Hypercholesterolemia Prevalence, Awareness, Treatment and Control among the Elderly: The 2011 National Health and Morbidity Survey, Malaysia

K. Ambigga[1*], K. Jasvindar[2], K. Gurpreet[3], A. Suthahar[4,5], B. K. Ho[6], S. M. Cheong[2] and K. H. Lim[2]

[1]*Faculty of Medicine and Defence Health, National Defence University of Malaysia, Malaysia.*
[2]*Institute for Public Health, Malaysia.*
[3]*National Institute of Health Secretariat, Malaysia.*
[4]*Faculty of Medicine and Health Sciences, Universiti Teknologi MARA, Malaysia.*
[5]*Faculty of Medicine and Health Sciences, Brain and Neuroscience Communities of Research, Universiti Teknologi MARA, Malaysia.*
[6]*Department of Selangor Health, Bandar Botanic Health Center, Malaysia.*

Authors' contributions

Author KA wrote the manuscript. Authors KJ and KG was involved in the design, conception and coordination of the study. Author KG performed the statistical analysis. Authors KA, KJ, AS, KG, BKH, SMC and KHL were involved in the critical revision and intellectual content of the manuscript. All authors have read and approved the final version.

Original Research Article

ABSTRACT

Aims: This study provides population-based estimates on the prevalence, awareness, treatment and control rates of hypercholesterolemia among the elderly in Malaysia.
Study Design: Analysis of secondary data from a cross sectional population-based survey was done.
Place and Duration of Study: This study was conducted throughout Malaysia in 2011.

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*Corresponding author: E-mail: ambigga@hotmail.com;

Methodology: A total of 2764 respondents (15.5%) were selected in this study; the elderly subjects are from the secondary data analysis of 60 years and older.
Results: The overall prevalence of hypercholesterolemia was 55.4%. The awareness rate for hypercholesterolemia was 39.5%. Out of those who were aware, treatment with medication was conferred to 77.7%. Control rate for hypercholesterolemia was 53.8%. Utilising multiple logistic regression analysis, factors associated with higher awareness rate of hypercholesterolemia were urban residents, secondary education level and Indian ethnicity; the factor associated with higher treatment rates was government/semi government employees; factors associated with higher control rate were males and Indian ethnicity.
Conclusion: The overall prevalence, treatment and control rate of hypercholesterolemia among the elderly in Malaysia were high in comparison to awareness rate in this population.

1. INTRODUCTION

Cardiovascular Diseases (CVD) remain as the leading epidemiological cause of disease burden and deaths in Malaysia [1] and worldwide [2]. It is also the main cause of health resource utilization among elderly individuals [3]. The major Cardiovascular Risk Factors (CVRF) among Malaysian adults were hypertension, diabetes, elevated Waist Circumference (WC) and Body Mass Index (BMI), dyslipidaemia and smoking [4].

Malaysia, an upper middle income country, although young and developing, is expected to have an increasing proportion of the elderly (above 60 years age) accounting to 10% of its population by 2020 [5]. In addition, dietary habits, physical inactivity, long working hours and other urban stress in most Asian populations have occurred concurrently with the rapid economic growth over the last 2-3 decades giving rise to chronic diseases. These diseases are typically exaggerated in later adult life thus explaining an increased risk of coronary artery disease in the South Asian population [6]. In view of this, there is a need to manage the CVRF well and population surveillance is imperative in monitoring these cardiovascular diseases risk factors. Additionally, among the elderly controlling the risk factors decreases CVD effectively [7].

Furthermore, there are some studies highlighting the various CVRF in the adult population of Malaysia but these data are still not well defined amongst the elderly population. Dyslipidaemia remains as an important modifiable risk factor in the development of coronary heart disease [8].

In the literature, it was also noted that the elderly in a semirural community in Kuala Langat district, in the state of Selangor, Malaysia, had a high dyslipidaemia prevalence rate of 63.1% [4]. Hence, the elderly population is at higher risk of developing CVD due to atherosclerosis caused by hyperlipidaemia. There is also a paucity of dyslipidemia prevalence studies in South Asians [9].

