Research Article

Dyslipidemia and its predictors among adult population: A community-based study

Aparajita Dasgupta[1], Keya Roy[1], Nivedita Roychoudhury[1], Shibani Datta[2], Lina Bandyopadhyay[1]

[1]Department of Community Medicine, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India, [2]Department of PHA, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India

Correspondence to: Keya Roy, E-mail: drkeyaroy10@gmail.com

Received: February 08, 2019; **Accepted:** March 01, 2019

ABSTRACT

Background: Dyslipidemia is a key independent modifiable risk factor for cardiovascular disease (CVD) and one of the main causes of the disease burden in developed and developing countries. **Objectives:** The objectives of this study were to elicit the proportion of dyslipidemia and its risk factors among the adult population of North 24 Parganas, West Bengal. **Materials and Methods:** This community-based cross-sectional study was conducted among 360 adults during August–October 2017 in Habra, an urban area of West Bengal, India. Sociodemographic data were obtained from structured questionnaire, followed by anthropometric measurement, fasting glucose, and lipid profile estimation. Assessment of dyslipidemia was determined according to the National Cholesterol Education Program Adult Treatment Panel (III) guidelines. Descriptive statistics and logistic regression were performed to analyze the data using SPSS 16 version. **Results:** The mean (standard deviation) age of the participants was 43.1 (±12.4) years. About 37.5% were found to have dyslipidemia. Variables which continued to remain significant in the multivariable analysis were less physical activity (adjusted odds ratio [AOR] = 2.75 [1.41, 5.39]), ever user of tobacco (AOR = 2.36 [1.12, 4.97]), hypertension (AOR = 2.52 [1.11, 5.71]), abnormal waist-hip ratio (AOR = 43.85 [21.62, 88.92]), and diabetes (AOR = 2.51[1.20, 6.69]) when adjusted for other variables in the multivariable analysis. **Conclusion:** Dyslipidemia is a known risk factor for CVD. Therefore, all steps must be taken for control and prevention of this disorder.

KEY WORDS: Dyslipidemia; Adult Population; Community Based

INTRODUCTION

Dyslipidemia is the elevation of plasma total cholesterol or triglycerides (TGs) or low density lipoprotein (LDL) or a low level of high-density lipoprotein (HDL) that contributes to the development of atherosclerosis.[1] Cardiovascular disease (CVD) is a major cause of morbidity and a leading contributor to mortality in both developed and developing countries.[2]

Access this article online	
Website: http://www.ijmsph.com	Quick Response code
DOI: 10.5455/ijmsph.2019.0203901032019	

Coronary artery disease is usually due to atherosclerosis of large- and medium-sized arteries, and dyslipidemia has been found to be one of the most important contributing factors.[3-6]

CVDs are the leading cause of death in the world, leading to almost 32% of all deaths in women and 27% in men in 2004. 36 million deaths (63% of total global mortality) annually are due to CVDs.[7-9]

Association of dyslipidemia with the development of CVD is well studied, and guidelines for the management of dyslipidemia have been published. Serum total cholesterol is usually used as a measure for monitoring at the population level, especially in developing countries. In the past few decades, data from several countries reported a high prevalence of dyslipidemia and unsatisfactory results of dyslipidemia management.[1,10-13]

However, there is a paucity of data regarding dyslipidemia and its risk factors from India, especially at the community level. With this background, this study was planned and implemented in an urban area from North 24 Parganas of West Bengal to assess the proportion of dyslipidemia and also to elicit the causative risk factors.

MATERIALS AND METHODS

This community-based cross-sectional descriptive study was conducted among people aged ≥18 years from August 2017 to October 2017 at Habra, North 24 Parganas, West Bengal, India.

Sample Size

Considering the prevalence of dyslipidemia to be 30.8 based on earlier study,[14] with absolute error at 5% and confidence level 95%, the sample size – $N = (Z_{\alpha/2})^2 pq/L^2$.

Where p = prevalence, q =1-p and L = allowable error, $Z_{\alpha/2}$ at confidence level 95% = 1.96.

