Awareness and Risk Factors of Heart Attack Among the General Population in the Southern Region of Peninsular Malaysia: A Cross-sectional Study

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Abstract

Background: Heart attacks, or acute myocardial infarctions, continue to be a leading global health issue. In Malaysia, cardiovascular diseases have been the primary cause of death since the 1980s, with a significant increase in heart attack-related fatalities over recent years. Public awareness of heart attack risk factors is crucial for reducing mortality rates. However, there remains a critical gap in understanding the knowledge, attitude, and practices (KAP) regarding heart attack risks in certain regions of Malaysia. This study aimed to assess these factors and identify demographic characteristics associated with them in the Southern region of Peninsular Malaysia. Methods: A cross-sectional survey was conducted using a structured questionnaire to evaluate the KAP toward heart attack risk factors among 432 participants from the Southern region of Peninsular Malaysia. Convenience sampling was employed. Chi-squared tests were used to assess the relationship between sociodemographic factors and KAP. Multiple logistic regression was performed to determine predictors of KAP. Data were analysed using descriptive statistics, and p-values <0.05 were considered significant. Results: The findings revealed that 81.7% of respondents had inadequate knowledge of heart attack risk factors. While 66% exhibited a positive attitude toward heart attack prevention, 83.6% had poor preventive practices. Significant predictors of KAP included education level and ethnicity, with higher education associated with better knowledge, attitude, and practices. Gender was a significant predictor of attitude, with women showing lower awareness of their risk. Conclusion: This study highlights a significant gap in heart attack-related knowledge and preventive practices within the Southern region of Malaysia. Education and tailored public health interventions are necessary to improve awareness and promote effective prevention strategies. Addressing these gaps is vital to reducing the burden of cardiovascular diseases in Malaysia and achieving better public health outcomes.

Keywords: Heart attack awareness, Cardiovascular disease, Risk factors, Public health, Malaysia.

Significance | This research provides valuable insights into the sociodemographic factors influencing knowledge, attitudes, and practices, offering a basis for targeted public health interventions aimed at reducing the burden of heart attacks in the region.

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Introduction

Heart attack, characterised by insufficient blood flow to a part of the heart muscle, remains a significant global health concern. It is defined operationally as acute myocardial infarction, marked by

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clinical symptoms, elevated cardiac biomarkers, and diagnostic evidence. Public awareness of heart attack risk factors is crucial for disease prevention and timely treatment. The Malaysian Ministry of Health reports heart attacks as the primary cause of death since the 1980s, contributing to 31% of the 17.7 million annual cardiovascular disease-related deaths globally. Previous studies by Jamaludin et al. (2019) and Firus Khan et al. (2022) highlight the persistent burden, with cardiovascular diseases causing 23.10% of all deaths in 2014, rising to 43.8% in 2018.

Malaysia faces a substantial heart attack burden, with 13.2% of all deaths attributed to cardiovascular diseases in 2016. The situation worsened in 2018, as 43.8% of deaths are caused by cardiovascular diseases, including heart attacks. Notably, coronary artery disease resulted in 15% of deaths in 2019, surpassing cancer-related deaths 2.5 times. These statistics underscore the urgent need for understanding and addressing heart attack risks within the Malaysian context (Firus Khan et al., 2022). The World Health Organization (WHO) data from 2020 revealed coronary heart disease, encompassing heart attacks, accounted for 21.86% of total deaths globally, positioning Malaysia 61st with an age-adjusted death rate of 136.21 per 100,000 people.

Despite the prevalence of heart attacks, there's a critical gap in understanding the knowledge, attitude, and practices related to heart attack risks in specific localities. Previous research by Ahmed et al. (2019) underscores the urgency, indicating that 50% of heart attack-related deaths occur within one hour of symptom onset before hospital admission. The latest clinical data emphasise age, gender, family history, lifestyle factors, and comorbidities as crucial risk factors. Complications, such as arrhythmias and cardiogenic shock, further highlight the gravity of heart attacks.

Given this backdrop, our study aims to assess the awareness of heart attack risk factors and identify factors associated with awareness in the general population of the Southern region of Peninsular Malaysia, contributing valuable insights for targeted intervention programs in Malaysia. This study aimed to assess the knowledge, attitudes, and practices towards the risk factors of heart attack and determine their associated factors among the general population in the Southern region of Peninsular Malaysia.

2. Materials and Methods

Study design and participants

A quantitative-based cross-sectional study was conducted among the adult population living in the Southern region of Peninsular Malaysia using convenience sampling. The sample size is calculated using the Single Proportion Formula with a 95% confidence level and 5% margin of error, resulting in an estimated total of 418 participants. Chi-squared was used to determine the relationship between independent and dependent variables.

