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Original Article

Cardiovascular Disease Risk Profiling Among First Degree Relatives of Coronary Artery Disease Patients Admitted in Cardiology Ward of JIPMER, Puducherry

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ABSTRACT

Background: Non-communicable diseases constitute about 68% of global death annually. Among NCD deaths, cardiovascular diseases (CVD) ranks first with a share of 46.2% amounting to 17.5 million deaths. First degree relatives of patients with coronary heart disease have a higher risk of getting cardiovascular events due to interplay between genetic as well as environmental factors. The aim of this research WAS to assess the prevalence of Cardiovascular Disease (CVD) risk factors and to estimate the cardiovascular risk among first degree relatives of CAD patients. **Methodology:** A cross-sectional study was performed in first degree relatives of coronary artery disease patients in cardiology ward of JIPMER a tertiary care hospital in Puducherry. Overall 218 first degree relatives aged ≥18 were involved in study. The desired information was obtained using a pre-tested questionnaire and participants were also subjected to anthropometric measurements and laboratory investigations. WHO/ISH risk prediction charts for the South-East Asian region was used to assess the cardiovascular risk among the study participants according to age, gender, blood pressure, smoking status, and presence or absence of diabetes mellitus. **Results:** The study covered 218 adults aged above 18 years. The mean age of the subjects was 41 (± 9) years and 56% subjects were men. Around 10% of the participants had more than 10% risk for the occurrence of cardiovascular events by using WHO/ISH risk prediction charts. In addition, CVD risk factors like physical inactivity, smoking, alcohol abuse, obesity, hypertension, diabetes abnormal lipid profile were found in 22.5%, 19.2%, 16.1%, 12.4%, 33%, 29% and 13.8% study participants, respectively. **Conclusion:** This cross-sectional study indicates that there is a high burden of CVD risk in the first degree relatives of coronary artery disease patients as assessed by WHO/ISH risk prediction charts. Opportunistic screening programs and appropriate risk stratification based management needs to be initiated for the first degree relatives of CVD patients.

Key words: Cardiovascular Disease, First degree relative, Prevalence, Cardiovascular risk prediction, CAD patients.

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BACKGROUND

Non communicable diseases like cardio vascular disorders, cancer, respiratory disorders and diabetes constitute 68% of global death annually. Among this 40% of deaths were in age group 30 to 70 years. CVDs alone constitute 31% of global deaths making it the leading cause of death. According to "WHO global status report on non-communicable diseases" published in 2014, deaths due to non-communicable diseases will increase from 38 million to 52 million in 2030 and more than 23 million may die annually due to cardio vascular diseases alone. Meanwhile in India non communicable diseases accounts for 60 per cent of all deaths and cardio vascular diseases alone contributes to 26 per cent of Indian mortality. In rural India due to poor health infrastructure cardiovascular events are found to be higher compared to urban counterparts. Across the globe also peak has shifted from developed to developing countries.[1-4]

INTERHEART study to identify risk factors for is chemic heart disease revealed that sedentary lifestyle, smoking, hypertension, psychosocial stress, abnormal lipids, diabetes, high waist-hip ratio, and a lack of consumption of vegetables and fruits are the cause of more than 90% of acute coronary heart disease events in South Asians.[5] In General cardiovascular risk factors can be broadly classified as 1) behavioural (tobacco use, alcohol consumption, unhealthy diet, inadequate physical activity) 2) physical (high BMI, waist circumference, elevated blood pressure) and3) biochemical (elevated blood glucose, elevated blood lipids). Due to several genetic and environmental factors population, first degree relatives of patients with coronary heart disease have a significant higher risk of getting cardiovascular events. This excessive risk is due to interplay between genetic as well as environmental factors. Clustering of various risk factors such as eating and life style habits, socio-economic status, exercise pattern and disease process like dyslipidemia, hypertension, defects in glucose metabolism make family members more prone to similar non- communicable diseases.[6]

