OPEN ACCESS

Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) | ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Lipid Profile and Its Association with Risk Factors for Coronary Heart Disease: A Single Centre Experience

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DOI: 10.36348/sjm.2022.v07i12.005 | **Received:** 28.10.2022 | **Accepted:** 12.12.2022 | **Published:** 15.12.2022

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Abstract

Introduction: The lipid profile of a Bangladesh population, which has a lower prevalence of coronary heart disease, compared with others nations, is studied to determine whether lipid-modifying disease prevention programs are necessary. ***Aim of the Study:*** The aim of the study was find out the Lipid Profile and Its Association with Risk Factors for Coronary Heart Disease. ***Methods:*** This is a cross-sectional study; a total of 172 patients were enrolled and analyzed. The study conducted during January 2020 to December 2020 at the Department of Cardiology in Department of Cardiology, Shaheed M. Monsur Ali Medical College, Sirajganj, Bangladesh. ***Result:*** The study population is shown in more than 30% of patients had hypercholesterolemia, 41(23.84%) patients were at the high borderline (5.17-6.19), and 38(22.09%) patients had high-density lipoprotein. Under low-density lipoprotein, 7(4.07%) patients had high LDL-C, and only 2(1.16%) patients had very high LDL-C. The age distribution of the study; 33.72% of patients were from the age group 40-49 years, and 17.44% of patients were aged more than sixty years. ***Conclusion:*** WHR is associated with an increase in TG, TC, and LDL-C and supports the view that abdominal obesity may be an important cardiovascular risk factor. This study emphasizes the role of HDL-C, which may avert the CHD risk in females. Further studies with longitudinal data are needed to assess the risk factors for CHD in high-altitude populations.

Keywords: Lipid Profile, Association, Risk Factors, Coronary Heart Disease.

INTRODUCTION

Coronary artery disease (CAD) is one of the most common causes of mortality and morbidity in developed and developing countries. It is a leading cause of death in India, and its contribution to mortality is rising: the number of deaths due to CAD in 1985 is expected to have doubled by 2015 [1]. According to reports from the National Commission on Macroeconomics and Health, 62 million people in India will have CAD by 2015, with 23 million below 40 years of age [2]. The prevalence of classic cardiovascular risk factors, such as hypertension, dyslipidemia, obesity, and diabetes, varies widely between countries and shows some critical secular trends. The conventional risk factors for CAD can be divided into non-modifiable and modifiable risk factors. The former includes age, sex, and family history, while the latter include diabetes mellitus (DM), smoking, dyslipidemia, hypertension, and obesity. An increasing incidence indicates that Asian Indians are at increased risk of CAD, which cannot be attributed to the common risk factors. Recently, several newer cardiovascular risk factors have been identified, which are of great interest as more than 60% of CAD in native Indians remains unexplained by conventional risk factors. Comparative studies on newer risk factors show that Indians have higher C-reactive protein, plasminogen activator inhibitor (PAI-1), and homocysteine levels [3]. The incidence of CAD is likely to increase further because of rapid urbanization and its accompanying lifestyle changes, including changes in diet, physical inactivity, drug and alcohol intake, as well as an increase in the prevalence of DM [4, 5]. The prevalence of risk factors in a population determines the future burden on healthcare services and the loss of an individual's productive years. Risk factors constitute a health risk for the individual and impose an overall burden on the economy. No large-scale studies of an adequate sample size to evaluate the prevalence of risk factors, risk factor patterns, and electrocardiographic changes in Indian populations. The present study was thus planned to evaluate the future CAD risk in a national organization.

METHODOLOGY & MATERIALS

This is a cross-sectional study; a total of 172 patients were enrolled and analyzed. The study conducted during January 2020 to December 2020 at the Department of Cardiology in Department of Cardiology, Shaheed M. Monsur Ali Medical College, Sirajganj, Bangladesh. Ethical approval was obtained from the ethical committee of the institution. Cardiovascular diseases encompassing coronary heart disease, angina pectoris, hypertension, myocardial infarction, cerebrovascular disease (stroke), and congestive heart failure (excluding organic and congenital cardiovascular disease) were considered in this study. Although hypertension is a cardiovascular disease, it is also one of the most critical risk factors for other cardiovascular diseases. So, it has been included in the list of risk factors measured during the study.

