CORONARY HEART DISEASE RISK FACTORS : PREVALENCE AMONG THE FEMALE MALAY USM STAFFS

by

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TABLE OF CONTENT

LIST OF FIGURE

LIST OF TABLES

ABSTRACT

Cardiovascular disease is progressively becoming a major cause of morbidity and mortality in women generally after menopause. In this study, our aim was to detect the prevalence of risk factors for coronary heart disease (CHD) among Malay female USM staffs aged 30 or over and to inform individual presenting with coronary heart disease.

We examined the risk factors for CHD, which includes high blood pressure, high blood cholesterol, hypertension, diabetes, and higher body mass index, which are common in women. The blood samples was analyzed and questionnaire was given out to the Malay female staff in USM from December 2004 to March 2005.

Distribution of subjects according to staff categories is 30% academic and 70% non-academic staff. From the data analysis, 62.5% of the subjects do the physical activity more than 1 hour however 68% of there are obese, 25% with hypertension, 43.8% suffering from hypercholesterolemia and 12.5% having high blood glucose. In this study, we can conclude that there is no significant difference between active and passive subjects to CHD. Therefore, we would like to mention that in addition to the primary prevention and early detection of CHD, the compliance of patients with their treatment should be the focus of clinicians in order to minimize CHD morbidity and mortality.

ABSTRACT

Penyakit kardiovaskular merupakan penyebab utama morbidity dan mortality dikalangan wanita selepas menopaus. Dalam kajian ini, tujuan utama kami ialah untuk mengkaji prevalensi faktor berisiko penyakit jantung koronari dikalangan kakitangan wanita melayu USM yang berumur 30 tahun ke atas dan memaklumkan kepada subjek jika mempunyai penyakit jantung koronari.

Kami menilai faktor risiko contohnya tekanan darah tinggi, kolesterol dalam darah, hipertensi, diabetes, dan indek berat badan yang menjadi kebiasaan pada wanita. Dilihat dari keseluruhan, faktor ini menyumbang prevalensi yang tinggi untuk mendapat PJK pada wanita. Sampel darah diambil dari subjek dan borang soal selidik telah diberikan dari Disember 2004 hingga Mac 2005.

Distribusi subjek mengikut kategori kakitangan ialah 30% akademik dan 70% bukan kakitangan akademik. Kakitangan akademik tidak berminat untuk menjadi peserta dan menjadikan kesibukkan kerja sebagai alasan. Dari analisis data, 62.5% subjek melakukan aktiviti fizikal melebihi 1 jam sehari tetapi 68% mengalami obese, 25% hipertensi, 43.8% mempunyai kolesterol dalam darah yang tinggi dan 12.5% kadar glukos tinggi dalam darah.

Selepas kajian ini, kesimpulan yang diperolehi ialah tiada signifikasi perbezaan diantara subjek yang aktif bersukan dan yang tidak aktif bersukan. Walaubagaimanapun, yang paling penting adalah pencegahan awal dan pemeriksaan awal untuk penyakit jantung koronari. Untuk mengurangkan kadar morbiditi dan mortaliti penyakit jantung koronari adalah disyorkan supaya pihak hospital memberi lebih perhatian terhadap rawatan yang berkesan.

1.0   INTRODUCTION

Coronary heart disease (CHD) is a leading cause of morbidity and mortality in many countries worldwide. It is being estimated to be the single largest cause of disease burden globally by the year 2020. It is markedly more common in men and the risk increases with age. The established major risk factors for CHD in most populations include a 'rich' diet, smoking, physical inactivity, obesity, hypertension, diabetes mellitus and hypercholesterolemia.

In 1999, the Statistical Department of Ministry Of Health reported that the CHD was the leading of the mortality rate of selected disease of the circulatory system. From the statistic, about 2088 people per 100,000 or 9.19% died because of CHD. In 2002, Ministry of Health reported that the CHD is leading causes of death in government hospital. About 5209 patients or 14.51% died caused of CHD in Malaysia. Malaysia has undergone rapid socio-economic development over the past few decades. Living status of the people has improved, and the life-style has changed.

Malaysia is a nation consisting of about 25 million people comprising approximately 55% Malay, 30% Chinese, 10% Indians and 5% from other ethnic groups. Over the past few decades it has undergone rapid socioeconomic development and CHD has become a leading cause of death.

1.1 Coronary heart disease

The heart is a double self-adjusting muscular pump, which work in unison to propel blood to all parts of the body. The right side of the heart receives poorly oxygenated blood from the body through the superior vena cava and interior vena cava and pumps the blood through the pulmonary trunk to the lungs for oxygenation. The left side receives well-oxygenated blood from the lung through the pulmonary veins and pumps it into the aorta for distribution to the whole body.

