Original Article

Association of Lifestyle Determinants with Coronary Artery Disease

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ABSTRACT

Objective: The present study examined the association of dietary patterns, smoking and physical activity with Coronary artery disease.

Study Design: A case-control study

Place and Duration of Study: This study was conducted at the Ayub Teaching Hospital, Abbottabad from January 2017 to January 2018.

Materials and Methods: The total sample size was 360, of whom 120 were cases and 240 were controls matched for gender and age ±5 years. Non-probability convenient sampling technique was followed in sample selection. The data on dietary patterns, smoking and physical activity was collected with the help of a structured questionnaire and analyzed using Statistical Package for the Social Sciences software.

Results: For the sample of 360, the mean age was 58.79 ± 13.356 and included 198 males and 162 females. The results showed that decreased number of cigarettes (OR: 0.889; 95% CI: 0.125-6.310), higher fruit consumption frequency (OR: 1.495, 95% CI 0.696-3.214) and physical activity (OR: 1.495, 95% CI 0.696-3.214) play a protective role in patients of CHD, while vegetable intake (OR: 1.181, 95% CI 0.529-2.637) and duration of exercise (OR: 0.933; 95% CI: 0.111-7.820) had insignificant role.

Conclusion: There is association of smoking, physical activity and fruit consumption with CAD, however vegetable intake is not associated with CAD.

Key Words: Coronary Artery Disease, Smoking, Diet, Physical Activity.

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INTRODUCTION

Coronary Artery Disease (CAD) is a type of cardiovascular disease (CVD). It is a major cause of disability and death in most developed countries. Although with improved health systems the mortality rate has declined over the past few decades, however it still accounts for one-third of all deaths of people above the age of 35 years.[1]

Coronary artery disease is a result of incomplete or complete occlusion of coronary arteries, the arteries responsible for the oxygenation of the heart itself and meeting its metabolic demands.[2]

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Atherosclerosis is a process that results in the occlusion of coronary arteries. The atherosclerotic damage to the heart can be a direct result of plaque formation in coronary arteries causing gradual narrowing or it can be the sudden obstruction of coronary arteries with a blood clot dispatched from elsewhere.[3] As a result of decreased blood supply to the heart muscle CAD develops and manifests itself in various forms including angina, myocardial infarction, abnormal heart rhythms (arrhythmias) and sudden heart block.[4]

More than 17 million people die of cardiovascular diseases each year and it is expected to further increase up to 23.6 million deaths worldwide by the year 2030. Most of the deaths caused by CVDs can be attributed to CAD. CAD accounted for 7 million deaths worldwide in 2010 alone. The mortality rates of CAD vary worldwide ranging from 35 deaths per year per 100,000 population in South Korea to more than 733 deaths per year per 100,000 population in Ukraine.[5]In the United States alone, CAD caused approximately 1 of every 7 deaths in 2013.[6] According to the data published by the World Health Organization (WHO) in 2014, deaths by coronary artery disease in Pakistan reached 111,367 accounting for 9.87% of total deaths.[7]

The prevalence and incidence rates of CAD vary greatly according to geographical region, sex, and ethnic background. As a result of increased awareness, improved therapy and reduction of risks, the morbidity and mortality rates for CAD have decreased in most

developed countries.[5] Fifteen and a half million people of age above 20 years have been reported to have CAD in the USA.[1] The prevalence rate is 2.3 million people affected from some form of CAD in the UK.[8] England has witnessed a decline of 73% in death rates of CHD between 1974-2013.[9] The story is however different for developing countries as both CAD mortality and the prevalence of CAD risk factors continue to rise rapidly.[10] Pakistan, being a developing country has one of the highest risks of CAD in the world. In a study carried out in Karachi, Pakistan in 2007, CAD was shown to be prevalent in 6.1% of men and 4% of women.[11] It is estimated that one in four adults over the age of 40 (26.9%) suffers from coronary artery disease in Pakistan.[12]

The etiology of CAD is multifactorial. Some of the risk factors of CAD are modifiable and some are non-modifiable. The modifiable risk factors of CAD include smoking, obesity, high blood pressure, elevated serum cholesterol, diabetes, insufficient physical activity and stress. The non-modifiable risk factors include age, sex, family history and genetic factors.[13]