Inclusion Criteria

- Patients aged >30 years old.
- Patients diagnosed with cardiovascular disease.

Exclusion Criteria

- Patients who received health education and advice from doctors following their diagnosis of cardiovascular diseases by changing their lifestyle, dietary habits, and physical activity practices.

The following tools were used during the study: a pre-designed, semi-structured questionnaire, a Mercury sphygmomanometer, measuring tape, and a weighing machine. Informed consent was obtained from each respondent before the interview and physical examination. The same instruments were used for measuring the different health parameters to maintain uniformity. Only proven risk factors, as obtained by the review of literature, were taken for the study. The risk factors for physical activity and dietary patterns were taken from the standard Integrated Disease Surveillance Program questionnaire, while the researchers themselves did the scoring for these risk factors. These risk factors' prevalence and association with different socio-demographic variables like age, sex, literacy status, and per capita monthly income were analyzed. All data were presented in a suitable table or graph according to their affinity. A description of each table and graph was given to understand them clearly. All statistical analysis was performed using the statistical package for the social science (SPSS) program and Windows. Continuous parameters were expressed as mean±SD and categorical parameters as frequency and percentage. Student's t-test made comparisons between groups (continuous parameters). Categorical parameters compared by Chi-Square test. The significance of the results, as determined by a 95.0% confidence interval and a value of P< 0.05, was considered statistically significant.

RESULT

In this cross-sectional study, a total of 172 patients were enrolled and analyzed in this study. The crude prevalence of abnormal serum lipids in the study population is shown in table 1. More than 30% of patients had hypercholesterolemia, 41(23.84%) patients were at the high borderline (5.17-6.19), and 38(22.09%) patients had high-density lipoprotein. Under low-density lipoprotein, 7(4.07%) patients had high LDL-C, and only 2(1.16%) patients had very high LDL-C. Figure 1 shows the age distribution of the study; 33.72% of patients were from the age group 40-49 years, and 17.44% of patients were aged more than sixty years. In this study, 37% were male, and 63% were female (Figure 2). The lipid profile associated with the risk factors of the study is shown in table 2.

Table 1: Crude Prevalence of Abnormal Serum Lipid of the study population (N=172)

Serum lipids	Frequency	Percentage
Total cholesterol (mmol/L)		
Borderline high (5.17-6.19)	41	23.84
High (≥6.20)	10	5.81
Hypercholesterolemia	54	31.40
High-density lipoprotein (mmol/L)	38	22.09
Low-density lipoprotein (mmol/L)		
High LDL-C (4.13-4.90)	7	4.07
Very high LDL-C (≥4.91)	2	1.16
Triglycerides (mm0l/L)		
Hypertriglyceridemia (≥1.69)	20	11.63
Total	**172**	**100.00**

