Original Article

A cross-sectional study of the knowledge of post-myocardial infarction patients in a low-middle-income country regarding myocardial infarction and adherence to secondary preventive strategies practices

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ABSTRACT

Objectives: Myocardial infarction (MI) is a leading cause of death worldwide and is associated with a sizeable economic impact in terms of health expenditure and loss of workforce. Current trends depict Central and South Asia to be the epicenter of this public health issue which is only set to worsen with predicted population growth. Added to this, the history of a single MI increases the risk for subsequent episodes. Improved cardiovascular-related health literacy including knowledge of the illness and secondary preventive strategies is a major precautionary strategy in the prevention of subsequent MI in post-MI patients, which can, in turn, lead to major health and economic benefits. An understanding of the nature and level of health literacy can identify roadblocks to secondary preventive programs and help target interventions to suit the needs of the local healthcare setting and individuals. Thus, the objective of this study was to describe the current level of knowledge regarding MI and its secondary preventive strategies as well as the self-reported level of adherence to preventive strategies in a cross-section of post-MI patients in a healthcare center in Sri Lanka. It also explored the association of self-reported adherence with secondary preventive strategies and the level of knowledge.

Materials and Methods: A cross-sectional descriptive study was conducted on consenting attendees to a cardiology clinic with a history of at least one MI in the past. A pre-tested and researcher-administered questionnaire collected sociodemographic data and tested the participant's knowledge on various aspects of MI and secondary preventive strategies. Knowledge subscores in each category were summed to determine the overall knowledge level. The participants also self-reported their adherence to secondary preventive strategies. The knowledge level and level of adherence to preventive strategies were then categorized as either excellent, good, or poor. Descriptive statistics were calculated as frequencies and percentages. Fishers extract test was used to determine the relationship between overall knowledge level and level of adherence.

Results: Among the sample of 120 post-MI clinic patients, the overall knowledge score showed that two-thirds of the sample possessed a good level of overall knowledge (61.7%), while 36.7% of participants had an excellent knowledge level, and only 1.7% had poor knowledge. The self-reported compliance with preventive practices of a majority (68.3%) of the participants was excellent, while just below one-third of the participants (30.0%) had a good level of compliance. Overall knowledge and self-reported compliance with secondary preventive strategies were not influenced by sociodemographic factors in this sample and no significant association could be determined between the level of adherence and knowledge.

Conclusion: While local secondary preventive programs for post-MI patients seem to be showing some success, the relative deficiency of knowledge in lifestyle modifications as preventive strategies and the lack of association between assessed knowledge levels and adherence with secondary preventive strategies suggests that more attention should be paid to help patients translate and apply recommended secondary preventive strategies in their daily life.

Keywords: Adherence, Knowledge, Health literacy, Secondary preventive strategies, Post-myocardial infarction

INTRODUCTION

Cardiovascular disease remains a major public health dilemma across the globe, with ischemic heart disease (IHD) comprising the bulk of the burden and contributing to 32% of global mortality in 2019.[1] In Sri Lanka, the Annual Health Statistics for 2019 reported that IHD has remained the primary cause of death for the past 9 consecutive years, with 37.2 deaths/100,000 population attributed to IHD.[2] In 2020, the estimated global prevalence of IHD was 244.1 million with the highest prevalence being in Central and South Asia.[3] More alarmingly, with the predicted increase in population growth and aging in these regions, these

statistics are only expected to rise further.[4] The number of disability-adjusted life years and years of life lost due to cardiovascular disease (CVD) has been shown to result in a concurrent burden to the global economy due to healthcare costs, disability, and premature mortality.[5,6] In fact, the economic impact of CVD in low- and middle-income countries is such that the annual cost of care for coronary heart disease is approximately 10 times the total healthcare expenditure per capita.[7]

Patients who have already suffered a single myocardial infarction (MI), that is, post-MI patients are known to be at an increased risk for repeated MI,[8] with 20% of such patients having a recurrent MI within the 1st year.[9] Given such monumental health and socioeconomic implications, there is considerable interest in the promotion and adaptation of secondary preventive measures. Secondary prevention in the form of cardiac rehabilitation provides a multipronged, comprehensive approach targeted at minimizing the effects of risk factors for recurrent MI by the use of health education, advocacy, and follow-up of both medication use and behavioral interventions,[10,11] Such measures help to prevent subsequent MI, allow a better quality of life,[8] and improve long-term survival markedly.[12]