Coronary heart disease (CHD) occurs when the arteries that supply blood to the heart muscle (coronary arteries) become hardened and narrowed due to the build up of plaque on the inner walls or lining of the arteries (artherosclerosis) (Figure 1.1). Artheriosclerosis is a slow, progressive disease that may start in childhood. It can affect the arteries of the brain, heart, kidneys and the arms and legs. As plaque build up it can cause serious diseases and complications. Plaque is made up of fat, cholesterol, calcium and other substances found in the blood. The build up of plaque will eventually narrows the inner side of the artery and in time may restrict blood flow. Soft plaque is more likely to break apart from the walls and enter the bloodstream. This can cause blood clot that may partially or totally block the flow of blood in the artery.
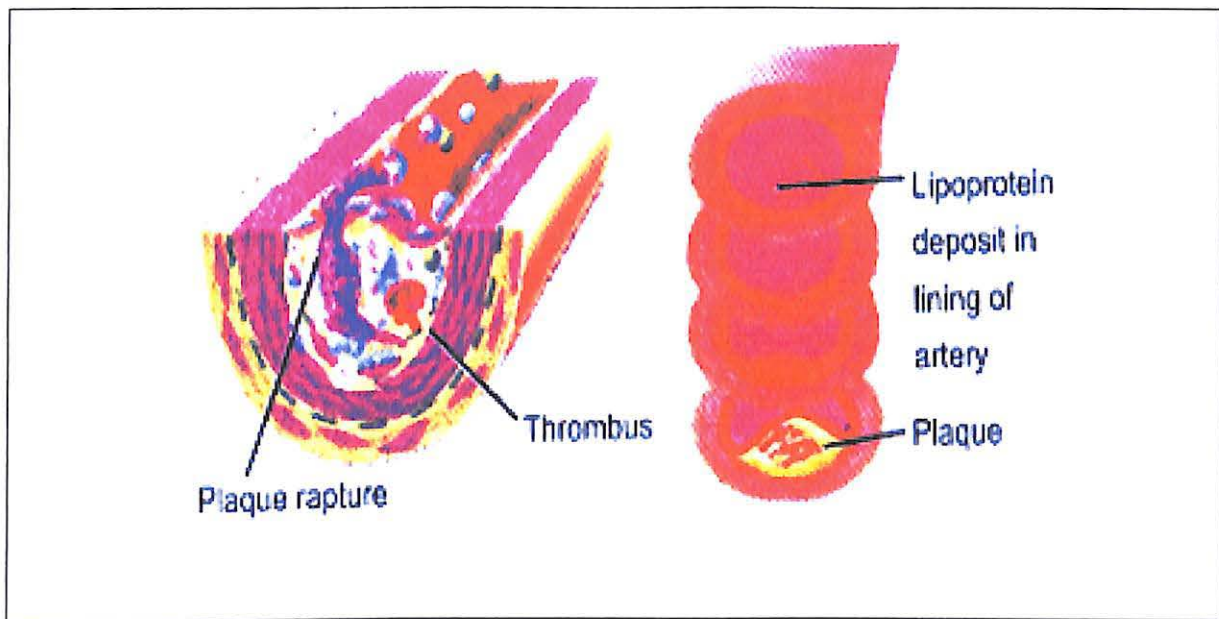
Figure 1.1: Deposition of hard yellow plaques of lipoid material in intimal layer of arteries

When blood flow and oxygen supply to the heart are reduced or cut off, it can cause angina or heart attack. Angina is the chest pain or discomfort that occurs when the heart is not getting enough blood. While the heart attack occurs when a blood clot suddenly cuts off most or all blood supply to part of the heart. Cells in the heart muscle that do not receive enough oxygen-carrying blood begin to die. This may cause permanent damage to the heart muscle (Figure 1.2).
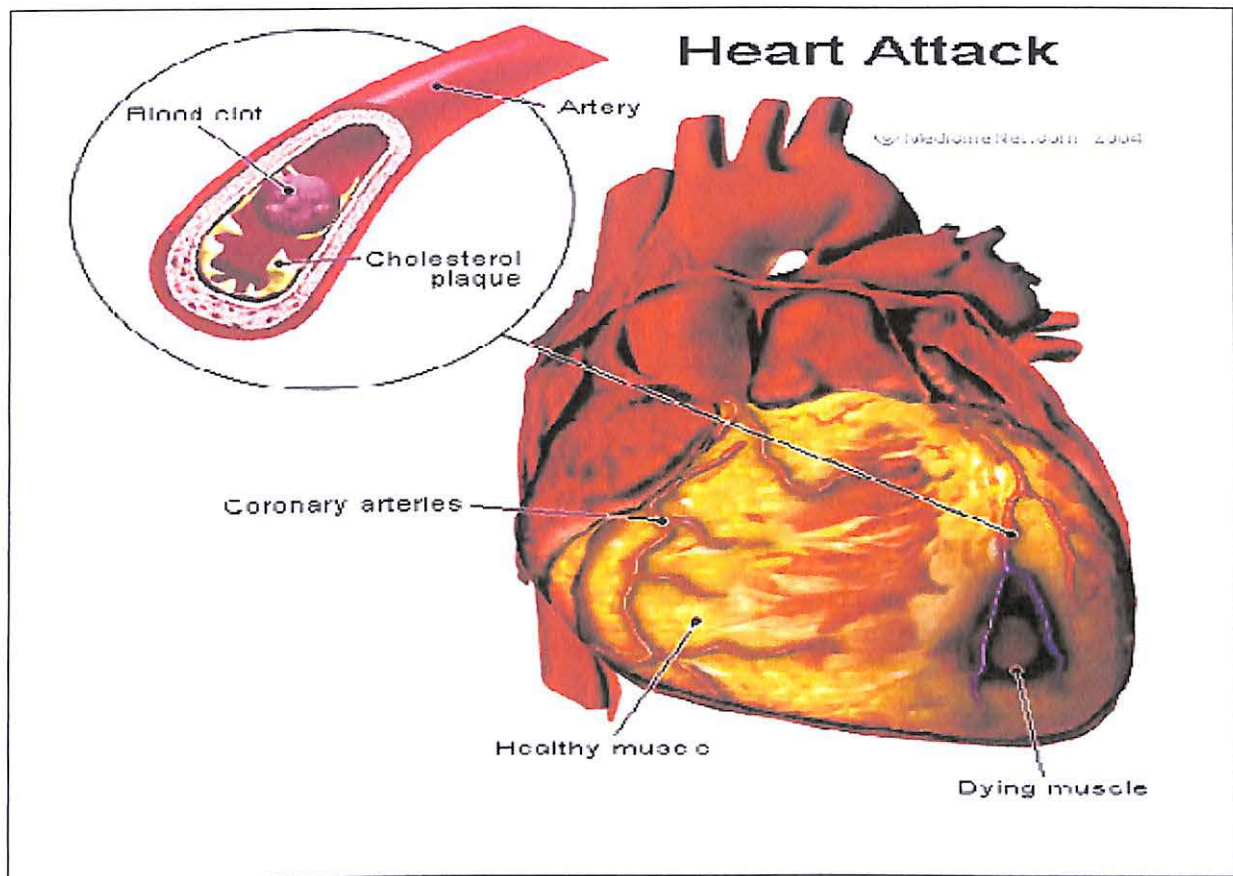
Figure 1.2 : Blood clot cuts off most or all blood supply to part of the heart

