis. All were determined as statistically significant when $p \leq 0.05$.

3. Results

Out of 1532 people that were approached, 1317 participated and completed the survey. The response rate was over 86 percent. Among the participants, 53.3% were male. Most

of them were in the age range of 40 to 50 years. Close to half of the participants were self-employed.

Table 1 shows the participants' scores on PRHDS. The data suggested that 40.3% of participants felt that they would get heart disease in the future, and 42.2% of the participants felt that they would get heart disease within the next ten years. About 55% of the participants agreed with the statement that "they are not doing anything that is unhealthy to their heart." This indicated that the participants think that their heart is healthy. About 52% of the participants felt their current lifestyle habits do not put them at risk of heart disease. Very few participants felt that they are at risk of getting heart disease. Among the participants, 67.3% disagreed with the statement that "those who get heart disease have no chance of being cured." About 38% of the participants were not worried/bothered that they might get heart disease.

Table 1. Descriptive frequencies.

Item Number	Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1	There is a possibility that I have heart disease.	29.8	28.8	25.8	14.5
2	There is a good chance that I will get heart disease during the next 10 years.	17.1	40.7	30.9	11.3
3	A person who gets heart disease has no chance of being cured.	20.4	46.9	24.0	8.7
4	I have a high chance of getting heart disease because of my past behaviors.	21.8	40.0	24.4	13.8
5	I feel sure that I will get heart disease in my life.	25.1	48.7	16.7	9.5
6	Healthy lifestyle habits are unattainable.	21.1	41.5	28.4	9.1
7	It is likely that I will get heart disease.	19.3	42.5	29.1	9.1
8	I am at risk for getting heart disease.	22.9	34.2	33.8	9.1
9	It is possible that I will get a heart disease.	14.3	34.3	36.6	13.4
10	I am not doing anything now that is unhealthy to my heart.	15.3	35.3	37.1	12.4
11	I am too young to have heart disease.	20.7	22.9	42.5	13.8
12	People like me do not get heart disease.	6.9	26.9	49.5	16.7
13	I am very healthy so my body can fight off heart disease.	6.9	30.2	48.0	14.9
14	I am not worried that I might get heart disease.	8.0	30.2	45.1	16.7
15	People of my age are too young to get heart disease.	13.8	25.5	40.7	20.0
16	People of my age do not get heart disease.	10.5	18.5	46.9	24.0
17	My current lifestyle habits do not put me at risk for heart disease.	11.6	41.8	33.5	13.1
18	No matter what I do, if I am going to get heart disease, I will get it.	18.5	37.1	31.6	12.7
19	People who don't get heart disease are just plain lucky.	26.9	38.2	24.4	10.5
20	The causes of heart disease are unknown.	25.1	40.3	21.5	13.1

Table 2 represents the differences in the PRHDS mean scores of participants by demographic profile. One-way analysis of variance and independent *t*-test did not reveal any significant differences in mean scores for PRHDS regarding age, gender, employment status, or monthly income. However, there was a significant difference in the mean score for PRHDS in participants' family history of heart disease ($p < 0.05$). The PRHDS mean score of participants who have a family history of heart disease (25.32 ± 2.81; $n = 556$) was significantly higher than the mean score of the rest of the participants (22.14 ± 3.42; $n = 76$), $p = 0.04$.

Table 2. One-way analysis of variance and *t*-test followed by Tukey's post hoc test.

	Mean Scores of Respondents $\pm$ SD (n = 1317)	*p*-Value
Age in years		
40–50	23.52 $\pm$ 5.23 (n = 942)	
51–60	24.25 $\pm$ 4.33 (n = 358)	0.58
61 and above	25.22 $\pm$ 4.38 (n = 17)	
Gender		
Male	25.25 $\pm$ 4.33 (n = 702)	
Female	22.52 $\pm$ 4.23 (n = 615)	0.36
Ethnicity		
Malay	24.12 $\pm$ 4.23 (n = 396)	
Chinese	23.78 $\pm$ 3.56 (n = 542)	0.29
Indian	24.97 $\pm$ 5.04 (n = 379)	
Employment status		
Self Employed	24.33 $\pm$ 4.88 (n = 638)	
Government	25.54 $\pm$ 3.47 (n = 156)	
Private	25.35 $\pm$ 5.63 (n = 502)	0.43
Retiree	24.28 $\pm$ 4.62 (n = 379)	
Monthly Income		
<RM1000	22.336 $\pm$ 3.82 (n = 211)	
RM1001–3000	23.58 $\pm$ 3.89 (n = 511)	
RM3001–5000	24.53 $\pm$ 3.38 (n = 540)	0.51
>RM5001	22.84 $\pm$ 3.23 (n = 55)	
Family history of CVD		
Yes	25.32 $\pm$ 2.81 (n = 556)	
No	22.14 $\pm$ 3.42 (n = 761)	0.04 *

* $p < 0.05$; RM = Ringgit Malaysia; CVD = cardiovascular disease.