As not much is known regarding the hypercholesterolemia prevalence, awareness, treatment and control rates and its associated factors among the elderly in Malaysia, the present study was to designed to fill these gaps. However, the scope of this paper is not to compare cholesterol levels based on gender. As a whole, this study was undertaken to provide baseline Malaysian data for the health care administrators to do the necessary health policies to control hyperlipidemia in the elderly population.

2. METHODS

2.1 Study Design, Population and Sampling Frame Selection

This is a cross sectional population-based survey conducted by the Institute for Public Health, National Institutes of Health of Malaysia and sponsored by the Ministry of Health, Malaysia. The study was approved by the Ministry of Health ethical committee and the detailed description of the sampling methods was described in the National Health and Morbidity Survey (NHMS) 2011 protocol [10]. Briefly, the sampling design is a two-stage stratified random sampling. This survey was conducted between April to July 2011 throughout Malaysia. The estimated sample size at the national level was based on the respondents stratified by urban/rural population of the different states in Malaysia. To ensure national representativeness, two stage stratified random sampling was used.

The two strata were primary stratum, which was made up of the states of Malaysia, including federal territories; and the secondary stratum, which was made up of urban and rural stratum formed within the primary stratum. The allocation of sample to the state, urban and rural was done proportionally to the population size. A bigger number of samples was allocated to the states with a larger population size such as Selangor, Johor and Sabah and a smaller number of samples was allocated to the states with smaller population size such as Perlis, Melaka and Putrajaya.

2.2 Subject Selection, Study Tools and Study Procedure

Adults aged 60 years and older who had participated in the survey were extracted from the NHMS, 2011 [10] data and 2764 elderly persons were included in this study. Hypercholesterolemia status of the elderly was assessed for the scope of this paper. The other cardiovascular risk factors were assessed in other papers. Respondent information sheet and informed consent form were made available for every respondent. Structured questionnaires were used to collect data for the scope of this paper. The "Cardiocheck meter" which has been validated and calibrated was used to assess fasting cholesterol levels after 12 hours to determine the hypercholesterolemia status. Venous cholesterol levels were not performed as this is a community survey. The fasting cholesterol test in this study was performed by the nurses who had been trained on the techniques of using the instrument and they were also briefed on the criteria for referral of respondents with health problems. Respondents with high fasting cholesterol levels were referred to the nearest health facility using structured referral letters for further evaluation and management.

2.2.1 Definition of elderly

Elderly subjects were defined as aged ≥ 60 years based on the United Nations Assembly on Ageing, 1982 which has been adopted by the Malaysian policy makers [11].

2.2.2 Definition of hypercholesterolemia

Hypercholesterolemia was defined as a Total cholesterol (TC) concentration of ≥ 5.2 mmol/L based on NCEP-ATP III, 2002 definition [12] which was used in the NHMS 2011 survey.

2.2.3 Definition of awareness

Awareness of hypercholesterolemia was defined as self-reports by subjects as having being diagnosed with hypercholesterolemia by medical personnel.

2.2.4 Definition of treatment

Treatment of hypercholesterolemia was defined as the proportion of respondents who reported receiving prescribed treatment for high levels of cholesterol from a doctor or health worker at the time of the interview. Unfortunately, the treatment details on the name of the drugs and the doses were not obtained during the survey.

2.2.5 Definition of control

Control was defined as the proportion of hypercholesterolemia respondents with total cholesterol (TC) concentration of ≤ 5.2 mmol/L.

3. STATISTICAL ANALYSIS

All sociodemographic results were described with frequency and percentage using descriptive analysis and 95% confidence intervals. A multivariate analysis using forward stepwise logistic regression was conducted to identify independent factors associated with awareness, treatment and control of hypercholesterolemia. All analyses were performed in the sub-samples; analysis on awareness was done on all hypercholesterolemia respondents who reported receiving prescribed treatment for high cholesterol from a doctor or health worker and analysis on treatment was done on subjects aware of taking treatment, while control rate was done on the treated sub-sample. Only significant factors in the univariate analysis were entered into the multivariate analysis. The effect was reported as odds ratios (ORs) with corresponding 95% Confidence Interval (CI). The significance level was set at $p < 0.05$. The software Statistical Package for Social Sciences (SPSS Inc. Chicago, USA) version 16 was used for statistical analysis. Data were weighted on the basis of complex sample design.