Over a period of time, CHD may weaken the heart muscle and contribute to heart failure and arrhythmias. In heart failure, the heart is not able to pump blood to the rest of the body effectively. Heart failure does not mean that heart stopped or is about to stop working. But it does mean that the heart is failing to pump blood the way that it should. Arrhythmias are changes in the normal rhythm of the heartbeats and can be quite serious.

The common sign and symptoms of CHD are chest pain, chest discomfort or angina. Sometimes it can cause pain in one or both the arms, the left shoulder, neck, jaw or back. The shortness of breath is very common in CHD. It can happen while the patient doing the physical activities like jogging or fast walking. The severity of the symptoms varies widely. The symptoms may become more severe as coronary arteries become narrower due to the build up of plaque. In some people, the first sign of CHD is a heart attack. A heart attack occurs when plaque in a coronary artery breaks apart, causing blood clot or to form and block the artery.

Coronary Heart Disease is developing in influenced by number of the risks factor. It is more likely with increasing the age. As somebody gets older, the risk for CHD increases. Cardiovascular disease is progressively becoming a major cause of morbidity and mortality in women generally after menopause (Luna *et al.*, 2002).

1.2 CHD risk factors

More than 3.2% to 34.3% among female aged 30-60 in developing countries are prone to suffer from CHD (Pyatat *et al.*, 1998). The main modifiable risk factors for CHD are elevated blood cholesterol, elevated blood pressure, diabetes, obesity, smoking and lack of physical activity and consumption of fatty foods and oils. Elevated blood cholesterol or hypercholesterolemia can be serious. People with high blood cholesterol have a greater chance of getting heart disease. High blood cholesterol itself does not cause symptoms; so many people are unaware that their cholesterol level is too high. The role of plasma lipids blood pressure, physical activity and obesity in CHD will be briefly discussed below.

1.2.1 Lipid

Lipid is the chemically diverse and insoluble in water. It is only soluble in organic solvents such as chloroform, benzene, ether and alcohol. Lipid is a long chain hydrocarbon and can be either hydrophobic or amphipathic. Total plasma lipid is in the human body about 400-600 mg/dl. Approximately, one- third is cholesterol (I50-200 mg/dl), one-third is triglyceride (50-200mg/dl) and one-third is phospholipid (150-200 mg/dl). Because lipids are insoluble in water they need the help of carriers in plasma. Therefore, they are complexes with proteins to form lipoproteins and the protein part on surface of lipoprotein is called apolipoprotein.

They're so many function of lipid and are ubiquitous in body tissues. It is plays an important role in all aspects of life. For example storage form of energy, structural components of biomembranes, provide insulation against changes in external temperature (subcutaneous fat), protect internal organs by providing a cushioning effect (pads of fats), metabolic regulators (steroid hormones and prostaglandins), surfactants, detergents and emulsifying agents (amphipathic lipids), act as electrical insulators in neurons and facilitate absorption of fat- soluble vitamins (A,D,E and K).