Despite the implementation of national-level preventive programs in Sri Lanka,[13] morbidity and mortality rates of MI remain high. One of the primary reasons for this is the existence of a "secondary prevention care gap."[10,11] This is the discrepancy between the provision of information regarding secondary prevention and the adherence to such strategies, which has been found to be marked in low-and middle-income countries.[14,15] Among the spectrum of reasons for poor adherence is a poor understanding of the seriousness of MI and the effectiveness of secondary preventive strategies.[10] In the local context, a single-center study done almost two decades ago concluded that the knowledge and secondary preventive practices of post-MI Sri Lankans were unsatisfactory,[16] but did not find a significant association between knowledge and attitude to secondary prevention strategies. With the evolution of health literacy to a more integrative[17] and contextualized[18] concept, effective health education and improved cardiovascular health literacy of patients can be useful as a key mediators of adherence with preventive strategies.[19]

Objective

The objective of the study was to assess the following aspects in a sample of post-MI patients:
1. The level of knowledge with respect to MI and secondary preventive strategies
2. The self-reported level of adherence with secondary preventive strategies
3. The association between the level of knowledge and self-reported adherence.

MATERIALS AND METHODS

Study design and setting

A cross-sectional descriptive study was conducted over a period of 8 months from March 2020 at the Cardiology unit of University Hospital Kotelawala Defense University.

Participants and ethics

From the approximately 100–150 patients visiting the cardiology clinic on each of the 3 designated clinic days per week, those with a history of one or more episodes of MI based on patient records were considered eligible. The potential participants were approached as they were seated in the waiting area before the consultation. These patients were given a verbal description of the study as well as a printed information sheet describing the study in Sinhala, Tamil, or English (the three national languages of Sri Lanka), which also listed the primary author's name and contact number. They were assured that participation was voluntary and would not affect their consultation or treatment and that all information collected was anonymous. They were also informed that the collected data would be accessible only to the researchers and research supervisor. The data would be kept confidentially in a password-protected computer until data analysis was complete and destroyed 6 months after completion of data collection. Data sets were identified by participant number only and each participant was given their number in writing. The participants were informed that they would be able to withdraw from the study at any point within 3 months of data collection by contacting the primary author and providing their participant number without the need for an explanation, following which the data set related to the particular number would be erased.

Informed written consent was taken from consenting participants after all queries were clarified. A researcher-administered, pre-tested questionnaire created by the researchers based on previous similar studies[20,21] collected sociodemographic data, tested the level of knowledge on MI and preventive strategies, and assessed the self-reported level of adherence to such strategies.

Ethical approval for this study was obtained from the Ethics Review Committee, Faculty of Medicine, General Sir John Kotelawala Defense (RP/MS/2020/13), which subscribes to the guidelines of the Council for International Organizations of Medical Sciences. The study was conducted in line with ethical principles for medical research involving human subjects outlined by the World Medical Association's Declaration of Helsinki (Available at https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/). Due permission was obtained from the Head of the Cardiology Unit, University Hospital KDU before visiting the study setting.

The questionnaire

The questionnaire consisted of parts A-G and collected information to determine the knowledge of the participants regarding MI and related areas as well as the level of adherence to secondary preventive strategies as described below.

Part A – Sociodemographic data

Data on age group, gender, marital status, educational status, district of residence, and monthly income were collected. To determine the patient profile in terms of past medical history, data were also collected on the number of episodes of MI in the past, when the last MI occurred, and the presence of risk factors before the first episode of MI.

Part B – General idea of MI

General knowledge of the participants on MI was determined by three questions in terms of "Do you know what is a MI?," "Can MI be prevented?" and "Does MI cause death?." Each correct answer received 1 mark, giving a total mark out of 03 for the subscore on general knowledge of MI.