4. RESULTS

A total of 2764 (15.5%) elderly subjects aged 60 years or more of the 17,783 respondents aged 18 years or older for the hypercholesterolemia module in NHMS 2011 were included in this study.

Table 1 shows the baseline characteristics of the study population. The elderly population was almost equally distributed in both urban and rural locations in this survey. Majority of the respondents were females (51.5%). Also, majority were less than 75 years old (79.4%). With regards to the other characteristics, 49.1% were Malays, 67.9% were married, 50% had primary education, 55.6% were retirees and 50.8% took treatment from government clinics.

The overall prevalence of hypercholesterolemia among the elderly was 55.4% (95% CI: 52.9-58%).

Awareness rate for hypercholesterolemia was 39.5% (95% CI: 35.8 - 43.4%). Table 2 illustrates the factors associated with awareness of hypercholesterolemia status among the elderly. Factors associated with increased awareness rate of hypercholestrolemia were the urban residents (aOR= 1.552; 95% CI: 1.12- 2.14), those with secondary education (aOR= 2.67; 95% CI: 1.61-4.40) and Indian ethnic group (aOR= 2.23; 95% CI: 1.06-3.66).

Treatment with medication was reported by 77.7% (95% CI: 72.7-82%) of the subjects, whereas, 79.3% of them were given dietary advice, 60.4% were told to lose weight and 77.1% were advised to exercise. Table 3 shows the factors associated with treatment of hypercholesterolemia among the elderly. The factor associated with higher treatment rate was government/semigovernment employees (aOR=8.71; 95% CI: 8.28-9.15).

The control rate for hypercholesterolemia was 53.8% (95% CI: 51.0-56.3%). Table 4 refers to control rate of hypercholesterolemia among the elderly. Factors associated with higher control rate were males (aOR= 2.51; 95% CI: 1.89-3.33) and Indian ethnic group (aOR= 2.23; 95% CI: 1.36-3.61).

Table 1. Sociodemographic characteristics of respondents for hypercholesterolemia module among elderly aged 60 years and above in NHMS, 2011 (N=2764)

Sociodemographic characteristics		N	n (%)
Strata	Urban	2764	1386 (50.1)
	Rural		1378 (49.9)
Gender	Male	2764	1286 (48.5)
	Female		1478 (51.5)
Age group(years)	60-74	2764	2208 (79.4)
	≥75		556 (20.6)
Ethnicity	Malay	2764	1516 (49.1)
	Chinese		796 (36.9)
	Indians		203 (5.8)
	Other Bumiputras		205 (7.7)
	Others (non-malaysians)		44 (0.5)
Marital status	Single	2763	51 (2)
	Married		1825 (67.9)
	Widow/widower/divorcee		887 (30.2)
Education level	No formal education	2719	814 (26.3)
	Primary education		1369 (50.0)
	Secondary education		418 (18.3)
	Tertiary education		118 (5.5)
Occupation	Government / Semi government	2486	16 (0.5)
	Private		162 (7.4)
	Self employed		508 (18.1)
	Unpaid worker/home maker		425 (18.5)
	Retiree		1375 (55.6)
Place of treatment	Government clinics	530	270 (50.8)
	Private clinics		104 (18)
	Government hospitals		125 (25.7)
	Private hospitals		16 (2.9)
	Pharmacy		9 (2.5)

Table 2. Factors associated with awareness of hypercholesterolemia among the elderly

	Variables	p	aOR*	95% CI
Strata	Rural		1.00	-
	Urban	0.008	1.552	1.12-2.14
Education	No formal education	0.002	1.00	-
	Primary		1.61	1.13-2.32
	Secondary		2.67	1.61-4.40
	Tertiary		2.28	1.01-4.71
Marital status	Single	0.747	1.00	-
	Married		0.610	0.17-2.17
	Widow/Widower/ Divorcee		0.626	0.18-2.23
Gender	Female	0.272	1.00	-
	Male		1.24	0.843-1.83
Race	Malay	0.011	1.00	-
	Chinese		1.62	1.17-2.51
	Indian		2.23	1.06-3.66
	Other Bumiputeras		1.92	0.96-3.71
	Others		1.29	0.05-2.14
Occupation	Retired	0.19	1.00	-
	Government/Semigovernment		0.66	0.006-0.78
	Private		0.96	0.53-1.72
	Self-employed		0.80	0.49-1.29
	Homemaker/Unpaid worker		0.76	0.76-1.79
Age group	≥ 75 years	0.46	1.00	-
	60-74 years		1.20	0.75-1.92

aOR- adjusted Odds ratio from multivariate analysis

Table 3. Factors associated with treatment of hypercholesterolemia among the elderly