1.2.1.1   Cholesterol

Cholesterol, a waxy, fat-like substance is found in all cells of the body. The body needs cholesterol in process that is fundamental to energy metabolism and cell membrane homeostasis. Cholesterol is found in some foods that come from animal sources for example egg yolks, meat, and cheese. The body need the cholesterol to make hormones, vitamin D and substances that help in digesting foods. Cholesterol is insoluble before it can be transported in plasma, which is predominantly water. This can be achieved by its inclusion into lipid protein. The small, complexes carrier known as lipoprotein packages are made of fat on the inside and proteins on the outside (Figure 1.3).
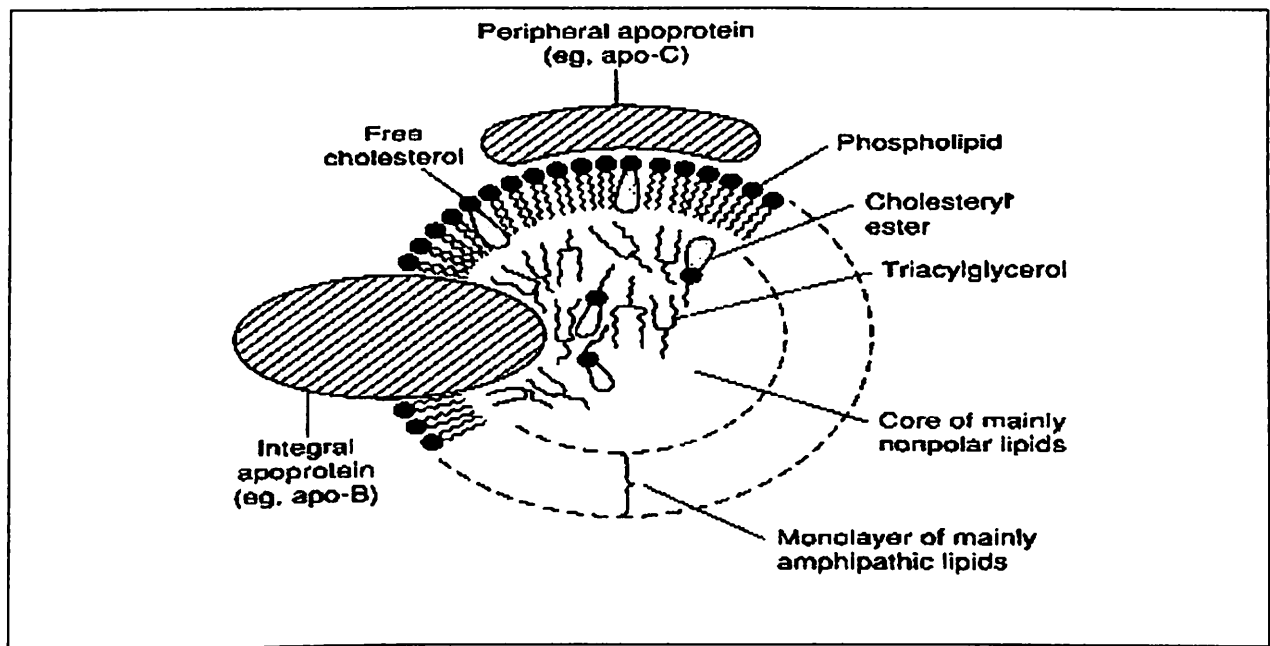
Figure 1.3: Structure of lipoprotein

1.2.1.2 Triglycerides

Triglycerides are the most significant source of fatty acids, because this is the form in which dietary lipids are assembled by the gut and liver. Triglycerides made up of long chain fatty acids, in the form of chylomicrons, which is from the intestinal absorption or lipoprotein from hepatic synthesis, are hydrolysed to glycerol and free fatty acids by an enzyme called lipoprotein lipase (LPL). Lipoprotein lipase is synthesized in adipocytes and secreted into adjacent endothelial cells. Chylomicrons and lipoprotein (very low density lipoprotein) contain C-11 apoprotein, which activates LPL. Free fatty acids are taken up by adipocytes in a concentration-dependent manner by a transmembrane transport protein.

Once triglycerides are hydrolyzed to fatty acids and glycerol, fatty acids enter the common free fatty acid pool where they may be re-esterified, undergo beta-oxidation (metabolic degradation), or be released into the circulation as substrates for skeletal muscle, cardiac muscle, and liver. If the fatty acids are to undergo beta-oxidation for ATP production, fatty acids move from the adipocytes into the blood and are carried to the tissues that can use them as an energy source. Long-chain fatty acids enter the cells of these tissues by passive diffusion, and their rate of uptake is proportional to their difference in concentration inside and outside of the cell.

Once inside the cells, beta-oxidation begins with "activation", that is, the formation of thioesters with coenzyme A. This activation step converts the fatty acids to a form that is more amenable to the successive biochemical changes that ultimately result in ATP formation. Triglycerides consist of glycerol esterified with three long-chain fatty acids, such as stearic or palmitic acids. Although the majority of fatty acids in the body are saturated, certain unsaturated fatty acids are important as precursors of prostaglandin and in the esterification of cholesterol.

Triglycerides containing both saturated and unsaturated fatty acids are important component of cell membranes. The high level of triglyceride in blood plasma can cause hypertriglyceridemia or Type I hypercholesterolemia in Frederickson -WHO classification. Triglycerides above 200mg/D1 are considered abnormal, but whether it is the accompanying low HDL that causes the increased risk is not clear because lowering triglycerides does not appear to lower risk.