WHO and National Programme for prevention of Cancer, Diabetes, Cardiovascular diseases and Stroke (NPCDCS) proposed opportunistic screening (screen adults wherever there is an opportunity of contact with the health system) as a main strategy to prevent NCDs. But in clinical setting any advice on life style modification or active intervention to manage risk factors are rarely given to family members .It was documented that only 17.8% of Coronary Artery Disease (CAD) patients had their family members screened for various risk factors.[7]

Currently, NCD prevention strategies are focusing more on integrated risk factor approach than individual risk factor. World Health Organization/ International Society of Hypertension (WHO/ISH) risk prediction charts assist in the estimation of 10-year risk of a fatal or non-fatal major cardiovascular event (stroke or myocardial infarction), based on age, gender, presence or absence of diabetes mellitus, smoking status ,systolic blood pressure and total blood cholesterol for 14 WHO epidemiological sub-regions which includes south-east Asia. This chart categorizes individuals into different risk categories and appropriate management is suggested for the respective group.[8-10]

Present study was conducted to assess the distribution of risk factors (behavioural, physical and bio-chemical) among first-degree relatives of patients with a known CAD event admitted in the department of Cardiology, JIPMER.

MATERIALS AND METHODS

A Cross-sectional analytical study was carried out among first-degree relatives of Coronary Artery Disease (CAD) patients admitted in the cardiology ward of Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry between 1st of January to 28th February 2015.

Study setting

JIPMER is a tertiary care teaching hospital and one of the Institutions of National Importance under Ministry of Health and Family Welfare, Government of India with a daily average out- and in-patients attendance of 6,247 and 1,481 respectively. Adult first degree relative (person who is either a close blood relative who includes the individual's parents, full siblings or children[11]) attendees (≥18 years) of patients admitted in the cardiology ward with a diagnosis of Myocardial Infarction, Coronary Artery Disease between 1st January to 28th February 2015 were included in the study after taking informed consent. First degree relatives who already had established cardiovascular disease (angina pectoris, coronary heart disease, myocardial infarction, transient ischemic attacks, cerebrovascular disease, peripheral vascular disease or after coronary revascularization or carotid endarterectomy) were excluded. To detect the prevalence of at least one risk factor among first degree relative as 91% with 5% absolute precision and 99% CI, minimum sample needed was 218.[12] The study was approved by institute ethics committee.

Study procedure

A day prior to enrolment of participants in the study, investigator screened the available first-degree relatives by interviewing attenders of patients diagnosed with Myocardial Infarction or CAD. After obtaining written consent, socio-demographic data like name, age, gender, monthly income were collected from study participants in order to make a case record in Medical record department of JIPMER. The study subjects were advised to come on next day morning with 8 hours of fasting to Cardiology OPD for measurement of biochemical and physical parameters. The investigator after training in interview techniques and anthropometric measurements administered the structured questionnaire and measured the baseline parameters as per standard protocol.[9,13,14] Screening of behavioural risks (self reported tobacco use, alcohol intake, diet, and physical activity), were done using a pretested structured proforma and screening of anthropometry and physical parameters like blood pressure, weight, height, waist and hip circumference were done as per their respective guidelines. For assessing bio-chemical parameters like blood glucose and lipid profile, 5 ml of fasting blood sample was collected and sent to biochemistry laboratory. Risk factor profiling of first-degree relatives was done using WHO/ISH risk prediction charts.[10] Ten year risk of a fatal or non-fatal major cardiovascular event (myocardial infarction or stroke) was assessed by WHO/ISH risk prediction chart according to age, gender, blood pressure, smoking status, total cholesterol, and presence or absence of diabetes mellitus. Based on the risk score evaluation they were counselled on life style modification or therapeutic intervention.

Statistical analysis

Statistical package SPSS (version 16.0) was used for the analyses. Categorical variables like gender, socio economic status, obesity status, tobacco use, alcohol, 10-year risk of CVD event use were expressed in proportions. Continuous variables like age, blood pressure, blood sugar, lipid profile were given as mean (± standard deviation) or median ((±IQR) Test of association between categorical variables (gender versus BMI, 10 year CVD risk) was done using Chi-square test and continuous variables (age in years vs. blood glucose level) was done using t-test.