Table 3 shows the differences in the number of participants' WTP by demographic profile. One-way analysis of variance test and independent *t*-test did not reveal significant differences among the number of participants willing to pay for diagnostic tests of heart disease risks across age, employment, gender, and monthly income. However, there was a significant difference in WTP among the participants with a family history of heart disease. ($p < 0.05$). The participants who had a family history of heart disease and were willing to pay for diagnostic tests of cardiovascular disease risks (n = 521) were significantly higher than those who did not have a family history of heart disease and were willing to pay (n = 148), $p = 0.02$.

Table 3. One-way analysis of variance and *T*-test followed by Tukey's post hoc test.

	Number of Participants	Number of Participants' WTP for CVD Risks Diagnostic Tests (Relative Frequency)	*p*-Value
Age in years			
40–50	942	456 (0.346)	0.62
51–60	358	298 (0.226)	
61 and above	17	–	
Gender			
Male	702	523 (0.397)	0.68
Female	615	482 (0.365)	
Ethnicity			
Malay	396	284 (0.215)	0.88
Chinese	542	308 (0.233)	
Indian	379	295 (0.223)	

Table 3. *Cont.*

	Number of Participants	**Number of Participants' WTP for CVD Risks Diagnostic Tests (Relative Frequency)**	***p*-Value**
Employment status			
Self Employed	638	459 (0.348)	0.06
Government	156	98 (0.074)	
Private	502	376 (0.285)	
Retiree	21	–	
Monthly Income			
<RM1000	211	104 (0.078)	0.07
RM1001–3000	511	273 (0.207)	
RM3001–5000	540	297 (0.225)	
>RM5001	55	–	
Family history of heart disease			
Yes	556	521 (0.395)	0.02 *
No	761	148 (0.112)	

* $p < 0.05$. WTP = willingness to pay.

Table 4 shows the differences among participants ($n = 521$) with a family history of heart disease and WTP for CVD diagnostic tests. The number of participants WTP only for diagnostic testing of heart diseases was low (17.4%), whereas the number of participants WTP to improve life expectancy and quality of life per year was high (49%).

Table 4. Percentage and frequency.

Participants with a Family History of Heart Disease and Willing to Pay for Diagnostic Tests	**Number of Participants WTP Only for Diagnostic Testing of Heart Diseases**	**Number of Participants WTP for Checking the Next 10 Year Risk of Cardiovascular Event**	**Number of Participants WTP to Improve Life Expectancy and Quality of Life per Year**
521 (100%)	91 (17.4%)	174 (33.9%)	256 (49%)

Table 5 shows the differences in WTP for diagnostic tests for heart disease by participants who were ready to spend up to Ringgit Malaysia (RM) 1000 ($n = 669$). Among the participants who were ready to spend up to RM 1000, the mean amount they are willing to pay for testing the heart disease alone is higher (RM 815.20/year), whereas the same group of respondents mentioned that they could spend only RM 245.75 to improve life expectancy and quality of life per year. However, the amount they are willing to pay is much higher (RM 725.80) if the participants have a history of heart disease.

Table 5. Amount in Rinnggit Malaysia.

	WTP Only for Diagnostic Testing of Heart Diseases	**WTP for Checking the Next 10-Year Risk of Cardiovascular Events**	**WTP to Improve Life Expectancy and Quality of Life per Year**
Mean amount willing to pay by participants who were ready to spend up to RM 1000	815.20	625.50	245.75
Mean amount willing to pay by participants with a family history of heart disease ready to spend up to RM 1000	470.10	580.35	725.80

The Spearman correlation test was used to measure the association between the perceived heart disease risk of participants and their WTP for its diagnosis (Table 6). The results showed that there was a significant correlation between the perceived heart disease

risk of participants and their WTP for its diagnosis (r = 0.638, *p* = 0.004). There was also a significant correlation between their family history of heart disease and their WTP for its diagnosis (r = 0.727, *p* = 0.001).

Table 6. Spearman correlation test.

Variables	Willingness to Pay (r Value)	*p* Value
Perceived heart disease risk	0.638 *	0.004
Family history of heart disease	0.727 *	0.001

* *p* < 0.01.

4. Discussion

This was the first study from Malaysia focused on risk perception of heart disease and WTP for the diagnosis of cardiovascular diseases. The highest response rate was a good sign of participants' willingness to be involved in such studies. People in the 40–50-year-old age group have been exposed to central obesity, hypertension, and dyslipidemia, which increase the risk of heart disease; thus, the mortality rate from heart disease is higher in this age group [20,21]. Most participants from this age group are an additional advantage of the data to generalize the results. The participants who responded to this survey could be a representative sample of those at high risk of heart disease in Malaysia.