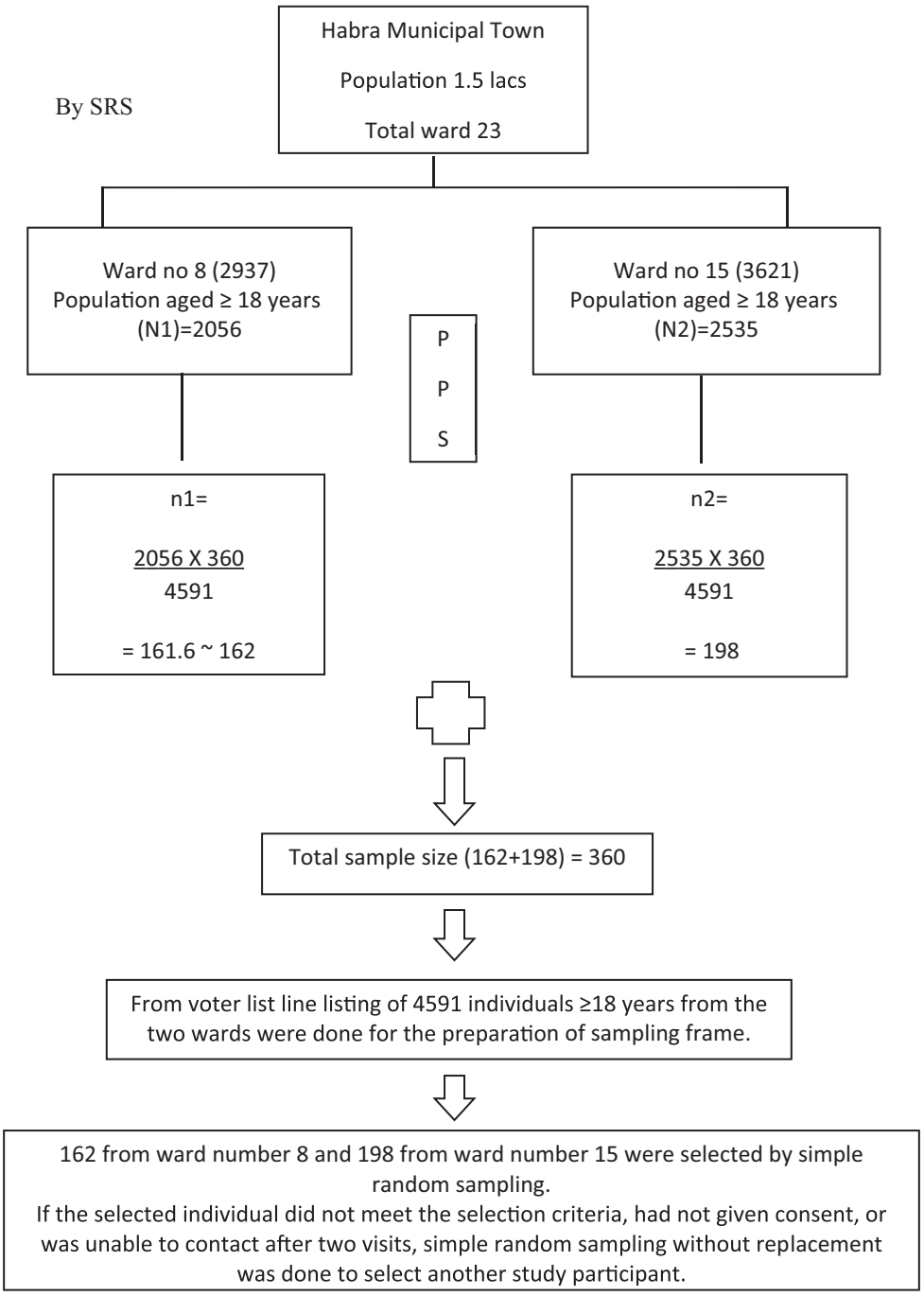

Figure 1: Sample selection

Sample size (N) = $(1.96 \times 1.96 \times 30.8 \times 69.2)/5^2 \sim 328$.

Assuming a 10% non-response (32), the final sample size was: −328 + 32 = 360.

Inclusion Criteria

All persons aged 18 years and above and permanent resident of that area were included in the study.

Exclusion Criteria

The following patients were excluded from the study:

Those who were critically ill.

Pregnant women.Participants who had not given written informed consent for the study.

Ethical clearance was obtained from the Institutional Ethics Committee.

Sampling Technique

Among 23 wards of Habra, two wards were chosen by simple random sampling. By probability proportionate to sampling the subsample size of each ward was estimated and the sampling frame was prepared from the voter list. The sampling units were selected by simple random sampling technique from the sampling frame, and thus, 360 persons aged ≥18 years living in those areas were selected [Figure 1].