From as early as the 1990s, association between lifestyle determinants and coronary artery disease has been clearly established.[14] Statistics show one third of coronary artery disease deaths are attributable to smoking and exposure to second-hand smoke in the USA.[6] Studies have clearly shown reduction of coronary artery diseases incidence in physically active and fit individuals.[15] The World Health Report 2002 estimated that over 20% of CAD in developed countries is due to lack of physical activity and benefits of exercise indicate it can reduce total mortality by 20% and cardiac mortality by 26%.[16] Obesity is another lifestyle determinant that is considered a global epidemic. It is a chronic metabolic disorder associated with CAD.[17] Possibility of sustained short duration of sleep leading to cardiovascular events has also been documented.[18]

MATERIALS AND METHODS

This case-control study was conducted in Ayub Teaching Hospital, Abbottabad from January 2017 to January 2018. A sample size of 360 which included 120 cases and 240 controls were selected through non-probability convenient sampling technique. Patients, diagnosed cases of chronic artery disease (CAD), admitted in the Cardiology ward and CCU of ATH was taken as cases. Controls were chosen from Medical and Surgical wards of ATH. The controls were matched for age ±5 years, sex, and were included based on no findings of CAD on history and ECG. Two controls for one case were selected for the study.

Informed verbal consent was taken from all the subjects who participated in the study. Purpose of the study was explained to them and was ensured complete confidentiality of their information. A questionnaire was used as a tool for data collection. A structured questionnaire was developed including variables of interest. The questionnaire was pre-tested twice before adopting a final version. The data was collected from 20th January, 2017 to 7th January, 2018.

Data was analyzed using SPSS version 23.0. Quantitative variables were described in terms of mean ± standard deviation. Categorical variables were described in terms of frequencies and percentages in cases and controls. Association between categorical variables was determined by applying odds ratio. The 95% confidence interval was calculated to determine the statistical significance of the association.

RESULTS

The cases and controls were matched for gender and age ±5 years. There were a total of 69 (19%) patients who were 22-45 years of age. Six of these were cases and 51 were controls. Patients above the age of 45 years were 291 (81%), which included 102 cases and 189 controls.

Table No.1: Association of weekly consumption of meat, chicken products, pulses, fruits and oil contents with CAD

Dietary Habits		Category		Total
		Case	Control	
Weekly meat and chicken products consumption OR: 1.258 (95% CI: 0.496-3.190)	Up to 3 meals	27	45	72
	More than 3 meals	93	195	288
	Total	120	240	360
Weekly pulses consumption OR: 1.130 (95% CI: 0.490-2.606)	Up to 3 meals	36	66	102
	More than 3 meals	84	174	258
	Total	120	240	360
Weekly consumption of fruits OR: 1.495 (95% CI: 0.696-3.214)	Up to 4 times	69	114	183
	More than 4 times	51	126	177
	Total	120	240	360
Oil content in food OR: 1.476 (95% CI: 0.611-3.569).	High oil content	93	168	261
	Low oil content	27	72	99
	Total	120	240	360

The odds ratio was 0.654 (95% CI: 0.236-1.813). 246 (68%) of the total study population was uneducated and included 84 cases and 162 controls. The total number of educated individuals were 114 (32%) of whom 36 were cases and 78 were controls. The odds ratio was 1.123 (95% CI: 0.494-2.557). 42 cases and 57 controls were from urban areas (27.5%), 63 cases and 150 controls were from rural areas (59%) and 15 cases and 33 controls from peri-urban areas (13.5%). Nine cases and 12 controls were government employee (5.8%). 27 cases and 78 controls were self-employed (29.1%). 24 cases and 39 controls were retired (17.5%). Only 3 controls were students (0.9%) and no students among cases. 12 cases and 12 controls had private sector jobs (6.7%) and 48 of the cases and 96 of controls were housewives (40%). 81 cases and 153 controls followed a vegetarian diet pattern (65%) as compared to 39 cases and 87 controls who followed a non-vegetarian diet pattern (35%). The odds ratio was 1.181 (95% CI: 0.529-2.637). Other Results are shown in the Tables.

Table No.2: Association of smoking status and number of cigarettes per day with CAD

Smoking		Category		Total
		Case	Control	
Smoking Status OR: 3.476 (95% CI: 1.210-9.986)	Ever smoked	30	21	51
	Non-smokers	90	219	309
	Total	120	240	360
Number of cigarettes per day OR: 0.889 (95% CI 0.125-6.310)	Up to 10 cigarettes	12	9	21
	More than 10 cigarettes	18	12	30
	Total	30	21	51

Table No.3: Association of physical activity and lifestyle with CAD

Activity and lifestyle		Category		Total
		Case	Control	
Physical activity status OR: 0.810 (95% CI: 0.264-2.481)	Yes	15	36	51
	No	105	204	309
	Total	120	240	360
Years of daily exercise OR: 0.933 (95% CI: 0.111-7.820)	Less than 10 years	6	15	21
	More than 10 years	9	21	30
	Total	15	36	51
Minutes of daily exercise OR: 5.6 (95% CI .472-66.447)	30 minutes	12	15	27
	More than 30 minutes	3	21	24
	Total	15	36	51

DISCUSSION

Coronary artery disease has a number of risk factors that play an important role in the disease etiology. Lifestyle determinants including dietary habits, smoking and physical are considered some of the major risk factors for CAD.[13] In an effort to identify the link between lifestyle determinants and CAD in patients admitted to Ayub teaching hospital, a case-control study was carried out with 120 cases and 240 controls.