This study assessed the perception of participants on heart disease using PRHDS and their WTP for diagnostic tests for heart disease using contingent valuation methods to recognize respondents' awareness and budget constraints, respectively. Cognitive, perceptual, and environmental factors can influence the risk perception of individuals, which will be directly linked to their health behaviors [22]. The instrument PRHDS is a tool designed to measure the risk of getting heart disease to enhance individuals' perception of the risk of heart disease [19]. Based on the responses, almost half of the study participants believed they would not develop heart disease during the next ten years; some appeared to believe that heart disease can be cured. The results indicated that the participants were not worried too much about their heart health and had a limited understanding of heart disease risk factors. Their tenderness to downplay the risk of heart disease is a factor of concern that was also reported in some previous reports [23–25]. Their perception of some of the lifestyles and their association with heart health is another notable response. A report by Chang et al. (2011) mentioned that several negative lifestyle behaviors, such as alcohol consumption and sedentary life, and chronic diseases, were significantly associated with poor self-rated health among Malaysian adults [23]. Therefore, there is a need for public health strategies to create awareness of healthy lifestyles and identify and reduce modifiable risk factors of heart disease. There is a need to devise a plan to encourage people to adopt a healthy lifestyle and strengthen primary care for early diagnosis. This will help to improve the management of CVD and reduce the direct healthcare cost associated with CVD.

The risk assessment is crucial to managing heart disease to predict the magnitude of CVD at the population level. This will be more helpful in informing policymakers and health authorities. The manifestation of heart disease in individuals is a result of complex interactions between genetic disposition, behavior, and environment. While we cannot control the non-modifiable risk factors such as gender, genetic disposition, and environmental factors, we can intervene to change the modifiable risk factors, such as behaviors and habits, which influence cardiovascular health. In addition, Yusuf et al. reported in the Prospective Urban and Rural Epidemiological (PURE) cohort study that approximately 70% of cardiovascular disease cases and deaths were attributed to modifiable risk factors and identified a few potentially modifiable risk factors of CVDs [26]. The results of this study showed that a family history of heart disease influenced perception scores. However, family history and perceived personal risk for heart disease are not sufficient to change health-related behaviors in high-risk populations [27]. Therefore, targeted public health interventions focusing on risk factors with the greatest impact in

a regional setting help educate the population to promote healthy behavior to combat the health consequences of CVDs. An effective education tool utilizing the information from family history can reduce the risk of heart disease [28,29], especially by regulating modifiable risk factors such as a sedentary lifestyle, obesity, altered lipid profile, and use of tobacco [30,31]. There is a need to design an education tool, considering people's regional aspects and lifestyles.

Cost-effective diagnostic tests such as blood pressure measurement, lipid profile, blood sugar monitoring, and electrocardiogram are useful for early diagnosis of CVDs. Though these diagnostic tests to determine the risk of heart disease are readily available [32,33], the cost of such tests is always a concern among the public [34,35]. The data from contingent valuation methods will help to evaluate the financial benefits of such tests [36]. From the results, the WTP payable by respondents on the three categories of WTP is different from each other. Contingent valuation method analysis showed that most participants were ready to pay up to RM 1000 per year for diagnostic tests for the risk of heart disease. This WTP does not necessarily mean that this amount can be instantly paid [37,38]. As the amount mentioned by the study participants for the diagnosis of heart diseases varied, there is a need for a possible risk-sharing mechanism such as social community health insurance [39]. If any expenditure is out-of-pocket costs, it may impact individuals' willingness to consider the service even when it is recommended by their physicians [40]. Normally, the diagnostic tests for heart disease vary between diagnostic centers. This significant detail on WTP from a sample of the Malaysian population is very important for the development of public health policies as it demonstrates the social value of the very effective intervention.

In this study, participants with a higher income and a family history of heart disease were more willing to pay for the diagnostic tests. These findings were similar to another study on WTP [41]. The high morbidity and mortality associated with heart disease have a significant economic burden on the national health care system. Therefore, these findings can be more valuable to the policymakers and stakeholders considering their plans to promote health screening for heart disease [37]. Education is one of the strongest socioeconomic predictors of CVD and its mortality. Hence, public awareness campaigns to increase awareness of CVDs will have a greater impact on the prevention of CVDs [42].

A strong correlation between the perceived heart disease risk of participants with their WTP for its diagnosis and their family history of heart disease suggested that people who were aware of risk factors and had a family history of heart disease were willing to pay for the diagnostic testing. These findings will be helpful in informing policymakers on setting priorities for current heart disease prevention programs, as well as on future public health campaigns.

Limitations

The perception and WTP may vary based on the other localities. As it was a convenient sample, non-random sampling bias could occur. At the same time, the sampling frame was large enough to overcome the sampling bias. However, caution should be taken while generalizing to the Malaysian population. The data for this study were collected without any specific diagnoses by the participants.

5. Conclusions

Most of our respondents believed they would not develop heart disease and perceived that heart disease could be cured. They have a limited understanding of the risk factors of heart disease. As metabolic risk factors were the predominant and behavioral risk factors contributed to high mortality, there is a need to focus on the health policies on the basis of risk factors with the greatest impact within Malaysia. The study populations' perception of heart disease risk and their WTP for the diagnosis of heart disease is correlated with their family history. The individuals with a family history of heart disease perceived a higher risk of heart disease for themselves and were willing to pay to improve life expectancy per year. From this study, the information on family history can be used as a tool for the holistic

approach to educate individuals on their risk factors of heart disease and encourage them to do early screening for heart disease and promote positive behavioral patterns to have an impact on non-modifiable risk factors of cardiovascular diseases.

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