Study tools

This study utilised a validated and structured questionnaire comprised of four sections: Part A assessed the sociodemographic features of the respondents; Part B focused on the respondents' knowledge regarding heart attack and its associated factors; Part C delved into the respondents' attitudes regarding heart attack and its associated factors; and Part D questioned the respondents' practices regarding heart attack and its associated factors.

Demographic and the socio-demographics profile contained 7 items which included age, gender, marital status, ethnicity, level of education, employment status, and family income. The knowledge of heart attack and its associated factors was adapted from Ahmed et al. (2019). The questionnaire assessed the risk factors, signs and symptoms of heart attacks and actions taken towards the signs and symptoms. A relevant scale was used to measure the knowledge score. Each correct answer was given 1 point and incorrect or 'don't know ' responses were scored as 0. The Total Score was the percentage of the sum of obtained scores. According to Elsheikh et al. (2023), statements with scores below 70% were considered indicative of low knowledge, while scores of 70% or higher indicated adequate knowledge.

The community's attitude regarding heart attack and its associated factors was adapted from Mohammad et al. (2018). The questionnaire assessed the public's attitude on three parts; Attitude on smoking; Attitude on Exercise and General Health; and Attitude on Diet. Scores given for questions on attitude depended on positive and negative statements. If the statement was positive, three marks were given for "Agree," two for "Neutral," and one for "Disagree" and vice versa for the negative statements. The Total Score was the percentage of the obtained score. According to Salahshoori et al. (2015), statements with scores below 70% were considered indicative of poor attitude, while scores of 70% or higher indicated good attitude.

The practice of preventive measures against heart attack in the community was adapted from Mohammad et al. (2018). The questionnaire assessed the public's practice in three parts; Work involving vigorous activities for more than 10 minutes; Walking for more than 10 minutes to places; and Eating Healthy. The scores for questions on practice were given as two for "Yes" and one for "No," if the activities were positive, and vice versa for the negative activities. According to Salahshoori et al. (2015), statements with scores below 70% were considered indicative of poor practice, while scores of 70% or higher indicated good practice.

Data analysis

Data analysis was performed using Jamovi data analysis software. Descriptive statistics (frequency and percentage) were used to describe the sociodemographic factors (age, gender, marital status, ethnicity, level of education, employment status, and family income), knowledge, attitude and practice towards heart attacks. Chi-squared test was applied to assess the association between

sociodemographic factors with knowledge, attitude, and practice towards heart attacks. Multiple logistic regression analysis was used to assess the association between two or more independent variables (sociodemographic characteristics) with the outcome (knowledge, attitude, and practice, respectively). The level of significance was set at $p < 0.05$ for all analyses. All results were presented with 95% confidence intervals where applicable.

Ethical considerations

The study's objectives and necessary details were explained to the participants, and informed consent was obtained before data collection. All participants were assured that their confidentiality would be maintained, and the information gathered would only be used for research purposes. Ethical approval was obtained from the University of Cyberjaya Research Ethics Review Committee (CREC) with the reference number - UOC/CREC/ER/609.

3. Results

3.1 Demographic Characteristics

A total of 432 respondents participated in the survey. The respondents' demographic characteristics are reported in Table 1. Socio-demographically, the majority of participants were male by (58.1%), age range 26-35 years old by (22.7%), tertiary level of education by (47.4%), employed status by (63%), Malay ethnicity by (75.7%), family income of below RM 5250 (B40) by (74.8%) and a married marital status by (69%).

3.2 Knowledge, Attitude and Practice towards Heart Attack

Table 2 presents the findings on the respondents' knowledge regarding heart attacks. Most of the respondents (93.3%) exhibited good knowledge regarding prior awareness of heart attacks. For risk factors, most of the participants identified smoking (80.8%) as one of the most prevalent risk factors associated with heart attacks, but less than two-thirds of the participants identified obesity, unhealthy diet, high blood pressure, and stress as major risk factors associated with heart attacks. Furthermore, only half of the respondents indicated that high cholesterol and heart diseases were the most influential diseases linked to heart attacks, with 58% and 47% agreeing, respectively. Similarly, for recognising the signs and symptoms, only about half of the respondents identified shortness of breath, pain or discomfort in the jaw and neck, and the back as the most associated symptoms with heart attacks, with agreement rates of 68% and 57%, respectively. Regarding appropriate actions to be taken when encountering a heart attack episode, a significant majority (98%) of the respondents acknowledged the necessity of taking action. Furthermore, 58.8% of the respondents believed that it is crucial to promptly transport the victim to the nearest hospital or clinic.