Parts C and D: Knowledge about risk factors and symptoms of MI

The knowledge of the participants about risk factors and symptomology was determined by asking them to list as many risk factors and symptoms of MI as they knew. One mark was awarded for every correct point out of a list of 14 possible risk factors and symptoms created based on established literature.[22,23] A symptom and risk factor knowledge subscore out of 5 was then computed separately according to the total number of correctly identified points ($\geq$9 correctly identified items were given a score of 5 points, 8–7 items a score of 4 marks, 6–5 points a score of 3 marks, 4–3 points a score of 2 marks, 2–1 points a score of 1 mark, and 0 points a score of 0 marks).

Part E – Knowledge about complications of MI

Participants' knowledge of complications was determined by asking them to list up to 5 complications of MI they knew of. The score was determined by allocating 1 point each for each correctly mentioned complication from a list of complications based on existing literature.[24]

Part F – Knowledge about secondary preventive strategies of MI

Participants' knowledge of secondary preventive strategies was determined by asking them to list as many strategies that they were aware of, up to a total of 11 possibilities. Each correctly mentioned strategy from a predetermined list based on the literature[10,11] received 1 mark giving a total point of 11 for this part. Based on the number of identified points, knowledge about secondary prevention strategies was divided into three categories; $\geq$6 – excellent knowledge, 3–5 – good knowledge, and <3 – poor knowledge.

The overall knowledge score was determined by adding the subscores of parts B, C, D, E, and F, the maximum score possible being 29. Based on this overall knowledge score, the knowledge level of the participants was categorized into three categories: >20, excellent, 10–19 good, and $\leqslant$10 poor.

Part G – Compliance with secondary preventive strategies

The level of compliance of the participants with secondary preventive strategies was determined by reading out a list of 11 lifestyle and socio-behavioral modifications and asking if the participant followed the advice. The self-reported level of adherence was computed by giving one mark for every correct behavior that the participant reported as following. Adherence level was divided into three categories based on the total score, with $\geq$11 indicating excellent adherence, 6–10, good adherence, and $\leqslant$5 poor adherence.

Data analysis

Due to the fact that the data were collected by a researcher-administered questionnaire, all relevant data were collected and there were no missing data. Thus, 120 complete data sets were analyzed. Data analysis was performed using IBM Statistical Package for the Social Sciences version 21 software. Descriptive statistics of categorical data (age group, gender, marital status, educational status, district of residence, and monthly income) were calculated as frequencies and percentage distribution. The MI-related patient profile was described by calculating the percentage distribution of patients who had one, two, and three previous MIs in the past, the time period since the last MI, and the percentage distribution of patients with risk factors before the first episode of MI. The participant's knowledge on each question related to MI, each risk factor, different symptoms, each complication, and each secondary prevention strategy was calculated as percentage distributions separately, as well as categorized into subcategories based on the subscores for general knowledge, knowledge on risk factors and symptoms, knowledge on secondary preventive strategies, and overall knowledge.

The association of selected sociodemographic factors (age, gender, financial, and educational status) with overall knowledge levels, as well as the self-reported level of adherence to secondary preventive strategies were computed by the two-tailed Fisher's extract test with $P < 0.05$ indicating a significant association.

RESULTS

Sociodemographic characteristics of the study population

The sociodemographic profile of the sample is shown in [Table 1]. The male predominance in the sample reflects the gender distribution of individuals who suffered from IHD reported in the 2019 Annual Health Statistics Report of Sri Lanka.[2] Almost 85% of the sample were over 40 years, with the age group between 45 and 50 years being the largest group of participants (*n* = 80, 66.7%). Most of the participants had some degree of schooling up to grade 10, while there were 10-degree holders (8.3%) and only 3 (2.5%) of the participants reported having no formal schooling. Almost half of the participants were found to have basic economic stability, reporting an income between Rs. 20,000 and 50,000 (*n* = 53, 44.2%) per month.

Almost two-thirds of participants reported a single previous MI (*n* = 84, 70%), while 27 (22.5%) had suffered from two previous episodes and the remaining 9 (7.5%) participants reported three. None of the participants reported more than three episodes of MI. Approximately 28% (*n* = 34) of the sample reported that they had suffered from an MI within the past month, while 15% (*n* = 18) of participants had a MI more than 5 years ago.

Table 1: Sociodemographic profile of the sample.