In our study vegetable intake was not associated with CAD. The odds ratio (OR) for vegetable intake turned out to be 1.181 (95% CI: 0.529-2.637) illustrating no statistical association between vegetable intake and CAD. This is in contrast to a meta-analysis of nine cohort studies done by Dauchet et al, which showed the relative risk (RR) of CAD with vegetable intake ranged from 0.79 to 0.97.[19] Similarlyin another study carried out in India an inverse relationship between frequency of vegetable intake and CAD was observed (RR: 0.33; 95% CI: 0.17-0.64).[20] The difference in the results is suggestive of the smaller sample in our study.

The risk of the frequency of meat consumption with CAD was analysed in our study and the results showed increasing risk of CAD with decreased meat and chicken products consumption. The result, however was statistically insignificant (OR: 1.258; 95% CI: 0.496-3.190). This is not with the agreement of results of a meta-analysis done by Micha et al, on processed meat consumption which showed increased consumption of meat products increases the risk of CAD (RR: 1.42; 95% CI 1.07-1.89).[21]

Frequency of fruit consumption was another factor studied in our study. The results showed an increased risk of CAD with lower consumption of fruit (OR: 1.495 95% CI: 0.696-3.214). This correlates with a meta-analysis published in 2016 which points out lower risk of CAD with daily fruit consumption (OR: 0.92; 95% CI: 0.90–0.95).[19] Similarly in another study carried out in Shanghai, China the results were in favour of reduced CAD risk with increased fruit intake (RR: 0.62; 95% CI: 0.38-1.02).[22]

Our study results reveal an increased risk of CAD with high oil content in food (OR: 1.476 95% CI 0.611-3.569). This is in contrast to a meta-analysis carried out by Siri-Tarino et al. Their results show no association of saturated fat content with CAD (RR: 1.07, 95% CI: 0.96-1.19).[23] The results of our study could be affected by recall bias. Majority of the patients could not clearly tell the amount of oil in their food. The results can be made more accurate by doing a multi-centre study.

In our study, there was a significant association between cigarette smoking and CAD. The results are applicable to men only as none of the females smoked cigarettes. Smoking turned out to be a significant risk factor for CAD (OR: 3.476; 95% CI: 1.210-9.986). This correlates with another study carried out by Tolstrup et

al, which showed that smoking had a relative risk of 8.5 (95% CI 5-14) among CAD patients aged 40-49 years and 3.1 (95% CI 2.0-4.9) among those aged 70 years or older.[24] The risk of CAD with the number of cigarettes smoked per day was also looked at in our study and the results show lower risk of CAD with less than 10 cigarettes per day as compared to smoking more than 10 cigarettes per day. The result, however was statistically insignificant (OR: 0.889; 95% CI: 0.125-6.310). This agrees with the study carried out in 2015 which showed a relative risk of 1.5 with 5 cigarettes per day as compared to a relative risk of 2.0 with 20 cigarettes per day.[25]

The third lifestyle determinant factor in our research paper was physical exercise. Physical exercise in our study showed an inverse relationship with CAD events, however the result was statistically insignificant (OR: 0.810, 95% CI 0.264-2.481). This is in agreement with a prospective cohort study carried out in 2015 that showed physical exercise to reduce the risk of CHD by 50% (OR: 0.50; 95% CI: 0.38-0.67).[26] The results could be made more accurate if a larger sample is used.

CONCLUSION

Smoking is significantly associated with CAD. The number of cigarettes also play a role. Our results show greater risk of CAD with increasing number of cigarettes. The association however is statistically insignificant. Vegetable intake does not play a significant role in causation of CAD disease whereas other dietary factors like meat consumption, high oil content in food and fruit consumption do show an association with CAD. Another factor in our study was physical exercise. Although the results of our study conclude an inverse relationship between physical activity and CAD, the results however, are statistically insignificant.

Author's Contribution:

Concept & Design of Study:	Saqib Malik
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