Table 3 provides a summary of respondents' attitudes towards smoking, exercise, and diet in relation to heart attack prevention. The findings indicate that the majority of respondents expressed concern about the impact of smoking on heart attacks (92.8%) and believed in personal responsibility for managing heart health risks related to smoking (93.3%). Many respondents had attempted to quit smoking in the past (51.2%) or were considering quitting in the near future (35.3%). In terms of exercise and general health, most respondents agreed that regular exercise habits can decrease the risk of heart attacks (91.9%). However, a significant portion reported lower levels of physical activity and a tendency to exercise more during work/school holidays (55.6%). While a majority expressed a preference for walking over transportation for short distances (57.2%), not all respondents were focused on maintaining a healthy BMI. Nevertheless, observing family members exercise was seen as a motivating factor for many (63.0%). Regarding diet, the respondents generally recognised the importance of reading nutritional facts (75.5%) and believed that increased intake of oily food (90.7%), fast food (85.9%), and carbonated drinks (80.8%) contributes to a higher risk of heart attacks. However, a notable number reported consuming high amounts of these items daily. Nevertheless, the majority expressed intentions to limit the intake of unhealthy food and increase the consumption of fruits and vegetables (90.4%).

Table 4 provides information on respondents' practices for heart attack prevention. In terms of vigorous activities, a minority of respondents reported not engaging in gardening every evening (72.2%), hiking every weekend (26.9%), and having work that involves carrying heavy equipment (41.4%). Regarding walking habits, approximately half of the respondents reported walking to buy groceries from shops in their residential area (49.5%) and intentionally parking their car further away to increase walking (39.8%). Furthermore, a significant proportion expressed a preference for taking stairs over using the lift (41.9%), and a majority had installed apps to track their steps and motivate them to walk more (58.1%). Regarding healthy eating, a large majority of respondents reported including vegetables in every meal (83.8%) and consuming less oil and fatty food (62.0%). In addition, more than half of the respondents reported not consuming fast foods (51.2%) and processed meat (61.8%). However, a lower percentage reported consuming fish high in omega-3 fatty acids (72.5%).

Based on the findings of this study in Figure 1, the overall knowledge level of respondents in both locations was predominantly below 70% (81.7%), with only a minority demonstrating a knowledge level above 70% (18.3%). In terms of attitude, a majority of respondents (66.0%) exhibited a positive attitude towards heart attacks, scoring 70% or higher, while a smaller proportion (34.0%) displayed a negative attitude, scoring below 70%. The overall practice of the respondents showed that a higher percentage (83.6%) had a poor practice score of 70% or higher, while a lower percentage (16.4%) had a good practice score below 70%.

Table 1. Sociodemographic Profile (n = 432).

Sociodemographic Factors	*n* (%)
Age group	
18-25	86 (19.9)
26-35	98 (22.7)
36-45	74 (17.1)
46-55	58 (13.4)
56-65	59 (13.7)
>65	57 (13.2)
Gender	
Male	251 (58.1)
Female	181 (41.9)
Education Level	
No formal education	10 (2.3)
Primary Education	27 (6.3)
Secondary Education	190 (44.0)
Tertiary Education	205 (47.4)
Employment Status	
Employed	272 (63.0)
Not Employed	160 (37.0)
Ethnicity	
Malay	327 (75.7)
Chinese	86 (19.9)
Indian	13 (3.0)
Others	6 (1.4)
Family Income	
B40 (< RM5250)	323 (74.8)
M40 (≤ RM11819)	79 (18.3)
T20 (> RM11819)	30 (6.9)
Marital Status	
Single	123 (28.5)
Married	298 (69.0)
Divorced/ Widowed	11 (2.5)

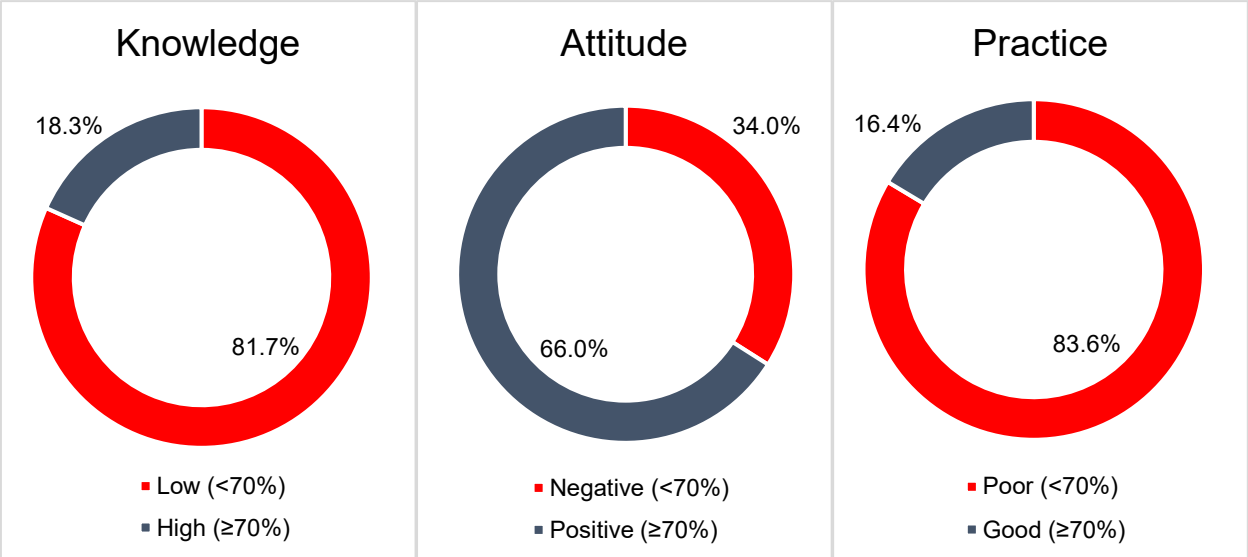

Figure 1. Knowledge, attitude, and practice towards heart attack (n = 432).