RESULTS

A total of 218 first-degree relatives were included in the study. Mean age of participants in this study was 41 ± 9 years and 56% were men. Selected socio demo graphic parameters of the participants are presented in Table 1.

The distribution of risk factors for cardiovascular diseases is shown in Table 2. In the study population 22.5% were physically inactive. Among the study subjects (98.2%) consumed less than five servings of fruits and vegetables/day. The proportion of tobacco use among study participants was found to be 19.2%, of whom 14.2% were current users and 5% were past tobacco users. About 16% of our study subjects had the habit of consuming alcohol. Of those consuming alcohol, 8.6% did so daily and 50% at least once a week, whereas the rest consumed it less frequently. In terms of BMI, 55.5% of the study group were overweight and 12.4% were obese. Out of 218 participants, 33% had self-reported history of hypertension and 29% had diabetes. About 76% of subjects with a history of hypertension were taking anti-hypertensive and 83% of subjects with history of diabetes were on anti-diabetic medication. Around 13.8% had serum cholesterol level above 200 mg/dl.

WHO/ISH risk assessment chart was used to predict the CVD risk among study group with more than 40 years age, which constituted 53% (*n*=116) of total population. Risk score was based on the age, tobacco use, gender, and blood pressure level of the individual. Risk assessment showed that 10% subjects had >10% risk of developing cardiovascular disease in next 10 years.

DISCUSSION

In the present study 22% of the first-degree relatives of CVD patients were inactive and another 40% were either active or very active. Sesso *et al* found similar results in the study done among the sons and daughters of MI patients, in which nearly 12-38% were found to be physically active.[15] only 1.8% of total study subjects, had more than five servings of fruits and vegetables per day. An ICMR-WHO six site study done among adults showed that 10-20% were consuming more than five servings of fruits and vegetables per day.[16]

80% of study population never used tobacco. Around 15% of the study participants were current tobacco users. Sesso *et al*. in the study done among the sons and daughters of MI patients reveled that tobacco prevalence ranged between 10-14% which is comparable with our present findings.[15] Sutter *et al*. found that tobacco prevalence among siblings and children of those with cardiac morbidities are 30% and 35% respectively.[17] 16% of study subjects had habit of using alcohol. This prevalence is comparable with the results shown by Sutter *et al*, where those with paternal history of CHD had a prevalence rate of alcohol use which varied between 10-25%.[17] But ICMR studies to assess distribution of NCD risk factors in India showed that alcohol consumption among males was in the range of 40- 49% while in females it was between 3-8%.[16] In this study, none of female participants had habit of taking alcohol.

In terms of BMI, 55.5% of our study group were overweight and 12.4% were obese. Mean BMI of this study group was 23.5 ± 1.3 kg/m^2. These results were comparable with results of study by Kang *et al*. to determine prevalence of risk factors among first-degree relatives of patients with premature coronary artery disease. The mean BMI in their study was 23.4 ± 2.8 kg/m^2.[18] similar results were seen in a study by Sutter *et al*. They found that prevalence of obesity among siblings and children as 19.6% and 10.2%.[17] Gene card studies showed prevalence of abdominal obesity among offspring's ranged between 25%-34%.[19] In study of Saghafi *et al*. over weight prevalence in first-degree relatives men was 56.3% and women 39.7% which is also comparable to this study findings.[12]

Among 33% of study subjects had self-reported history of hypertension, 71% were pre hypertensive and 29.2% were hypertensive grade1. About