9

1.2.1.3   High-density lipoprotein

High-density lipoprotein (HDL) or the good cholesterol carries cholesterol from other parts of the body back to the liver. The liver removes the cholesterol from the body through the gastrointestinal tract. HDL is main transport form of cholesterol from peripheral tissues to liver and cholesterol later is excreted through bile. HDL can be further divided by density into TWO sub-populations, HDL$_2$ and HDL$_3$. HDL$_2$ and HDL$_3$ have different metabolic roles and clinical significance. HDL-2 is "anti-atherogenic" or "protective" in natures so HDL-2 type is known as "good cholesterol".

HDL level less than 35 mg/dl in blood plasma will increases the risk occurs of coronary heart disease (CHD) while, level more than 60 mg/dl completely protects a person from CHD. HDL carries cholesterol from other parts of our body back to the liver. The liver removes the cholesterol from the body through the gastrointestinal tract. The higher HDL cholesterol level in the body is directly proportional with the lower of the chances of getting heart disease.

1.2.1.4   Low-density lipoprotein

Low-density lipoprotein (LDL) is cholesterol rich molecules about 75% containing only apolipoprotein B-100. It are derivatives from Very low density lipoprotein (VLDL) after the process of liberated of free fatty acids from liver to the peripheral tissue. The remnant is produce from VLDL known as Intermediate density lipoprotein (IDL). Liver takes up the small part of IDL and produce Low-density lipoprotein (LDL). Conversion of VLDL to IDL and then to LDL is referred to as Lipoprotein cascade

pathway. The main function of LDL is to transport cholesterol from liver to peripheral tissues.

LDL concentration in blood has positive correlation with incidence of cardiovascular diseases. LDL cholesterol is "bad" because LDL, specially oxidized LDL, creates a pro-coagulant surface on epithelium, causing blood clot formation. Oxidized LDL is rich in cigarette smokers, patients with diabetes mellitus and in insulin resistance. Low-density lipoproteins (LDL) can be oxidized by free radicals. This causes them to be incorporated into the intima by macrophages. The cholesterol and fat from LDL are the main source of cholesterol accumulation and blockage in the arteries. Thus the more LDL-cholesterol in the blood, the greater the risk of heart disease.
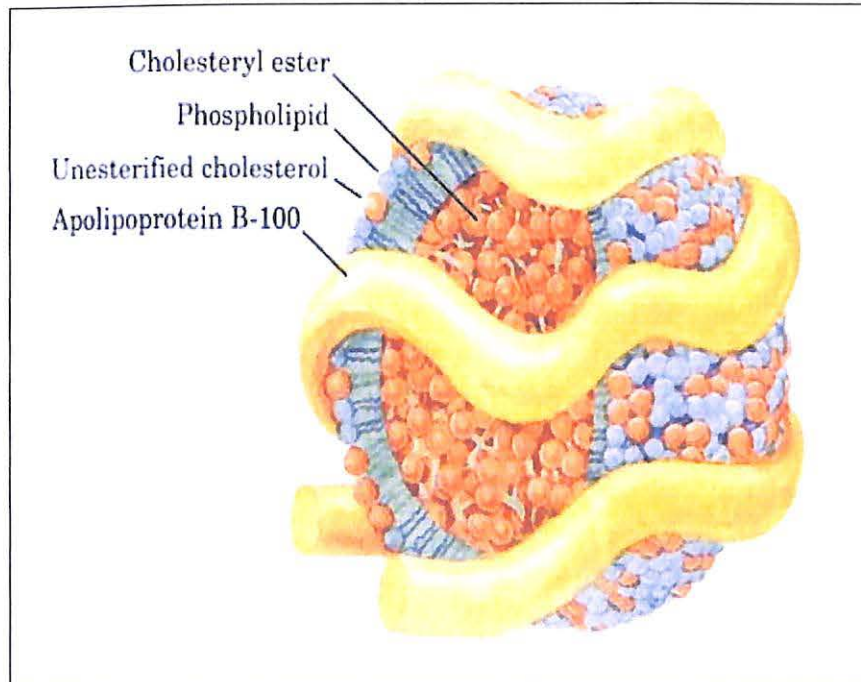

Figure 1.4 : Low Density Lipoprotein structure

Hypercholesterolemia is caused by several controlled and uncontrolled factors. Some foods can raise the cholesterol level. These foods contain saturated fat and raise the LDL cholesterol level more than anything else in the diets. Trans fatty acids (trans fats) are made when vegetables oil is 'hydrogenated' to harden it. Trans fatty acids also raise cholesterol levels. Cholesterol also found in foods that come from animal sources, for example eggs yolks, meat and cheese. Inversely when a lot of the dietary fibre intake everyday, the risk of CHD decreases (Pereira et al., 2004).

Another controllable factor in hypercholesterolemia is weight. Being overweight tends to increases the LDL level, lower HDL level, and increases the total cholesterol level. The lack of regular activity can lead to weight gain and raise the LDL cholesterol level. Regular exercise can help to lose weight and lower the LDL level and raised the HDL level.