Table 2. Knowledge in heart attack (n = 432).

Items	Answers		n (%)
General knowledge in heart attack			
1. Have you ever heard about a heart attack?	Yes		405 (93.8)
	No		27 (6.2)
2. Do you know anyone who had a heart attack before?	Yes		291 (67.4)
	No		141 (32.6)
3. Have you ever received any information related to a heart attack?	Yes	TV	311 (72.0)
		Internet	280 (64.8)
		Books	121 (28.0)
		Social Media	269 (62.3)
		Promotional Leaflets	94 (21.8)
		Health care professionals	190 (44.0)
		Seminars	54 (12.5)
		Others	65 (15.0)
Risk factors of heart attack			
4. Do you think any of these factors are the major risk factor for heart attack?	Condition	Smoking	349 (80.8)
		Obesity	286 (66.2)
		Diabetes	190 (44.0)
		Exercise	111 (25.7)
		Unhealthy Diet	269 (62.3)
		Stress	239 (55.3)
		High Blood Pressure	244 (56.5)
		Alcohol	179 (41.4)
		Genetic	136 (31.5)
		Lack of Exercise	186 (43.1)
	Diseases	Atrial Fibrillation	49 (11.3)
		High Cholesterol	253 (58.6)
		Heart disease	203 (47.0)
		Diabetes Mellitus	106 (24.5)
		Cancer	49 (11.3)
		Asthma	55 (12.7)
		Allergies	45 (10.4)
Signs and symptoms of heart attack			
5. Do you think any of these signs and symptoms can be related to heart attack?	Sudden pain or discomfort in jaw, neck and back	Yes	250 (57.9)
		No	182 (42.1)
	Dizziness and weakness	Yes	236 (54.6)
		No	196 (45.4)
	Sudden disturbance of vision in one or both eyes	Yes	124 (28.7)
		No	308 (71.3)
	Shortness of breath	Yes	297 (68.8)
		No	135 (31.2)
	Sudden pain or discomfort in arms or shoulders	Yes	201 (46.5)
		No	231 (53.5)
Actions need to be taken when encounter an episode of heart attack			
6. Do you think heart attack requires a prompt treatment	Yes		425 (98.4)
	No		7 (1.5)
7. What would you do if someone is showing the signs and symptoms of heart attack?	Take them to a hospital/clinic		254 (58.8)
	Call an ambulance		236 (44.6)
	Call police		7 (1.6)
	Contact family		54 (12.5)
	Others		14 (3.2)

Table 3. Attitude towards heart attack (n = 432).