	Variables	p	aOR*	95% CI
Strata	Rural	0.354	1.00	-
	Urban		1.36	0.71-2.58
Education	No formal education	0.464	1.00	-
	Primary		0.53	0.22-1.25
	Secondary		0.52	0.22-1.22
	Tertiary		0.52	0.15-1.75
Marital status	Single	0.359	1.00	-
	Married		2.03	0.25-16.4
	Widow/Widower/ Divorcee		3.24	0.37-28.14
Gender	Female	0.054	1.00	-
	Male		1.95	0.99-3.85
Race	Malay	0.131	1.00	-
	Chinese		0.62	0.30-1.27
	Indian		0.56	0.19-1.60
	Other Bumiputeras		0.26	0.09-0.73
	Others		1.46	0.07-29.3
Occupation	Retired	0.00	1.00	-
	Government/Semigovernment		8.71	8.28-9.15
	Private		0.99	0.31-3.19
	Self-employed		1.32	0.60-2.94
	Homemaker/Unpaid worker		2.29	1.06-4.94
Age group	≥ 75 years	0.388	1.00	-
	60-74 years		1.58	0.56-4.45

aOR- adjusted Odds ratio from multivariate analysis

Table 4. Factors associated with control of hypercholesterolemia among the elderly

	Variables	p	aOR*	95% CI
Strata	Rural		1.00	-
	Urban	0.131	1.103	0.89-1.42
Education	No formal education	0.606	1.00	-
	Primary		0.954	0.710-1.281
	Secondary		0.790	0.538-1.159
	Tertiary		1.008	0.586-1.735
Marital status	Single	0.290	1.00	-
	Married		0.456	0.171-1.219
	Widow/Widower/ Divorcee		0.487	0.184-1.284
Gender	Female	0.00	1.00	-
	Male		2.51	1.89-3.33
Race	Malay	0.00	1.00	-
	Chinese		1.62	1.24-2.12
	Indian		2.23	1.36-3.61
	Other Bumiputeras		1.92	1.21-3.04
	Others		1.29	0.379-4.40
Occupation	Retired	0.545	1.00	-
	Government/Semigovernment		0.618	0.187-2.04
	Private		0.980	0.612-1.57
	Self-employed		0.771	0.563-1.06
	Homemaker/Unpaid worker		0.967	0.703-1.33
Age group	≥ 75 years	0.154	1.00	-
	60-74 years		1.27	0.915-1.76

*aOR- adjusted Odds ratio from multivariate analysis

5. DISCUSSION

This study highlights that the hypercholesterolemia prevalence, treatment and control rates are high in the elderly in comparison to the awareness rates. The literature mentions that elevated lipid levels in the Asian population are linked to age, ethnicity, gender, economic development, urbanization, fatty food intake, and other risk factors, such as Diabetes Mellitus [13].

In this study, the overall prevalence of hypercholesterolemia among the elderly population in Malaysia was 55.4%. This percentage was slightly higher than that observed among the elderly in China, whose prevalence was 51.5% [14]. Furthermore, the elderly in the United States of America also had a slightly higher prevalence of dyslipidaemia which was 60.3% [15]. The high prevalence of hypercholestrolemia in this study may be attributed partially to the increasing trend for overweight and obesity among Malaysians [10] and also to an increasing aging population. Unfortunately, the scope of this paper does not cover the overweight and obesity prevalence rates among the elderly in Malaysia. In addition, the public health burden posed by hypercholesterolemia will be aggravated in our elderly people. Eventually, Malaysia will be at an increased risk for developing a cardiovascular disease epidemic in its escalating ageing population. Although Malaysia is considered a relatively young nation; its ageing population of ≥ 60 years is rising steadily from 5.7% in 1990 to 6.3% in 2000 and is expected to be 9.8% in 2020 [5]. This elderly population with multiple risk factors and co-morbidities will become a major challenge to the Malaysian healthcare system in the future [16] especially in terms of cost of treatment for chronic ailments.

