Characterization of Coronary Artery Disease Patients Managed in an Outpatient Facility in Selangor

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ABSTRACT

Introduction: Coronary Artery Disease (CAD) remains a major disease in the world. As CAD often presents suddenly with little warning, identification of early cardiac disease could allow intervention that may be effective in slowing the progression. To this end, characterization of patients would be useful to aid healthcare practitioners to plan the best care needed by individual patients.

Objective(s): The aim of this study is to characterize the patients treated at an outpatient facility in Selangor by focusing on the trends of HbA1c and serum lipid profile.

Methodologies: Sample data were taken from 119 CAD patients at An-Nur Specialist Clinic, Bangi. Patient demographic data such as age, sex and BMI was collected through the hospital records. Lipid profile and HbA1c results was obtained from hospital records. All patient's data were collected retrospectively from records obtained in the year 2014. IBM SPSS was used as the tool for statistical analysis. Total cholesterol (TC), Triglyceride (TG), High density lipoprotein (HDL), low density lipoprotein (LDL) and glycated haemoglobin (HbA1c) were analysed according to gender, age and BMI.

Results: Result show that TG and HDL in this study does not show a significant as a strong indicator for CAD risk factor. LDL and HbA1c show promising positive result to be useful as a parameter to monitor CAD.

Conclusion: LDL and HbA1c show positive indication to be used in further characterizing CAD patients in Selangor and the prevalent risk factor for this population include LDL level and diabetes.

Keywords: Coronary artery disease; diabetes; HbA1c; LDL; HDL

INTRODUCTION

Coronary artery disease (CAD) is one of the leading causes of death globally. In Malaysia, CAD is one of the main causes of morbidity and mortality (National Heart Association of Malaysia, 2018). CAD is on the rise in Asian-Pacific countries that are currently undergoing rapid urbanization, industrialization, and lifestyle changes; in parallel with increasing life expectancies (Lu et al., 2014). A Malaysian study shown by Rissam, Kishore & Trehan (2001), Indians have 15 times higher rate of CAD than Chinese and 10 times higher rate than Malays < 40 years. Besides that, research by Gijsberts et al., (2015) stated that South Asians have repeatedly been described as a high-risk group for early onset and severe CAD.

Cardiovascular health was defined by American Heart Association to be characterised by components that covers health behaviours and health factors that include blood cholesterol, body mass index (BMI), blood pressure and blood glucose (Tsao et al., 2022). Risk factors of CAD are divided into non- modifiable factors that include age, gender, and family history and also the modifiable risk factors such as hypertension, smoking, physical inactivity, obesity, diet, diabetes mellitus and dyslipidaemia (Yahagi et al., 2015).

CAD often presents suddenly with little warning (Knopp et al., 2002). Therefore, prevention of CAD should start with global risk assessment and proceed to suitable treatment of correctable risk factors. If the blood lipid profile is abnormal, this should be corrected thus the indications for drug therapy in CAD prevention are increasingly well defined (Assman et al., 1999). Vasan et al. (2001) noted that several epidemiologic studies have demonstrated that systolic and diastolic blood pressures have an association with CVD outcomes. Franklin & Wong (2013) described that Framingham Heart Study show that diastolic blood pressure <70mm Hg with systolic blood pressure ≥120 mm Hg was associated with increased CAD risk.

Diabetes mellitus is one of the most important diseases in the modern society and represents not only a medical but also a social problem (Silva et al, 2018). Diabetes and its predominant form, type 2 diabetes mellitus (T2DM), has distinctive association with CAD and have two-to-five–fold higher risk in developing coronary disease (Ali et al.,2010). Besides that, in the Framingham study, the incidence of cardiovascular disease among diabetic men was twice that among nondiabetic men and similarly was three times more elevated in diabetic women compared to nondiabetic women (Chiha et al., 2012). In Malaysia, the National Health and Morbidity Survey 2019 showed that the prevalence of diabetes for adults aged >30 years old was 9.4%, increased by 11.2% within 8 years from 2011 to 2019. Also 6th Clinical Practice Guideline of Diabetes Mellitus (2020) showed the prevalence of T2DM is the highest among Indian ethnic at 31.4%, followed by Malays and Chinese at 22.6% and 15.1% respectively.