Items	Answers	*n* (%)
Attitude towards smoking		
1. I am concerned about the impact of smoking on developing heart attack.	Agree	401 (92.8)
	Neutral	13 (3.0)
	Disagree	18 (4.2)
2. I think that personal responsibility plays a part in managing heart health risks in relation to smoking.	Agree	403 (93.3)
	Neutral	21 (4.9)
	Disagree	8 (1.8)
3. I am currently on the use on tobacco products and: a. I have attempted to quit smoking in the past	Agree	*(n=187)* 97 (51.2)
	Neutral	47 (25.1)
	Disagree	43 (23.7)
b. I am likely to consider quitting smoking in the next 1 to 6 months	Agree	66 (35.3)
	Neutral	71 (38.0)
	Disagree	50 (26.7)
c. I have no intention to quit smoking	Agree	40 (21.4)
	Neutral	61 (32.6)
	Disagree	86 (46.0)
Attitude towards exercise and general health		
4. I believe that regular exercise habits can decrease the risk of having heart attack.	Agree	397 (91.9)
	Neutral	23 (5.3)
	Disagree	12 (2.8)
5. I frequently engage in moderate to vigorous physical activity per week.	Agree	240 (55.6)
	Neutral	128 (29.6)
	Disagree	64 (14.8)
6. I tend to exercise more during my work/school holidays.	Agree	243 (56.3)
	Neutral	125 (28.9)
	Disagree	64 (14.8)
7. I will try to maintain a healthy BMI according to my weight and height.	Agree	343 (79.4)
	Neutral	73 (16.9)
	Disagree	16 (3.7)
8. I prefer walking to go somewhere near rather than taking transportation.	Agree	247 (57.2)
	Neutral	90 (20.8)
	Disagree	95 (22.0)
9. I frequently go for my medical checkups in the clinic.	Agree	239 (55.3)
	Neutral	109 (25.2)
	Disagree	84 (19.5)
10. I think that watching my family members exercise motivates me even further to exercise as well.	Agree	272 (63.0)
	Neutral	118 (27.3)
	Disagree	42 (9.7)
Attitude towards diet		
11. I think that it is important to read the nutritional facts about each food product that I am consuming.	Agree	326 (75.5)
	Neutral	65 (15.0)
	Disagree	41 (9.5)
12. I think that more intake of oily food contributes to heart attack.	Agree	392 (90.7)
	Neutral	28 (6.5)
	Disagree	12 (2.8)
13. I am consuming high amount of oily food in my diet and: I will try to limit the intake of oily food in my diet.	Agree	*(n=235)* 185 (78.7)
	Neutral	40 (17.0)
	Disagree	10 (4.3)
14. I think that more intake of fast food contributes to an increased risk of heart attack.	Agree	371 (85.9)
	Neutral	39 (9.0)
	Disagree	22 (5.1)
15. I am consuming high amount of fast food daily and: I will try to reduce the intake of fast food.	Agree	*(n=209)* 166 (79.4)
	Neutral	36 (17.2)
	Disagree	7 (3.4)
16. I think that increased intake of carbonated drinks could lead to increased risk of heart attack.	Agree	349 (80.8)
	Neutral	45 (10.4)
	Disagree	38 (8.8)
17. I am consuming high amounts of carbonated drinks daily and: I will try to reduce the intake of carbonated drinks daily.	Agree	*(n=185)* 137 (74.1)
	Neutral	30 (16.2)
	Disagree	18 (9.7)
18. I think that increasing the intake of fruits and vegetables in my diet reduces the risk of having a heart attack.	Agree	396 (91.6)
	Neutral	28 (6.5)
	Disagree	8 (1.9)
19. I am not consuming enough fruits and vegetables in my daily diet and I will try to increase the intake of fruits and vegetables in my diet.	Agree	*(n=240)* 217 (90.4)
	Neutral	20 (8.3)
	Disagree	3 (1.3)

Table 4. Practice for heart attack prevention (n = 432).

Items	Answers	*n* (%)
Work involving vigorous activities for more than 10 minutes		
1. I do gardening every evening.	Yes	130 (27.8)
	No	312 (72.2)
2. I hike every weekend.	Yes	116 (26.9)
	No	316 (73.1)
3. My work involves carrying heavy equipment.	Yes	179 (41.4)
	No	253 (58.6)
Walking for more than 10 mins to places		
4. I walk to buy groceries from shops in my residential area.	Yes	214 (49.5)
	No	218 (50.5)
5. I park car further than the place I planned to go just to walk more.	Yes	172 (39.8)
	No	260 (60.2)
6. I prefer taking stairs than lift.	Yes	181 (41.9)
	No	251 (58.1)
7. I installed apps that calculates my steps to motivate me to walk more.	Yes	251 (58.1)
	No	181 (41.9)
Eating Healthy		
8. I include vegetables in every meal.	Yes	362 (83.8)
	No	70 (16.2)
9. I consume less oil and fatty food.	Yes	268 (62.0)
	No	164 (38.0)
10. I don't consume fast foods.	Yes	221 (51.2)
	No	211 (48.8)
11. I don't consume processed meat such as nuggets and sausages.	Yes	267 (61.8)
	No	165 (38.2)
12. I consume fish high in omega 3 fatty acids (salmon, tuna).	Yes	313 (72.5)
	No	119 (27.5)

Table 5. Association between sociodemographic characteristics with knowledge, attitude, and practice towards heart attack (n = 432).