The uncontrolled factors that can influence hypercholesterolemia are heredity, age and sex (Jousilahti et al., 1999). High blood cholesterol can run in families. An inherited genetic condition results in very high LDL cholesterol levels. It is called familial hypercholesterolemia. It begins at birth, and results in heart attack at an early age. Starting at puberty, men have lower levels of HDL than women. As women and men get older, their LDL cholesterol levels rise. Younger women have lower LDL cholesterol levels than men, but after the age of 55 they'll have higher levels of LDL cholesterol than men. It is because when the women reach

menopause, the estrogen hormone level will be lower and the risk of CHD increases with age.

1.2.1.5 Hypertension

Elevated blood pressure or hypertension is the health problem most commonly associated with obesity, and being overweight, the greater the risk. Hypertension carries its own serious risk for stroke and heart attack, a major risk factor for heart failure. There is a linkage between hypertension and Coronary heart disease with respect to irregular work hours, shift work, frequent work-related trips, working in a cold or noisy environment, and jet lag. In addition, the chronic effects of psychological job strain, which can be conceptualized by the job demand-control-support model, are related to cardiovascular disease. In this model, high job demand and low work control accompanied by low social support at work are the most harmful to health (Kobayashi , 2004).

1.2.1.6 Diabetes mellitus

Insulin resistance, which is a factor in obesity, stimulates parts of the nervous system to retain sodium, which in turn increases blood pressure. Obesity may also alter the kidney's physical characteristics and function, leading to retention of sodium and water. Blood pressure rises as the body tries to restore the flows of fluids. Even modest weight loss is beneficial in reducing blood pressure and the risk of heart failure.

The increased risk for Coronary Heart Disease in women with either type 1 or type 2 diabetes has been well documented. Interventions directed towards primary, secondary and tertiary prevention should be promptly implemented in these women to improve long-term outcomes. Approximately 10% have type 1 diabetes, which is characterised by insulin deficiency and an absolute requirement for exogenous insulin. The remaining 90% have type 2 diabetes, which is characterised by defects in insulin secretion and sensitivity (Howard *et al.*, 1998).

Regardless of the pathophysiological defect causing hyperglycaemia, there is a growing appreciation of the acceleration in risk for coronary heart disease in women with any form of diabetes. In fact, diabetes erases any protective female advantages in regard to CHD, which is the number one cause of death in diabetes women. Diabetes mellitus is a stronger CHD risk factor in women than in men, and CHD rates are approximately 3-7 times greater among diabetic women than among non-diabetic women (Luna *et al.*, 2002). The increase in CHD risk in women with diabetes has been confirmed in other epidemiological studies. In fact, there is concern that, with the alarming increase in the prevalence of diabetes, the prevalence of CHD mortality is also increasing, particularly for women (Gu *et al.*, 1998).

This increases in CHD morbidity and mortality in women is observed at the time of diagnosis of diabetes, as well as in normoglycemic women who develop diabetes at a later date, suggesting both a delay in the diagnosis of dysglycaemia as well as the

14

presence of prior contributing risks factors. Dysglycaemia is the term to refer the abnormality in plasma lipid transport thus causing decrease or increase of lipids in plasma. For women with or at risk for type 2 diabetes, as well as for many with type 1 diabetes, abnormalities in glucose tolerance serve as one manifestation of Syndrome X, or the insulin resistance syndrome, which includes dyslipidaemia, hypertension, and obesity. These disorders, taken together, are associated with an increased risk for cardiovascular disease. Several potential interacting factors may contribute to the acceleration of CHD risk in women with diabetes. These include a greater tendency for poor glycemic control, more severe elevations in blood pressure and circulating lipids, the development of central obesity, higher rates of depression, and low socio-economic status (Isomaa *et al.*, 2001).

In women, factors that can influence stability of glycemic control over time include a higher frequency of eating disorders, use of hormonal contraception, menstrual variability in glucose control and insulin sensitivity, pregnancy, and variability in glucose control through per menopause. The term "dyslipidaemia" is used to describe the lipid abnormalities associated with the insulin resistance syndrome. These abnormalities include elevated triglycerides, low HDL cholesterol, and small, dense, atherogenic LDL cholesterol particles. High triglycerides and low HDL have a greater adverse impact on risk for vascular diseases in women. Measurement of the non-HDL cholesterol, which indirectly account for this triad of lipid abnormalities, is emerging as the most significant predictor of CHD risk in both women and men with diabetes (Lu *et al.*, 2003).

This measurement is calculated by subtracting the HDL from the total cholesterol and is recommended as a secondary target for lipid -lowering therapy once LDL cholesterol is at goal level. Diabetes is more likely to be associated with elevations in both systolic and diastolic blood pressure in women than in men. This is independent of age, obesity, body fat distribution and fasting insulin. Together with hyperglycaemia, hypertension predisposes to the development of micro albuminuria and proteinuria, which in turn further aggravates the risk for vascular complications (Haffner et al., 1992).

1.2.1.7 Obesity

Obesity is measure by the weight in pounds times 704 divided by the square of the height in inches equals the Body Mass Index (BMI). Overweight is now defined as a BMI of more than 25 to 29.9 and obesity as a BMI of 30 or above. Waist measurement with the tape passing over the top of the hips is a good indicator of risk. Over 40 inch in men is known as abdominal obesity and over 35 inch in women referred as abdominal obesity. A pear shape is less of a risk than an apple shape. Everyone does not carry his or her adipose tissue in the same anatomical locations. Adipose tissue that is located predominantly on the upper body has been termed android, male, central, upper-body segment, or "apple" distribution. This distribution pattern is found more frequently in men. When adipose tissue accumulates predominantly in the lower body, the terms gynoid, female, lower-body segment, or

"pear" distribution are used. As the terms gynoid and female imply, this fat pattern is found more frequently in women than in men.