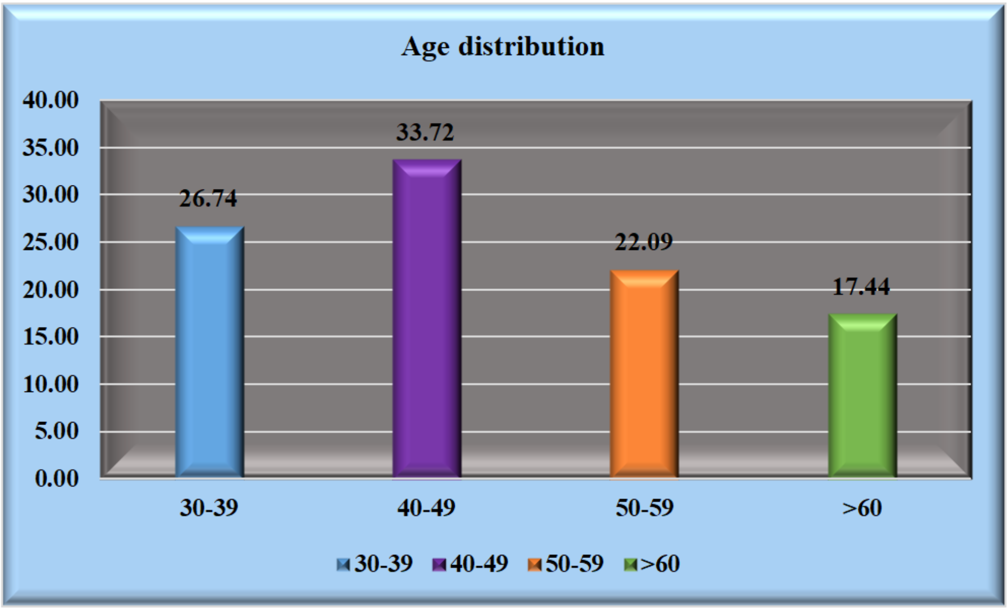

Figure 1: Age distribution of the study population (N=172)

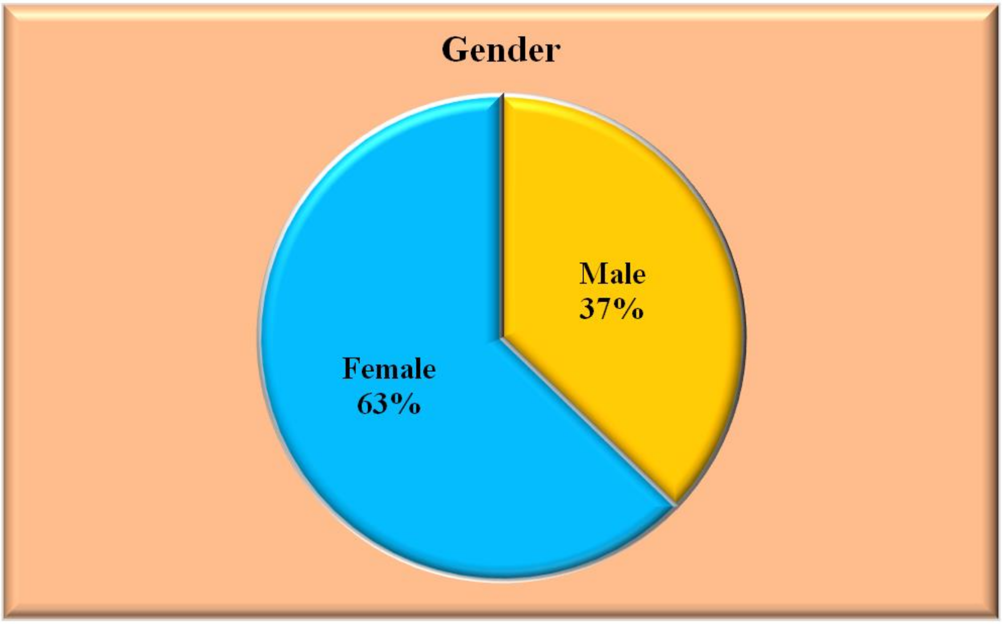

Figure 2: Gender distribution of the study population (N=172)

Table 2: The lipid profile association with risk factors

Variables	Frequency	Percentage	TG P-value	TC P-value	LDL-C P-value	HDL-C P-value
Age range (Years)						
30-39	46	26.74	0.07	0.001	0.03	0.44
40-49	58	33.72				
50-59	38	22.09				
>60	30	17.44				
Gender						
Male	64	37.21	0.001	0.59	0.265	0.105
Female	108	62.79				
Smoking						
Yes	42	24.42	0.32	0.35	0.521	0.56
No	130	75.58				