Variable	Knowledge			Attitude			Practice		
	High *n* (%)	**Low** *n* (%)	χ^2	**Positive** *n* (%)	**Negative** *n* (%)	χ^2	**Good** *n* (%)	**Poor** *n* (%)	χ^2
Age									
18-25	11 (12.8)	75 (82.7)	2.30	50 (58.1)	36(41.9)	8.02	16(18.6)	70(81.4)	10.00
26-35	14 (14.3)	84 (85.7)		61(62.2)	37(37.8)		18(18.4)	80(81.6)	
36-45	11 (14.9)	63 (85.1)		54(73.0)	20(27.0)		18(24.3)	56(75.7)	
46-55	12 (20.7)	46 (79.3)		38(65.5)	20(34.5)		9(15.5)	49(84.5)	
56-65	11 (18.6)	48 (81.4)		37(62.7)	22(37.3)		7(11.9)	52(88.1)	
>65	10 (17.5)	47 (82.5)		44(77.2)	13(22.8)		3(5.3)	54(94.7)	
Gender									
Male	37 (14.7)	214 (85.3)	0.68	151(60.2)	100(39.8)	8.29*	44(17.5)	207(82.5)	0.52
Female	32 (17.7)	149 (82.3)		133(73.5)	48(26.5)		27(14.9)	154(85.1)	
Education Level									
Low	23 (10.1)	204 (89.9)	12.20*	133 (58.6)	94 (41.4)	10.90*	30 (13.2)	197 (86.8)	3.61
High	46 (22.4)	159 (77.6)		151 (73.7)	54 (26.3)		41 (20.0)	164 (80.0)	
Employment status									
Employed	45 (16.5)	227 (83.5)	0.18	170(62.5)	102(37.5)	3.42	46(16.9)	226 (83.1)	0.12
Not employed	24 (15.0)	136 (85.0)		114 (71.3)	46(28.7)		25(15.6)	135 (84.4)	
Ethnicity									
Malay	43 (13.1)	284 (86.9)	7.99*	209(63.9)	118(36.1)	1.99	64(19.6)	263(80.4)	9.64*
Non-Malay	26 (24.8)	79(75.2)		75 (71.4)	30 (28.6)		7 (6.7)	98 (93.3)	
Family Income									
B40 (< RM5250)	48 (14.9)	275 (85.1)	6.07*	200(62.7)	119(37.3)	6.29	55(17.0)	268(83.0)	0.45
M40 (≤ RM11819)	19 (24.1)	60 (75.9)		48(76.2)	15(23.8)		11(13.9)	68(86.1)	
T20 (> RM11819)	2 (6.7)	28 (93.3)		19(79.2)	5(20.8)		5(16.7)	25(83.3)	
Marital Status									
Married	50 (16.8)	248 (83.2)	0.47	199(66.8)	99(33.2)	0.50	50(16.8)	248(83.2)	0.08
Not married	19 (14.2)	115 (85.8)		85 (63.4)	49 (36.6)		21 (15.7)	113 (15.7)	

Notes: *$p < 0.05$

Table 6. Multivariable logistic regression analysis of factors associated with knowledge, attitude, and practice regarding heart attack (*n* = 432).

Variable	Knowledge			Attitude			Practice		
	AOR	**95%CI**	***p***	**AOR**	**95%CI**	***p***	**AOR**	**95%CI**	***p***
Age									
18-25	Ref			Ref			Ref		
26-35	0.975	0.344-2.76	0.962	0.632	0.297-1.345	0.234	0.975	0.344-2.76	0.962
36-45	0.823	0.272-2.49	0.73	0.447	0.195-1.023	0.057	0.823	0.272-2.49	0.73
46-55	0.505	0.161-1.58	0.241	0.507	0.205-1.255	0.142	0.505	0.161-1.58	0.241
56-65	0.52	0.164-1.65	0.267	0.689	0.28-1.697	0.418	0.52	0.164-1.65	0.267
>65	0.547	0.16-1.88	0.338	0.39	0.144-1.055	0.064	0.547	0.16-1.88	0.338
Gender									
Male	Ref			Ref			Ref		
Female	1.214	0.701-2.1	0.489	0.630	0.4-0.992	0.046	1.214	0.701-2.1	0.489
Education Level									
High Level	**Ref**			**Ref**			**Ref**		
Low Level	3.411	1.826-6.37	< .001	1.867	1.171-2.976	0.009	3.411	1.826-6.37	< .001
Employment status									
Not Employed	**Ref**			**Ref**			Ref		
Employed	1.398	0.711-2.75	0.331	1.42	0.823-2.449	0.208	1.398	0.711-2.75	0.331
Ethnicity									
Non-Malay	**Ref**			**Ref**			Ref		
Malay	2.468	1.331-4.58	0.004	0.744	0.426-1.298	0.297	2.468	1.331-4.58	0.004
Family Income									
B40 (< RM5250)	**Ref**			**Ref**			**Ref**		
M40 (≤ RM11819)	0.902	0.462-1.76	0.762	0.625	0.319-1.225	0.171	0.902	0.462-1.76	0.762
T20 (> RM11819)	4.17	0.91-19.11	0.066	0.5	0.173-1.448	0.202	4.17	0.91-19.11	0.066
Marital Status									
Married	**Ref**			**Ref**			**Ref**		
Not Married	0.908	0.416-1.98	0.809	0.685	0.377-1.245	0.214	0.908	0.416-1.98	0.809

Note: High knowledge, positive attitude and good practice are reference groups of the respective dependent variable. Outcome = low knowledge, negative attitude, and poor practice.