Sociodemographic factors	Frequency	Percentage
Age group (years)		
30–34	03	2.5
35–39	16	13.3
40–44	21	17.5
45–50	80	66.7
Sex		
Male	88	73.3
Female	32	26.7
Marital status		
Married	111	92.5
Single	05	4.2
Divorced	04	3.3
Educational status		
No schooling	03	2.5
Grade 1–5	21	17.5
Grade 6–10	26	21.7
Passed GCE O/L	33	27.5
Passed GCE A/L	27	22.5
Degree holders	10	8.3
Monthly income (in SLR)		
<5000	6	5.0
5000–20,000	46	38.3
>20,000–50,000	53	44.2
>50,000–200,000	13	10.8
>200,000	2	1.7

GCE O/L: General certificate of education ordinary level, GCE A/L: General certificate of education advanced level, SLR: Sri Lankan rupees

Most of the participants (*n* = 86, 71.7%) reported being hypertensive before the onset of the disease. Hypercholesterolemia (*n* = 67, 55.8%) and alcoholism (*n* = 58, 48.3%) were the next most commonly reported risk factors. Thirty-nine percent of the participants (*n* = 47) had a habit of smoking and 46% were known patients with diabetes mellitus (*n* = 56). A family history of MI was reported in 26.7% (*n* = 32) of participants.

Knowledge regarding MI

Despite 67.5% (*n* = 81) of the participants acknowledging the lack of a clear idea regarding MI, the majority were aware that MI is deathly (86.7%, *n* = 104), but is preventable (80.8%, *n* = 97). [Table 2] illustrates the knowledge of the symptomology of MI in the sample. Acute onset of severe chest pain was the most common symptom reported by the participants, with other commonly reported symptoms including the crushing nature of the chest pain, heavy sweating, and shortness of breath or dyspnea. Symptoms that were less commonly known were presyncope or syncope, sudden dizziness/tiredness, arm discomfort, and rapid irregular heartbeat. The least known symptoms were the prolonged duration of pain, response to Glyceryl Trinitrate, arm discomfort, and neck or jaw pain.

Out of the 14 risk factors, four were identified by more than half the sample (cigarette smoking; 81.7%, *n* = 98, high-fat diet; 65%, *n* = 78, lack of exercise; 60.8%, *n* = 73, and high blood cholesterol; 60.8%, *n* = 73). Obesity (40%, *n* = 48), hypertension (50.8%, *n* = 61), and diabetes mellitus (43.5%, *n* = 51) were identified by about half the sample. Approximately one-fourth of the sample were able to list family history (22.5%, *n* = 27), stress (35.8%, *n* = 43), and sedentary lifestyle (22.5%, *n* = 27) as risk factors for MI. While only 1 (0.8%) and 2 (1.7%) patients identified genetic abnormalities and male gender as risk factors, respectively, none were aware of the fact that low birth weight and ongoing inflammation may increase the risk of a MI.

With respect to knowledge regarding complications, around 2/3rds of the participants were aware of the impact on daily activities in terms of tiredness (67.5%, *n* = 81) and difficulty carrying out daily work (65%, *n* = 78). While only 19.2% (*n* = 23) listed heart failure as a complication, 61.7% (*n* = 74) were aware of the possibility of sudden cardiac death. The least known complication was arrhythmia (1.7%, *n* = 2).

Knowledge about secondary preventive strategies

[Table 3] depicts the level of knowledge of the sample regarding preventive strategies. Two-thirds of the participants were aware of the benefit of stopping smoking and a low-fat diet. Close to half of the participants were knowledgeable about at least 6 other risk factors out of 14 including cessation

Table 2: Knowledge on the symptomology of myocardial infarction.

Symptoms	Able to name the symptoms		Unable to name the symptoms	
	Frequency	Percentage	Frequency	Percentage
Acute onset of severe chest pain	102	85	18	15
Crushing or tightening kind of chest pain	82	68.3	38	31.7
Chest pain lasting more than 20 min	22	18.3	98	81.7
Pain does not respond to sublingual GTN	17	14.2	103	85.8
Heavy sweating	92	76.7	28	23.3
Shortness of breath/dyspnea	76	63.3	44	36.7
Arm discomfort concomitant with chest pain	46	38.3	74	61.7
Neck or jaw pain concomitant with chest pain	16	13.3	104	86.7
Sudden dizziness/tiredness	37	30.8	83	69.2
Anxiety (sense of impending doom)	16	13.3	104	86.7
Rapid irregular heart rate	23	19.2	97	80.8
Palpitations	18	15	102	85
Pre-syncope/syncope	40	33.3	80	66.7

GTN: Glyceryl trinitrate

Table 3: Knowledge about the secondary preventive strategies.