Variables	Frequency	Percentage	TG P-value	TC P-value	LDL-C P-value	HDL-C P-value
Alcohol						
Yes	76	44.19	0.68	0.21	0.21	0.1
No	96	55.81				
PA[a] (Kcal/wk)						
<2000	112	65.12	0.21	0.23	0.32	0.32
≥2000	60	34.88				
SBP[b] ≥140 (mmHg)						
Yes	28	16.28	0.45	0.77	0.1	0.21
No	144	83.72				
DBP[c] ≥90(mmhg)						
Yes	27	15.70	0.75	0.65	0.21	0.53
No	125	72.67				
Hb[d] (mg/dL)						
6-12	13	7.56	0.04	0.008	0.35	0.74
12.1-18	140	81.40				
18.1-25	19	11.05				
Diet						
Healthy	45	26.16	0.23	0.12	0.05	0.83
Mod H[e]	74	43.02				
Unhealthy	53	30.81				
WHR[f] (unit)						
Yes	93	54.07	0.01	0.001	0.02	0.1
No	79	45.93				

DISCUSSION

This cross-sectional study is the first to report the prevalence of abnormal lipid distribution in the Tibetan population of TAR. The main findings were a high prevalence of hypertriglyceridemia in males, a higher prevalence of low HDL-C in females, and high hypercholesterolemia prevalence in both genders. The age-related changes were minimal despite the observed association between TG, TC, and LDL-C with age, Hb, DBP, TC, and SBP. The most profound increase in TG, TC, and LDL-C was noteworthy for increased units of WHR. The prevalence of CHD risk based on the Framingham risk score adjusted to the WHO standard world population was high among men and low in women. Results from two high-altitude populations support our findings of a high prevalence of hypercholesterolemia and low HDL-C. Mohanna and colleagues (2006) determined a hypercholesterolemia prevalence of 34.3% and a prevalence of low HDL-C at 30.4% in high-altitude men and women of Peru (4100 m) [6]. Likewise, Northern Chile (2000 to 4500 m) reports a prevalence of hypercholesterolemia at 36.8% for men and 37.4% in women and low HDL-C at 26.3% for men and 24.4% in women, respectively. However, in contrast to our findings, the prevalence of hypertriglyceridemia in Peru was considerably higher at 53.9% [7]. A very high overweight–obese prevalence (74.2%) and abnormal waist circumference (77.4%) among Peruvians when compared with Tibetans possibly explains the difference in TG. Nevertheless, it should be noted that Tibetans are undergoing an epidemiological transition [8], which may influence health behaviours and, finally, health changes at the population level. Tibetans' mean TG and TC levels were slightly lower than other high-altitude permanent residents [10]. However, mean LDL-C and HDL-C levels were slightly higher. [9]These disparities can be owing to ethnic differences and behavioural risk factors such as smoking and obesity [7, 11-13]. Studies in animals and humans have consistently shown an association between serum iron concentration, TG, and TC Concentration of red blood cells was affected by cholesterol synthesis or its mobilization from tissue to plasma. Cholesterol, triglycerides, and Hb values were also influenced by changes in plasma volume [14]. In a study by Salonen and colleagues (1992), high body iron stores were related to CHD. A higher serum iron concentration may explain higher mean TG and TC with increasing Hb levels in our study, considered a risk factor for myocardial infarction [15, 16]. However, Tibetans rarely exhibit higher Hb levels [10], possibly for being the oldest natives living at high altitudes and having a genetic predisposition. Nonetheless, this finding may be important for other high-altitude natives exhibiting polycythemia. This study also found an association between blood pressure and TC and LDL. There was an inverse association with SBP but a positive one for DBP [17]. Differences in blood pressure with a significantly higher DBP among high-altitude natives and no difference in SBP between low and high-altitude natives have been reported. Hypoxia and cold temperatures increase plasma catecholamines [18]. Because catecholamines are likely to be involved in the development of atherosclerosis, it seems paradoxical to find the inverse relation between SBP with TC and LDL. However, in our study, 65% of people had less than 2000 kcal/week energy expenditure. Increased abdominal obesity with age has been demonstrated in Peruvian highlanders and reported in Tibetans [19, 20]. Prospective studies have shown that abdominal obesity, particularly with a higher WHR, is associated with a higher risk for CVD and CHD independently of body mass index (BMI), as well as other classic cardiovascular risk factors, even among non- obese individuals (BMI<30 kg/m2) [21-23]. The random sample selection of 537 invitees from the 1457 eligible in the list resulted in a skewed sex distribution in favor of more women. It was not possible to explain this. However, due to a higher response rate among women than men, the final sample, consisting of 139 men and 232 women, reflects fairly well the sex distribution in the population under study, with a slight predomination of women. A general finding is that association measures in cross-sectional epidemiological studies are robust, even though the response is low and skewed [24]. This study included only known CHD risk factors. However, there may be other unknown potential confounders that may ex- plain the variation in lipid profile in populations living at high altitudes. The Framingham risk score was validated for an Asian population. However, validation among high-altitude populations is lacking [25]. Moreover, the incidence and prevalence of coronary disease are not available for the Tibetan population. The shallow CHD risk in females in our study may be owing to the inability of the Framingham risk score measurement to capture all the other unknown risks in a high-altitude population. Finally, the absence of longitudinal studies on high altitude populations on CHD risk factors makes it difficult to assess the significance of other variables.