Obesity is not a single disorder. A variety of methods and criteria are used to diagnose the presence of obesity. It is the quantity of adipose tissue and not just total body weight that defines obesity. Several factors contribute to the development of obesity: genetics, environment, physiology, psychology, and undetermined. Obesity is a risk factor for heart disease, high blood pressure, diabetes, and stroke. People who are obese have almost three times the risks for heart disease as compared to people with normal weight and contribute 27.9% from all the risks to get CHD (Pyatat *et al.*, 1998). Fat cells in the upper part of the body appear to have different qualities from those found in the lower parts.

Obesity is a stable weight depends on an even balance between energy intake from food and energy expenditure. When a person's caloric intake exceeds her energy expenditure, the body stores the extra calories in the fat cells present in adipose tissues. This adipose cell function as energy reservoirs, and they enlarge or contract depending on how people used this energy. If people do not balance energy input and output by adopting healthy eating habit and regular exercise, then fat build up, and they may become over weight.

Environment influences on obesity include food intake and degree of physical activity. Overeating relative to energy needs is a component of obesity development.

The amount of energy that an individual expends will also influence the development of obesity. Increase level of activity is associated with leanness other than the energy deficit that occurs with exercise, metabolic change with training also impact fat utilization and storage (Albright *et al.*, 1998).

1.2.1.8 Physical activity

Physical inactivity is very common in the urban life. Most urban society doesn't have the time to do physical activity. The higher their education, the lower their physical activity (Takao *et al.*, 2003). Exercise 3 times a week has shown to promote weight loss, improve insulin sensitivity, lower blood pressure and raise HDL cholesterol. Exercise can also replace fat with muscle. Most experts recommended building up to 45 to 60 hours of mostly aerobic exercise. If fats are not burned, the risks in getting CHD will become higher. Physical inactivity is linked to obesity. Because obesity is so often relates to the CHD, it has been proven that physical activity is very important in preventing CHD. Physical activity also gives so many benefits to cardiovascular. It can even reduce the deposit of fats and reduce blood pressure.

1.2.1.9 Ethnicity

Ethnicity is another uncontrolled risk factors related to CHD. Research has shown that the Asians Indians were at greater risk in getting CHD compared to the malays and chinese. It is due to the traditional daily diet intake, which is full of fats (Jeannete *et al.*, 2001). The Indians show the highest prevalence for hypercholesterolemia and diabetes mellitus. The malays too also show relatively

high prevalence for hypertension and hypertriglycerides (Geok Lin Khor, 1994). Overweight is also common with the indians and the malays. This study is directly proportional with the rapid socio-economic development and urbanization in recent decades. Many of the malays and indians migrated to the city and enjoy the urban life style.

Most of the Malaysian are used palm oil as their cooking oil. Studies have shown that the palm oil is a hypocholesterolemia agent. These results support observations from previous studies on lowering plasma cholesterol in animals by tocotrienols, which are naturally occurring compounds in grain and palm oils and may have some effect on lowering plasma cholesterol in humans (Qureshi *et al.*, 1991). Therefore, in this research project, our aim is to know the distribution and prevalence of these major risk factors among the female staffs of USMKK and to identify the individuals who are at risks, for appropriate prevention measures.
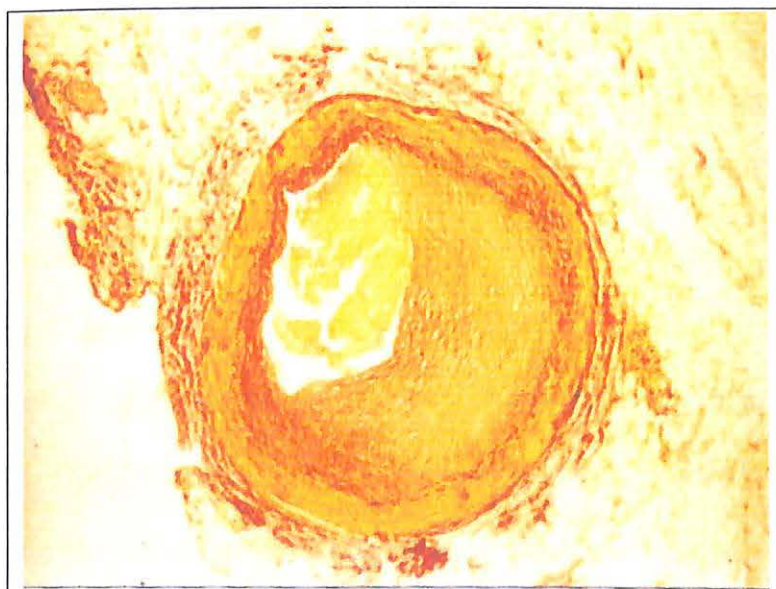

Figure 1.5 : Photograph of an arterial plaque

1.3 Scope

Strategies for preventing early CHD include measures to control the above risk factors directed towards the population as a whole and the individual subjects at high risk. Although the USMKK is in rural Kelantan, but the staffs here enjoy completely urban lives. USMKK has recently been declared the healthy campus, but no program is visible other than only limited campaign on 'to quit smoking'. Health education program and screening for the risk factors of some of the fatal diseases like CHD among the staffs have not yet been installed. USM Health Campus (USMKK) comprises both male and female staffs of different categories. Their lifestyle varies according to their post & position and on the overall income of the family. Even some of them have the habit of frequent food intake. This Campus has been declared as a healthy campus recently, but the program may not work, if its staffs are not free from CHD risks.