Secondary preventive strategy	Able to name the preventive strategy		Unable to name the preventive strategy	
	Frequency	Percentage	Frequency	Percentage
Smoking cessation	85	70.8	35	29.2
Cessation of other forms of tobacco	51	42.5	69	57.5
Reducing alcohol intake	55	45.8	65	54.2
Reducing total saturated fat amount (coconut oil, meat and eggs)	72	60	48	40
Replacing saturated fat with mono unsaturated and poly unsaturated fat	42	35	78	65
Reduce salt intake (<5 g).	51	42.5	69	57.5
Increasing vegetables and fruits intake in our daily foods.	56	46.7	64	53.3
Increasing physical activity at least 30 min per day.	56	46.7	64	53.3
Maintaining the weight within recommended BMI range (below 25 kg/m²)	20	16.7	100	83.3
Maintaining mental well-being	30	25	90	75.8
Reducing stress	21	17.5	99	82.5

BMI: Body mass index

of other forms of tobacco, reduction in alcohol intake, and other dietary modifications. Less than one-third of the sample was aware of the influence of psychosocial factors (mental well-being and stress) as well as ideal body weight on the risk of recurrent MI.

Levels of knowledge

Computation of overall knowledge scores showed that a majority (61.7%, *n* = 74) of patients had an intermediate level of knowledge, while only a few (1.7%, *n* = 2) of the participants were poorly knowledgeable. One-third of the sample was assessed to have excellent knowledge (*n* = 44, 36.7%). Among the group with excellent knowledge, almost all (98.6%) were educated beyond the GCE ordinary levels and 28.3% (*n* = 34) were those who had reported a MI within the previous month. Just about half the participants had a

good level of knowledge regarding secondary preventive strategies (*n* = 52, 43.3%), while a quarter demonstrated an excellent knowledge level. (*n* = 26, 21.7%) and 35% (*n* = 42) had poor knowledge.

Self-reported adherence levels

[Table 4] summarizes the self-reported adherence to secondary preventive measures in the sample. A majority reported adhering to medication-related practices and coming for regular clinic follow-ups (80%). However, patients reported being less compliant with lifestyle modifications. Despite this, the subscore for adherence with secondary preventive measures showed that 68.3% (*n* = 82) of the study population reported an excellent level of adherence, while only 1.7% (*n* = 2) were extremely poor at following secondary preventive strategies.

Table 4: Self-reported secondary preventive practices followed by post-myocardial infarction patients.

Secondary preventive strategy	Following correct practices		Not following correct the correct practices	
	Frequency	Percentage	Frequency	Percentage
Taking medications in prescribed frequency	107	89.2	13	10.8
Taking medications in prescribed number	100	83.3	20	16.7
Taking medications at a specified time	103	85.8	17	14.2
Has not missed the clinic in the past 6 month	96	80	24	20
Do not forget to take their medications over the past 1 week	98	81.7	22	18.3
Do not stop the medications when they feel worse	105	87.5	15	12.5
Do not stop taking medications when they feel better	96	80	24	20
Do not take medications when they travel or leave home	84	70	36	30
Stop taking medications during other illnesses	86	71.7	34	28.3
Follow the recommended controlled diet	79	65.8	41	34.2
Exercise regularly	31	25.8	89	74.2
Do not smoke	77	64.2	43	35.8
Do not consume alcohol	60	50	60	50
Takes medications for other comorbidities regularly	109	90.8	11	9.2
Store the medications properly	109	90.8	11	9.2

Association of selected sociodemographic factors with knowledge and adherence levels

Overall knowledge of the participants was not influenced by gender, age, financial, or educational status. Similarly, age, gender, and educational level did not influence the level of adherence to secondary preventive strategies. While all the participants who had suffered an MI within the past year were found to have good knowledge ($n = 65$) compared to those who had the last attack over 1 year ago, there was no significant association between the time of the last attack and knowledge about MI. Similarly, almost all of the participants (about 98%) who had the last MI episode within 1 year and beyond 1 year reported good compliance with preventive strategies. However, the relationship between the time of the last attack and compliance level did not reach statistical significance.