Limitations of the Study

Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The limitations of the present study are mentioned. Therefore, the results of the present study may not be representative of the whole of the country or the world at large. The number of patients included in the present study was less in comparison to other studies. Because the trial was short, it was difficult to remark on complications and mortality.

CONCLUSION AND RECOMMENDATIONS

This study demonstrated a high prevalence of hypertriglyceridemia in males, a higher prevalence of low HDL-C in females, and high hypercholesterolemia prevalence in both genders. WHR is associated with an increase in TG, TC, and LDL-C and supports the view that abdominal obesity may be an important cardiovascular risk factor. This study emphasizes the role of HDL-C, which may avert the CHD risk in females. Further studies with longitudinal data are needed to assess the risk factors for CHD in high-altitude populations.

Funding: No funding sources.

Conflict of Interest: None declared.

Ethical Approval: The study was approved by the Institutional Ethics Committee.

REFERENCES

1. Misra, A., Nigam, P., Hills, A. P., Chadha, D. S., Sharma, V., Deepak, K. K., ... & Gupta, for the Physical Activity Consensus Group, S. (2012). Consensus physical activity guidelines for Asian Indians. *Diabetes technology & therapeutics*, *14*(1), 83-98.
2. Indrayan, A. (2005). Forecasting vascular disease cases and associated mortality in India. Reports of the National Commission on Macroeconomics and Health, Ministry of Health and Family Welfare, India.
3. Reddy, K. S., & Yusuf, S. (1998). Emerging epidemic of cardiovascular disease in developing countries. *Circulation*, *97*(6), 596-601.
4. Murray, C. J. L., & Lopez, A. D. (1997). Alternative projection of mortality and morbidity by cause 1990–2020: Global Burden of Disease Study. *Lancet*, 349, 1498–504.
5. Deepa, R., Arvind, K., & Mohan, V. (2002). Diabetes and risk factors for coronary artery disease. *Current science*, 83, 1497-1505.
6. Sherpa, L. Y., Stigum, H., Chongsuvivatwong, V., Luobu, O., Thelle, D. S., Nafstad, P., & Bjertness, E. (2011). Lipid profile and its association with risk factors for coronary heart disease in the highlanders of Lhasa, Tibet. *High altitude medicine & biology*, *12*(1), 57-63.
7. Mohanna, S., Baracco, R., & Seclén, S. (2006). Lipid profile, waist circumference, and body mass index in a high altitude population. *High altitude medicine & biology*, *7*(3), 245-255.
8. Jemal, A., Siegel, R., Ward, E., Hao, Y., Xu, J., Murray, T., & Thun, M. J. (2008). Cancer statistics, 2008. *CA: a cancer journal for clinicians*, 58(2), 71-96.
9. Sherpa, L. Y., Stigum, H., Chongsuvivatwong, V., Luobu, O., Thelle, D. S., Nafstad, P., & Bjertness, E. (2011). Lipid profile and its association with risk factors for coronary heart disease in the highlanders of Lhasa, Tibet. *High altitude medicine & biology*, *12*(1), 57-63.
10. Sherpa, L. Y., Stigum, H., Chongsuvivatwong, V., Luobu, O., Thelle, D. S., Nafstad, P., & Bjertness, E. (2011). Lipid profile and its association with risk factors for coronary heart disease in the highlanders of Lhasa, Tibet. *High altitude medicine & biology*, *12*(1), 57-63.
11. Joseph, T., Johnson, B., Battista, R. A., Wright, G., Dodge, C., Porcari, J. P., ... & Foster, C. (2008). Perception of fatigue during simulated competition. *Medicine and Science in Sports and*

Exercise, *40*(2), 381-386.