Thus, subjects are 30 years and above, without known diseases, and neither on drugs representing the female staff in USM Health Campus was randomly picked for the study. A cross-sectional epidemiology data were obtained from the subject, who includes their ages, job status, ethnicity, physical activity, smoking habits, body mass index and family history on CHD. The biochemical parameters namely fasting blood sugar, fasting lipid profile, and blood pressure were also taken from the subjects. For the study of biochemical parameters, blood sample were withdrawn from the subject after an overnight fasting and send for analysis in the Chemical Pathology Laboratory, USM.

1.4 Objectives

1. To identify the prevalence of some major CHD risk factors namely obesity, hypertension and physical activity among the female malay staffs of USMKK.

2. To identify the individuals who are at risks, for appropriate prevention measures.

2.0 LITERATURE REVIEW

Malaysia is a nation consisting of about 25 million people comprising approximately 55% Malay, 30% Chinese, 10% Indians and 5% from other ethnic groups. Over the past few decades it has undergone rapid socioeconomic development and CHD has become a leading cause of death. Indians consistently show the highest prevalence of hypertension, hypercholesterolemia and diabetes mellitus. Among the Malays, a relatively high prevalence of hypertension and hypertriglyceridemia has been reported but Chinese tends to have a lower prevalence for these CHD risk factors than the Indians and Malays (Geok, 1994).

Women tend to get coronary heart disease similarly with men. In both sexes, the risk of CHD increased markedly with age. In most population, total serum cholesterol increases as age increases. In women, the increase continues sharply until the age of 60 to 65 years. Like serum cholesterol, blood pressure also tends to increase with age, and more prominent in women than in men. The HDL/total cholesterol ratio is the major determinant of the sex difference in CHD risk with aging particularly in women. The decrease in estrogen production after menopause changes the female lipid metabolism toward a more antherogenic form by decreasing the HDL cholesterol and by increasing the LDL and total cholesterol, triglycerides, and lipoprotein (a) levels (Pekka *et al.*, 1999).

CHD is associated with diabetes mellitus. LDL is the main cholesterol-bearing lipoprotein and the major determinant of atherosclerosis in patients with diabetes. Triglyceride, VLDL remnants and IDL accumulate as a result of altered lipoprotein metabolism has been shown to be highly atherogenic. LDL cholesterol was the predictor of CHD in the patient with diabetes. Hazard ratios for the highest non-HDL cholesterol in women with diabetes were higher than those for either LDL cholesterol or triglycerides alone in women. Average LDL concentration in patients with diabetes may not be higher than those of their non-diabetic counterparts. Changes in LDL particles composition, such as density, oxidation potential, and glycation render even normal LDL levels highly atherogenic (Weiquan et al., 2003).

This measurement is calculated by subtracting the HDL from the total cholesterol and is recommended as a secondary target for lipid -lowering therapy once LDL cholesterol is at highest level. Diabetes is more likely to be associated with elevations in both systolic and diastolic blood pressure in women than in men. This is independent of age, obesity, body fat distribution and fasting insulin. Together with hyperglycaemia, hypertension predisposes to the development of micro albuminuria and proteinuria, which in turn, further aggravate the risk for vascular complications (Haffner et al., 1992).

The menopausal symptoms, such as hot flashes, vaginal dryness, sleep disorder and mood disturbances, which occur in women, causing a stress and hypertension. Metabolic changes in those women as they transition through the perimenopausal to

the menopausal state suggested that the women were exposed to the enhanced risk for CHD. Menopausal and long lasting effect of work can improve the stress in women. Women may be exposed long work hours combined with lack of sleep is a main contributed to major risk factor (Kobayashi, 2004).

Exercise can help promote weight loss, improve insulin sensitivity, lower blood pressure, and raise HDL cholesterol. Current recommendation suggests 60 minutes of moderate physical activity several days of week. Women have a higher rate of false-positive exercise stress than do men. The education status also plays the role in physical activity. In fact it showed that the lower education status having a greater physical activity than a higher education status. It is due to the working hours and the life style (Takao et al., 2003).

Dietary fiber intake and the risk of coronary heart disease has a better combination because the result show the consumption of dietary from cereals and fruit is inversely associated with risk of coronary heart disease. The associations were stronger for coronary mortality than for all events. Although cereal and fruit fiber have strong inverse associations with CHD risk, no such association were observed for vegetables fiber. These associations seemed to be independent of other dietary factors, sex, ages, baseline body mass index, smoking, and history of hypertension, diabetes and hypercholesterolemia (Pereira et al., 2004).