Association between knowledge level and self-reported adherence to secondary preventive practices

In this sample, there was no significant association between the level of self-reported adherence to secondary preventive practices and overall knowledge regarding MI ($P = 0.9668$).

DISCUSSION

Almost two decades ago, Senevirathne[16] concluded that the overall knowledge regarding MI in a sample of post-MI Sri Lankans attending a health center was unsatisfactory. Such findings have been replicated over the past decade across a number of low-middle-income and middle-income countries.[20,21,25-27] Similar conclusions were also reported when lower socioeconomic groups were targeted in more financially stable countries.[28,29] In comparison, the sample in

this study performed relatively better, demonstrating almost universally good or excellent levels of overall knowledge (98.4%, $n = 118$). Interestingly, a recent study that collected data from a set of Sri Lankans who attended an indigenous healthcare facility offering Sri Lankan traditional medicine (Ayurveda) showed similarly positive findings (Kisholorjan *et al.*, presented at the 2019 National Health Research Symposium), suggesting that there seems to be a positive trend in the attitude of Sri Lankans to preventive care.

Awareness of participants in this sample regarding the symptoms of MI was limited to commonly reported symptoms such as chest pain, crushing and tightening nature, heavy sweating, and shortness of breath which is in line with a recent systematic review on the knowledge of cardiac symptoms.[28] This symptom knowledge profile has not changed over the past two decades in the local setting, being similar to the findings of Senevirathne.[16] Such findings are likely because these symptoms are among the most common ones associated with MI and, thus, were more likely to have been experienced by the participants. However, because MI is notoriously known to manifest as any one of the other symptoms and early recognition is key to effective treatment, post-MI patients in particular should be made aware of the full profile of possible symptoms.[30]

The most commonly identified risk factors included cigarette smoking, hypertension, lack of exercise, high blood cholesterol, and high-fat diet. This study sample demonstrated better knowledge of risk factors in comparison with their Asian counterparts.[20,26] However, the risk factor profile shows a significant lack of knowledge regarding non-modifiable factors (male gender, family history, and genetic predisposition). Despite being non-modifiable, educating

patients regarding such factors can contribute to increased awareness and therefore care.

Knowledge levels of secondary preventive strategies in almost two-thirds of this study population were either good or excellent, similar to studies done in Iran and Nepal[20,25] and almost all of the sample reported following preventive practices to a considerable level. Analysis of individual practices shows that participants are reasonably compliant in terms of medication-related factors and tend to visit clinics for reviews. However, they are less compliant with recommended lifestyle modifications including stopping smoking, alcohol intake, and regular exercise. This implies that health promotion programs should also focus on the importance of healthy habits and lifestyle changes.

This study did not show significant associations of knowledge levels with sociodemographic factors similar to the study done in the Sri Lankan indigenous health-care facility (Kisholorjan *et al.*, presented at the 2019 National Health Research Symposium), but in contrast to other studies which showed that older,[16] more educated[16,20,25] are more knowledgeable. This could be explained by the fact that the study sample was primarily composed of older patients and those with some level of school education.

Limitation

This study was conducted in a single center in an urban setting which primarily caters to patients residing in the areas around the hospital. Therefore, the results cannot be generalized to the Sri Lankan population as a whole. The sample may have been subjected to bias in that the more motivated would have opted to consent to the study. Further, the level of adherence was determined by self-report which may have been subject to recall and social desirability bias.

CONCLUSION

The results of this study demonstrate that the implementation of cardiac secondary prevention programs, especially in limited resource settings is a challenge and requires a contextualized and customized approach tailored to the characteristics of the individuals and society at large[10,11] to be effective. In this line, the spectrum of data suggests the need for increased emphasis on advocating for healthy lifestyle habits in the local context. In addition, the failure to show a significant association between knowledge and adherence to preventive measures suggests that more attention should be paid to helping patients translate and apply preventive practices in their daily life, thereby bridging the knowledge-related secondary prevention care gap.

Acknowledgments

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Conflicts of interest

There are no conflicts of interest.

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