67% of remaining subjects without a history of hypertension belonged to pre-hypertensive group. Sutter *et al.* also found that prevalence of hypertension among siblings and children as 23.4% and 8.3%.[17] In Gene card studies prevalence of hypertension among off spring varied from 20 to 60%.[19] Saghafi *et al.* found prevalence of hypertension in first-degree relatives men as 53.2% and women 24.7%.[12] Kang *et al.* study in first-degree relative showed hypertension prevalence as 25% and mean systolic blood pressure as 132 ± 19 mmHg which is comparable to present study mean of 136 ± 7 mmHg.[18] Around 14% males belonged to the hypertensive group, whereas only 5% females had hypertension in the study. 29% of study subjects had self-reported history of diabetes. 3% of this sample population had fasting glucose level ≥126 mg/dl. The mean fasting glucose level of those without a history of diabetes was 93 ± 8 mg/dl. Similar results were observed by kang *et al.*, where he found a mean of 96 ±15 mg/dl in first-degree relatives as well as prevalence of diabetes was found to be 8%.[18] In the studies done by saghafi *et al.* prevalence of diabetes among women was found to be 5% and men 8%.[12] Sutter *et al.* found that prevalence of diabetes among siblings and children as 7.8% and 1%.[17] Mean total cholesterol level of study sample was 183.52 ± 13.13 mg/dl. Around 13% had serum cholesterol level above 200 mg/dl. This result is consistent with the findings of kang *et al.* where Total Cholesterol level was found to be 195 ± 32 mg/dl.[18] Prevalence of dyslipidaemia in our study is lower when compared to other studies. In gene card studies, prevalence of dyslipidaemia ranged from 25% to 60%.[19] Saghafi *et al* found the prevalence of dyslipidaemia in first-degree relatives men as 38% and women 35.6%.[12]

Suitability of risk prediction model depends on incidence of disease as well as prevalence of risk factors in that area. Current study could observe a ten-year risk prediction results as <10% risk among 90% of the study participants. Similar to this, study by Selvarajah *et al* to compare various risk prediction models in Asian population found that, despite high proportion of CVD risk factors prevailing in that area, the WHO, ISH chart showed that there was only a less than 10% risk among 90% of high risk population.[20] A cross-sectional study was conducted in defined areas in eight selected countries from eight WHO epidemiologic sub regions to determine the population distribution of cardiovascular risk. In that a large fraction (90.0-98.9%) of the study population had a 10-year cardiovascular risk <20%. Only 0.2-4.8% are in high-risk categories (≥30%).[21] Another study to determine the distribution of cardiovascular risk in Cuban population using the WHO/ISH risk prediction charts revealed that 97.1% and 95.4% respectively of the study population were in the ten-year cardiovascular risk category of <20%, while 2.9% and 4.6% respectively were in the category of ≥20%.[22] A population-based examination survey of Cardio vascular risk factors was conducted in 2004 in Seychelles showed 89% of individuals had a low Cardiovascular risk (0–9.9%), 6% had an intermediate risk (≥10% but <20%) and 5% had a high risk (≥20%).[23] Another study used data from national STEPS surveys (STEPs Approach to Surveillance) conducted between 2005 and 2010 in Cambodia, Malaysia and Mongolia of men and women aged 40–64 years in that majority of people in all three countries has a low (<10%) 10-year CVD risk ranging from 89.6% in Mongolia to 94.4% in Malaysia to 97% in Cambodia.[24]

There may be a chance of selection bias because those who are volunteering to participate may be healthy as compared to their counterparts who are not a part of this study. Social desirability bias may present in this study. Only those first-degree relatives who were available with patients as well as those who were willing to participate in the study after a briefing through telephone were included. All the remaining first-degree relatives were not a part of this study. This is one of the limitations in the study.

CONCLUSION

This cross-sectional study indicates that there is significant burden of CVD risk in the first degree relatives of coronary artery diseases as assessed by WHO/ISH risk prediction charts. Most of the study subjects had a 10 year CVD risk of <10%. Only less than ten percent (8%) had a risk in the range of 10 to 20%.

ETHICAL ISSUES

The ethical committee of Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry approved the present study. Informed consent was obtained from all study participants before interviewing them and utmost care was taken to maintain privacy and confidentiality.

COMPETING INTERESTS

There is no competing interests in this study.

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CONFLICT OF INTEREST

None declared.

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