3.3 Associated Factors of Knowledge, Attitude and Practice towards Heart Attack

Table 5 presents the distribution of respondents' knowledge, attitude, and practice based on various demographic variables. The knowledge level generally increased with age, with the highest percentage of respondents having high knowledge among those aged 46-55 and >65. Attitudes and practices also showed some variations across age groups. There were no significant association in knowledge and practice between males and females, indicating that gender did not play a significant role in these factors while there was a significant association in attitude between males and females $p < 0.05$. Respondents with higher education levels had higher knowledge and attitudes ($p < 0.05$) compared to those with lower education levels. There was no association in knowledge, attitude, and practice between employed and unemployed respondents. Malay respondents had higher knowledge and practice compared to non-Malay respondents ($p < 0.05$). However, there was no significant association in attitudes between the two groups. Income had a significant association with knowledge ($p < 0.05$) while attitudes and practices did not show significant variations across income groups. Finally, there were no notable association in knowledge, attitude, and practice between married and unmarried respondents.

Multivariable logistic regression analysis was performed to estimate the predictive risk factors of knowledge, attitude, and practice when other confounders were controlled and adjusted odd ratios were calculated. The independent variables were sociodemographic characteristics, and the outcome variables were knowledge, attitude, and practice.

Table 6 revealed the significant factors that were associated with knowledge, attitude, and practice after controlling the confounders ($p > 0.05$). It was observed that education and ethnicity ($p < .001$ and $p=0.004$, respectively) were the strongest predictors of knowledge. Regarding attitude, gender and education were the most significant predictors ($p= 0.046$ and $p= 0.009$, respectively). Finally, education and ethnicity ($p < .001$ and $p=0.003$, respectively) were the strongest predictors for practice.

4. Discussion

In this study, the majority of the respondents (81.7%) showed a low level of knowledge regarding heart attacks. However, in terms of attitude, most respondents (66.0%) exhibited a positive attitude towards heart attacks. The overall practice among respondents indicated a higher percentage (83.6%) with poor practices, with only a minority (16.4%) achieving a good practice score above 70%. Regarding the association between sociodemographic characteristics and knowledge, attitude, and practice (KAP) towards heart attack, significant associations were observed. Education level was the most significant factor associated with the KAP towards heart attack. Ethnicity was significantly associated with knowledge and practice regarding heart attacks. Gender was found to be significantly associated with attitudes towards heart attack.

In recent years, multiple studies in Malaysia that assessed the knowledge and awareness of heart attacks among the population have shown relatively consistent findings with our study regarding low knowledge of heart attacks. For instance, a study conducted in Kuantan, Malaysia revealed low awareness of heart attack symptoms among the general public (Abdo Ahmed et al., 2020). Similarly, another study carried out in Pahang, Malaysia found that most respondents only recognised one modifiable risk factor for heart attacks, suggesting a lack of awareness about other risk factors (Ahmed et al., 2020). These findings align with our study, where the majority of participants identified smoking as the most prevalent risk factor, but fewer recognised obesity, unhealthy diet, high blood pressure, and stress as other major risk factors contributing to heart attacks.

However, an earlier study conducted in 2018 among 100 patients attending outpatient clinics in Kuantan, Malaysia, found that participants had a moderate level of knowledge, with a mean score of 60.75 (Mohammad et al., 2018). There has been a decrease in knowledge about heart attacks, possibly due to the perception among the public that such incidents are becoming more common in Malaysia. Additionally, a report based on data from the National Health Interview Survey (NHIS) in 2014 in the United States revealed that approximately 47.2% of U.S. adults were able to identify all common symptoms of a heart attack, reflecting their level of knowledge (Fang et al., 2019). These findings underscore the need to implement health promotion and education programs aimed at improving the knowledge and awareness of heart attacks among the Malaysian population, especially among high-risk groups.

As for attitude and practice, a previous study in Iran that assessed the KAP regarding cardiovascular diseases (CVD) among adults attending healthcare centres revealed that participants generally had a positive attitude but demonstrated less satisfactory practice behaviours (Koohi and Khalili, 2020). A study in Gombak also found that the local community is poor in practicing preventive measures for CVD risk factors (Othman et al., 2020). Our study yielded similar results, in which most of the respondents showed good attitudes but poor practices. This trend may be attributed to various factors, including cultural beliefs, lack of access to healthcare resources, inadequate health education, health literacy, and socio-economic constraints (Othman et al., 2020; Machaalani et al., 2022; Marzo et al., 2022). Additionally, the role of community resilience and social responsibility in promoting better health practices is crucial in bridging the gap between positive attitudes and effective health practices (Irasanti et al., 2023; Chen et al.,

2024a, 2024b). By nurturing these attributes, communities can better support their members in adopting and maintaining behaviours that reduce the risk of heart attacks and improve overall cardiovascular health.