Awareness rate for dyslipidaemia among the Malaysian elderly was 39.5%, lower than the treatment or control rate of dyslipidaemia in the study population. However, the awareness level for hypercholesterolemia was much higher than in adults in Beijing, which was 22.4% [14]. A study in America highlighted that the proportion of awareness for this condition increases with age [17] and this was evidenced in our study as well as in the Beijing study. The awareness rate for hypercholesterolemia in Malaysia was one and a half times higher among the urban residents compared to the rural population, 2.6 times higher among those with secondary

education and almost twice higher among the Indian ethnic group compared to other races. A possible explanation for this might be that the urban residents have better access to healthcare facilities, health literacy availability and higher household incomes due to their education level, hence enabling them to be aware of their health condition.

Treatment rate for hypercholesterolemia with medication was 77.7% in the Malaysian elderly. The treatment rate for this condition was higher than for adults in China (46.1%). Cardiovasular diseases tend to occur more in the elderly population. In view that hyperlipidemia is a known CVRF, it is treated aggressively in the elderly population, to prevent CVD epidemic in Malaysia. Moreover, among the Malaysian elderly, 79.3% were given dietary advice, 60.4% were told to lose weight and 77.1% were advised to exercise. In contrast, only 51% of the elderly in China adopted lifestyle modification [14]. The factor associated with the higher treatment rates among the Malaysian elderly was being government/semigovernment employees, resulting in an association eight times higher compared to other occupations. The reason for the high treatment rates may be related to the affordable prices fixed by the government clinics, which charged the minimum in Malaysia. Hence more elderly sought treatment in these clinics. In addition, government employees were treated free of cost in these government health facilities located within residential communities, what makes them highly accessible to the elderly population.

Regarding adherence to medical recommendation for hypercholesterolemia, this can be implemented using financial and regulatory mechanisms to encourage healthy diets [18] and developing a friendly environment for physical activity to promote physical exercise [19].

The control rate for hypercholesterolemia was 53.8%. Factors significantly associated with hypercholesterolemia control were being of the male gender, with an association 2.5 times higher when compared to the female respondents, and being of the Indian ethnic group, which have a rate two times higher when compared to the other ethnic groups. Despite high treatment rates, the control rates for hypercholesterolemia in the elderly were low. We can conclude that medications alone will not solve the problem of dyslipidaemia control

completely and lifestyle changes are effective in controlling serum lipids as evidenced by other interventional and observational studies [17].

The ongoing control of the CVD epidemic contributed by hypercholesterolemia will be translated in an increased utilisation of healthcare services, escalating healthcare costs, increased premature deaths, reduction in productivity and appalling economic implications [20]. To reduce such a burden, priorities should be given to the most cost effective strategies to produce rapid changes when resources are restricted [21].

The trend towards a younger age of first myocardial infarction caused by the CVD epidemic is already occurring in Malaysia [22] along with higher cardiovascular disease mortality compared to developed countries [23]. Hence, this bothersome trend needs to be addressed urgently by controlling the CVD risk factors.

6. CONCLUSION

Our study provides up-to-date and reliable information on the hypercholesterolemia status among the elderly in Malaysia. This study is significant to the local healthcare system and public health workers. This result can also be compared with those regarding the cholesterol status of elderly population in other countries. Raising awareness and strict control are vital through patient education programs and regular health screening in the elderly together with both pharmacological and non-pharmacological treatment. Creating healthcare policies to improve disease management and increasing the overall health care resource allocation especially among the elderly in Malaysia is crucial in preventing an upsurge of the cardiovascular diseases continuum.

The vigour of this study includes its population-based sampling frame and its large sample frame. A limitation in our study is that only total cholesterol levels and not venous cholesterol levels were measured as this is a community survey. Also, awareness rate may be over or under estimated as it is reported by the respondents themselves. Ultimately, as a cross sectional, this study does not allow for cause and effect relationships to be studied.

Nevertheless, the data from this study can be used as a platform for further studies to be

conducted towards the effective management of hypercholesterolemia amongst the older patients in Malaysia.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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