12. Freedman, B., Butterfield, R. O., & Pryde, E. H. (1986). Transesterification kinetics of soybean oil 1. *Journal of the American oil chemists' society*, *63*(10), 1375-1380.
13. Craig, W. Y., Palomaki, G. E., & Haddow, J. E. (1989). Cigarette smoking and serum lipid and lipoprotein concentrations: an analysis of published data. *British medical journal*, *298*(6676), 784-788.
14. Böttiger, L. E., & Carlson, L. A. (1972). Relation between serum cholesterol and triglyceride concentration and haemoglobin values in non-anaemic healthy persons. *Br Med J*, *3*(5829), 731-733.
15. Simon, J. A. (1992). Vitamin C and cardiovascular disease: a review. *Journal of the American College of Nutrition*, *11*(2), 107-125.
16. Morrison, S. J., & Weissman, I. L. (1994). The long-term repopulating subset of hematopoietic stem cells is deterministic and isolatable by phenotype. *Immunity*, *1*(8), 661-673.
17. Bønaa, K. H., & Thelle, D. S. (1991). Association between blood pressure and serum lipids in a population. The Tromsø Study. *Circulation*, *83*(4), 1305-1314.
18. Moncloa, F., Gómez, M., & Hurtado, A. (1965). Plasma catecholamines at high altitudes. *Journal of Applied Physiology*, *20*(6), 1329-1331.
19. Medina-Lezama, J., Zea-Diaz, H., Morey-Vargas, O. L., Bolanos-Salazar, J. F., Munoz-Atahualpa, E., Postigo-MacDowall, M., ... & Chirinos, J. A. (2007). Prevalence of the metabolic syndrome in Peruvian Andean hispanics: the PREVENCION study. *Diabetes research and clinical practice*, *78*(2), 270-281.
20. Sherpa, A. T. L., Clifford, G. M., Vaccarella, S., Shrestha, S., Nygård, M., Karki, B. S., ... & Franceschi, S. (2010). Human papillomavirus infection in women with and without cervical cancer in Nepal. *Cancer Causes & Control*, *21*(3), 323-330.
21. De Koning, B. B., Tabbers, H. K., Rikers, R. M., & Paas, F. (2007). Attention cueing as a means to enhance learning from an animation. *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition*, *21*(6), 731-746.
22. Canoy, D. (2008). Distribution of body fat and risk of coronary heart disease in men and women. *Current opinion in cardiology*, *23*(6), 591-598.
23. Canoy, D., Boekholdt, S. M., Wareham, N., Luben, R., Welch, A., Bingham, S., ... & Khaw, K. T. (2007). Body fat distribution and risk of coronary heart disease in men and women in the European Prospective Investigation Into Cancer and Nutrition in Norfolk cohort: a population-based prospective study. *Circulation*, *116*(25), 2933-2943.
24. Bax, J. J., Ansalone, G., Breithardt, O. A., Derumeaux, G., Leclercq, C., Schalij, M. J., ... & Nihoyannopoulos, P. (2004). Echocardiographic evaluation of cardiac resynchronization therapy: ready for routine clinical use? A critical appraisal. *Journal of the American College of Cardiology*, *44*(1), 1-9.
25. Berger, C. N., Sodha, S. V., Shaw, R. K., Griffin, P. M., Pink, D., Hand, P., & Frankel, G. (2010). Fresh fruit and vegetables as vehicles for the transmission of human pathogens. *Environmental microbiology*, *12*(9), 2385-2397.