Regarding the association between sociodemographic characteristics and KAP towards heart attacks, factors such as education, gender and ethnicity were associated with KAP. Specifically, concerning knowledge, lower education levels and Malay ethnicity were linked to lower levels of knowledge regarding heart attacks. Our study findings regarding education level were reflected in other Malaysian studies, where participants with higher education levels demonstrated a higher level of awareness regarding heart attack symptoms and modifiable risk factors (Abdo Ahmed et al., 2019; Ahmed et al., 2020). However, regarding ethnicity, contrary to our findings, the former Gombak, Malaysian study revealed that non-Malays (Chinese ethnic) were less likely to have good knowledge regarding CVD risks (Othman et al., 2020). This discrepancy might be attributed to the study's location, as most of the village areas were predominantly resided by Malays, which explains our findings that Malays are more likely to have poorer knowledge of heart attacks due to barriers in accessing health information.

In terms of attitude, lower education levels and females were significantly associated with poorer attitudes toward heart attacks. Numerous studies have highlighted gender differences in KAP towards CVD (Keteepe-Arachi and Sharma, 2017). CVD in women remains underdiagnosed and undertreated due to the diagnostic challenge it presents, coupled with the persisting attitude that CVD predominantly affects men (Keteepe-Arachi and Sharma, 2017). This gender disparity is fueled by the perception that CVD is primarily a concern for men, leading women to underestimate their own risk (Kim et al., 2022). However, women having a poorer attitude towards the perceived risk of developing CVD can be attributed to the limited access to and sources of health information received (Maffei et al., 2021). Additionally, education and awareness levels about CVD and its risk factors can also contribute to gender differences in attitudes towards CVD (Cushman et al., 2021). Similar to our study findings, women residing in rural areas might be influenced by cultural factors, having lower education and a lack of awareness about CVD symptoms and risk factors that contribute to poorer attitudes toward CVD.

For heart attack prevention practices, contrary to our study findings, the former Gombak, Malaysian study highlighted that non-Malay Bumiputera individuals generally exhibited poorer practice to preventive measures for CVD risk factors compared to Malays (Othman et al., 2020). This disparity likely stems from cultural beliefs and socioeconomic barriers faced by the non-Malay Bumiputera communities. In addition, the Malaysian government has been advancing digitalisation in the healthcare sector, especially amidst the COVID-19 pandemic, utilising social media platforms as crucial health communication tools (Marzo et al., 2024; Chen et al., 2023). This transition can significantly disadvantage marginalised groups like the non-Malay Bumiputera in accessing essential health information and services, leading to poorer preventive measure practices against non-communicable diseases. However, because of the study's location, Malays made up the majority of the village areas, which helps to explain our findings that Malays are more likely to have poorer heart attack prevention practices in comparison to other ethnic groups.

Lastly, understanding the importance of KAP towards heart attacks aligns with the Sustainable Development Goals (SDGs), particularly Goal 3 (Good Health and Well-being). Improving knowledge, attitudes, and practices related to heart attacks can significantly contribute to achieving these SDGs by reducing the incidence and mortality associated with cardiovascular diseases. A study on the knowledge regarding SDGs among medical students in Shah Alam highlighted the importance of integrating SDG knowledge into education (Ghazi et al., 2020). However, the benefits of this integration should extend beyond medical students and healthcare workers. By broadening this approach to include the general population, we can foster a more informed and proactive community in addressing health challenges, thereby ensuring that health promotion and education efforts are aligned with our national and global health objectives.

5. Limitations and Recommendation for Future Research

This study has some limitations. Firstly, the convenience sampling technique employed in this study may limit the finding's generalisability. While the findings underline the significance of expanding KAP within the studied population, due to selection bias, it might not be able to generalise other similar demographics. Secondly, this research is based on self-reported data and might have recall and response bias. Lastly, this is a cross-sectional study and cannot establish causality. Hence, this suggests a possible direction for future research in using a more robust research methodology and conducting the study in demographics to better comprehend and address discrepancies in heart health-related KAP.

6. Conclusion

In conclusion, the study's findings indicate that demographic variables influence respondents' knowledge, attitudes, and practices in various ways. Education level is the most significant factor associated with the KAP towards heart attack. Participants with lower education levels exhibited poorer KAP compared to those with higher education levels. Females were significantly associated with poorer attitudes compared to males. For ethnicity, Malays were significantly associated with lower levels of knowledge and poorer practice regarding heart attacks compared to non-Malays.

These findings underscore the critical role of education and ethnicity in shaping knowledge and practices, while gender and education significantly impact attitudes. This information can guide the development of tailored health promotion and interventions to improve knowledge, attitudes, and practices towards heart attacks within Malaysia.

Author contributions

M.A.A. and H.C. conceptualized and designed the study. N.A.M., A.R.M., K.G.R., and T.W.N. contributed to data collection and analysis. A.A.A., M.Z.B.O., and A.N.B.M.G. provided critical revisions and insights into the methodology. H.C.T. and J.R.N. assisted in manuscript drafting and literature review. H.F.G. contributed to the final review and approval of the manuscript. All authors reviewed and approved the final version of the manuscript.

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Competing financial interests

The authors have no conflict of interest.

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