The HbA1c test is an indicator of average blood glucose concentrations over the preceding three months, and it is a well-established biomarker of long-term glucose control (Matheka et al., 2013). Studies show that HbA1c is more useful than fasting plasma glucose levels for assessing CAD risk and mortality (Selim et al., 2010). HbA1c in the range of 5.5% to 6.5% poses considerably high risk of morbidity and mortality due to CAD (Syed & Khan, 2011). Based on Cai et al., (2014) observational study, they found out that in non-diabetic population HbA1c level was associated with the severity of CAD. This further supports the notion that HbA1c may be a useful and independent indicator for CAD risk evaluation. High levels of cholesterol increase the risk of formation of plaques and atherosclerosis, thus increase risk of CAD. Serum lipid profile is measured for cardiovascular risk prediction and has now become almost routine test. The test includes four basic parameters: total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides (Nigam, 2010). Raised total cholesterol, low density lipoprotein-cholesterol (LDL-c) and reduced high density lipoprotein-cholesterol (HDL-c) level have been shown to be strong independent risk factors for CAD in numerous cross sectional, prospective and intervention trials (Cromwell et al., 2007). Karalis (2009), also noted that high concentration of LDL-C is a major risk factor for CAD. Furthermore, by monitoring dietary intake it is proved that lowering serum cholesterol level will effectively decrease atherosclerotic disease (Dawber et al., 1982).

METHODOLOGIES

STUDY DESIGN

This was a retrospective study which involved patients of Specialist Clinic An-Nur in 2014.

DATA COLLECTION

The tool for data collection in this study was a case record form.

Study site
Study was conducted at Specialist Clinic An-Nur, Bangi.

Inclusion Criteria
Patients >18 years old diagnosed with CVD with co-morbidity of T2DM, HTN or Hyperlipidemia.

Exclusion Criteria
Patients with incomplete medical profile.

Data Analysis
All data was analysed using Statistical Package for Social Sciences (SPSS) version 22.0. All continuous data was checked for the normality. Parametric test such as T-test, Pearson correlation test were used. Pearson chi square analysis was utilised to determine association between variables.

RESULTS AND DISCUSSION

Total of 119 patients from Specialist Clinic An-Nur from 2014 were included in the study. Demographic data of patients are shown in Table 1.

Table 1: Demographic data

Characteristics		Frequency	Percentage (%)
Gender	Male	71	59.7
	Female	48	40.3
Age	≤45 years	55	46.2
	46-65 year	50	42
	≥66 years	14	11.8
BMI	Underweight, <18	3	2.5
	Normal, 18.5-22.9	13	10.9
	Pre-Obese, 23-27.4	27	22.7
	Obese 1, 27.5-34.9	57	47.9
	Obese 2, 35-39.9	14	11.8
	Obese 3, >40	5	4.2

There were 71 (59.66%) males and 48 (40.34%) were females. Among middle-aged people, CAD is 2 to 5 times more common in men than in women (Jousilahti et al., 1999). Although this shows men are more affected by CAD, it remains as a major concern for both sexes. In women the risk of death from cardiovascular disease shows a significant increase when reaching 60 years of age (Mikkola et al., 2013). It is generally accepted that as age increases, they are more likely to develop

CAD. Furthermore, aging is associated with increased vulnerability to endothelial injury and decreased endothelial repair (Torella et al., 2004). However, in this study it shows that patients in group of 45 years below have the highest number diagnosed with CAD. This shows a transition of population of those having CAD as it may be seen even at the middle age.

The mean total BMI in patients in this study was 29.14 kg/m2. Obesity is one of the risk factors for CAD and earlier onset of metabolic diseases such as diabetes mellitus and hypertension (Ritchie & Connell, 2006). There was no significant difference in mean of male BMI (29.47 kg/m2) and mean of female BMI (28.65 kg/m2), P= 0.466.

Data for serum lipid level was only available for 112 patients. Analysis of the mean total cholesterol of patients showed value of 5.12 mmol/L, which is within the normal limit of 5.2 mmol/L. There was no significant difference in mean cholesterol of male (5.09 mmol/L) and the mean of cholesterol of female (5.17 mmol/L), P= 0.812. This reflects the high level of medication adherence among the patients surveyed. Besides that, dietary intakes also play a major role in controlling cholesterol level. In a further analysis, patients were divided into 2 groups based on their cholesterol level: group 1 the normal group (<5.2 mmol/L) and group 2 the higher-level group (>5.2 mmol/L). It was found that 57 (48.8%) CAD patients (34 males and 23 females) are classified under normal group whereas 55 (46.2%) CAD patients (33 males and 22 females) result to have higher cholesterol level. The distribution of cholesterol level in different age group shows that CAD patients who have higher cholesterol are those aged less than 45 years old followed by group 46-65 years and more than 66 years. This shows that the younger generation already experienced an abnormal cholesterol level which then progress to atherosclerosis thus increasing the risk of CAD at an early age. This observation may be linked to the about high prevalence of CAD patients among patients who are less than 45 years old (Nadeem et al., 2013). The contribution to the trend may be due to the lifestyle of consuming a high lipid diet as well as smoking habits among young adults.

Association between obesity with cholesterol level was investigated. The positive relationship between level of cholesterol with BMI was not seen in this study as there were no significant difference in the cholesterol levels between different BMI classes, P=0.26. Mean total triglyceride (TG) of CAD patients in this study was 1.29mmol/L. There was no significant difference in mean TG of males (1.23mmol/L) and females (1.38 mmol/L), P= 0.927. The mean TG is >1.68mmol/L. TG as a risk indicator for CAD is still being debated. Evidence state that the role of TG as biomarker has been inconclusive and treatments aimed at lowering TG level have not yet succeeded in reducing disease risk (Do et al., 2013).

The mean total HDL cholesterol level of patients was 1.29 mmol/L. The results show that patients HDL level is in the normal range (>1.03 mmol/L). There was no significant difference in mean cholesterol of male (1.38 mmol/L) and the mean of cholesterol of female (1.23 mmol/L), P= 0.927. Patients were divided into 2 groups based on their HDL level: group 1 the normal group (>1.03) and group 2 the lower-level group (<1.03). It was found that the normal group was the majority with 99 (83%) patients (57 males and 42 females). Low serum levels of HDL are commonly encountered in patients with CAD (Toth, 2004). As a result, HDL-C is gaining increasing interest as a therapeutic target (Natarajan et al., 2010). In this study, it was observed that the mean of total HDL cholesterol was 1.29 mmol/L (1.23 males and 1.38 females) which fall between the desired range.

The mean total LDL cholesterol level of patients was 3.12 mmol/L. There was no significant difference in mean cholesterol of male (3.12 mmol/L) and the mean of cholesterol of female (3.08 mmol/L), P= 0.887. Majority of patients (87 patients, 73%) in this study have higher level of LDL level than the normal range (<2.58 mmol/L). Disorders LDL metabolism is associated with accelerated atherosclerosis (Grundy et al., 2004). The age group with highest LDL level are those <45 years old. Diet high in saturated fat leads to high LDL cholesterol and has been associated with increased risk of CAD (Siri-Tarino et al., 2010). Raised LDL level has been shown to be strong independent risk factor for CAD in numerous cross sectional, prospective and intervention trials (Cromwell et al., 2007). Analysis of the association of LDL level with BMI observed that the number of patients in all BMI classifications are higher in the group having abnormal reading of LDL level. This may be due to the established correlation between LDL level and CAD risk (Cromwell et al., 2007). This reinforced the hypothesis that LDL level is an independent risk factor as it has no association with BMI.

Data for HbA1c was available for 49 patients. Diabetes mellitus (DM) is one of the major public health problems worldwide, affecting approximately 24 million individuals in the US alone (Cowie et al., 2009). DM patients face 2- to 4-fold increased risk of death due to cardiovascular problems and are also regarded to have worse CAD prognosis (Aronson & Edelman, 2014). More than 70% of patients with type 2 diabetes die from cardiovascular causes (Moss et al., 1991). Plus, individuals with HbA1c ≥6.5% had 10-fold increase CAD risk (Cahill et al., 2015). Mean HbA1c level of patients was 7.37%, with majority having readings within the range of 6.5%-7.5%. It was found that there was no significant difference in mean HbA1c of male (7.17 %) and the mean of HbA1c of female (7.45 %), P= 0.220. Current study results show that patients HbA1c level is high (7.37 %). This may indicate uncontrolled diabetes although medication has been prescribed. National Health and Morbidity Survey 2019 revealed that 1.7 million Malaysians (8.1%) have the three major risk factors for CAD which are diabetes, HTN and high cholesterol levels. A concerning 5% of young Malaysians aged 18-29 are already diabetic (6th Clinical Practice Guideline for Management of Type II Diabetes, 2020). In this study, patients with diabetes are mostly aged between 46-65 years old. As diabetes is also a strong indicator for CAD, monitoring of HbA1c level in this age group should be considered. However, careful glycaemic control does not contribute to better outcomes at it leads to higher incidence of hypoglycaemia but has no effect on mortality (Aronson & Edelman, 2015). Study by Nura et al., (2021) revealed that uncontrolled DM was associated with anxiety and depression among CAD patients. Thus, this may suggest HbA1c is a parameter that needs to be emphasized when monitoring CAD, but the therapy should be holistic to include mental health as well.

CONCLUSION

A total of 119 patients were characterised and cholesterol level results most of patients have an undesired level of LDL level. Based on result of HbA1c level, majority of patients have >6.5% HbA1c level. The results confirmed an expected connection between CAD and non-modifiable risk factors such as gender and BMI. Results of current research can be used to promote public health awareness that will ultimately reduce heart disease in CAD patients in Malaysia, positively change public policy health laws and implementations, and contribute to social change by providing insight into the need for public policy that encourages a competent health care system.

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