Tools and technique

The interview was conducted with a pre-designed and pre-tested schedule after obtaining informed written consent from the participants. The schedule was designed keeping in mind the objectives of the study. To ascertain reliability, objectivity, and simplicity and to remove any ambiguity, necessary modifications were done. This schedule was judged by a group of experts of the institute where necessary corrections were made to enhance the face validity and content validity. The schedule was translated to Bengali. Pre-testing of the schedule was done by administering the questions to a small number of representative sample. Necessary modifications were made following their response. Furthermore, utmost care was taken to make the language simple so that the respondents, even if illiterate, could understand the questions easily. Clinical examination (blood pressure) and anthropometric measurements were carried out following standard operating procedures. The data included were weight, height, abdominal circumference,[15] and hip circumference.[15] Body mass index (BMI) was calculated from height and weight.[16] The participants were sent to Habra state general Hospital for testing of fasting blood sugar and lipid profile estimation on next day in empty stomach. Socioeconomic status was determined using modified B. G. Prasad's classification.[17]

Statistical Analysis

SPSS version 16.0 (IBM, USA) was used for statistical analysis. First, a bivariate analysis was done to ascertain the relationship of dyslipidemia with relevant independent variables. Only those found to be significant were entered into a multivariable logistic model with a confidence interval of 95%, $P < 0.05$. Diagnostic tests were done after modeling to assess goodness-of-fit and assumptions pertaining to logistic regression.

Biomedical waste disposal was followed according to SOP of hospital waste disposal.[18]

Working Definitions

Dependent variable: Dyslipidemia - According to the NCEP ATPIII guideline if any of the following abnormalities are found in the serum: Total cholesterol ≥200 mg/dL, LDL ≥130 mg/dL, HDL <50 mg/dl (for women) and <40 mg/dl (for men), triglyceride ≥150 mg/dl then that individual is suffering from dyslipideamia.

Independent variables: i) Socio-demographic profile, ii) diet (per day consumption of fruit, vegetable, junk food, fast food, weekly consumption of red meat, monthly consumption of visible fat), iii) addiction(alcohol and tobacco), iv) physical activity (International Physical Activity Questionnaire).[19]

Table 1: Distribution of study participants according to lipid profile (*n*=360)

Lipid profile	*n* (%)
Dyslipidemia	
Absent	225 (62.5)
Present	135 (37.5)
Serum TC (mg/dl)	
Normal (<200)	269 (74.7)
Borderline high/high (≥200)	91 (25.3)
Serum TG (mg/dl)	
Normal (<150)	266 (73.9)
Borderline high/high (≥150)	94 (26.1)
Serum LDL	
Optimal/near optimal (<130)	275 (76.4)
Borderline high/High (≥130)	85 (23.6)
Serum HDL	
Normal	294 (81.7)
Low[§]	66 (18.3)
Total	360 (100)

[§]-Low: <50 mg/dl (for women) and <40 mg/dl (for men),
LDL: Low-density lipoprotein, HDL: High-density lipoprotein,
TC: Total Cholesterol

RESULTS

The proportion of dyslipidemia among the study participants was 37.5%. The study participants who had high serum TC (≥200 mg/dl) were 25.3%. High serum total TG (≥150 mg/dl) was found among 26.1% of the study participants. High serum LDL (≥130 mg/dl) was found among 23.6% and low serum HDL (<50 mg/dl for women, <40 mg/dl for men) was found among 18.3% of the study participants [Table 1].

The mean (standard deviation [SD]) age of the participants was 43.1 (±12.4) years. 56.4% were females, 85.6% were currently married, 51.9% reside in joint family, 11.4% were illiterate, and 41.7% were home maker. Most of the study participants belonged to middle class (40.3%) and lower middle class (37.7%) according to modified B. G. Prasad Scale, January 2017.

The mean (SD) physical activity among the participants was 1814 (723) mean metabolic equivalent-min/week.

About 74.4% of the participants consumed inadequate amount (<200 g/day) of fruits and vegetables. 46.9% of participants consumed visible fat 750–1000 ml/month. Major (84.2%) portion of the study participants consumed more salt than recommended 5 g/day and more than half of the study participants (66.7%) added extra salt in food.

Among the study participants, 15.9% were current smokers. SLT user was 20%. 4.2% of participants were regularly consuming alcohol and 9.7% was occasional alcohol consumer. 9.2% of the participant consumed both alcohol and tobacco.

The proportion of diabetes found among the study participants was 16.3% and impaired fasting glucose level was found among 3.1%. Overall proportion of hypertension was 18.1% and pre-hypertension was 7.5%.

Majority of the study participants (65.8%) were having normal BMI. Underweight was 1.7%, overweight was 28.3%, and

Table 2: Association of dyslipidemia with various factors among the study participant: Univariate logistic regression (*n*=360)

Variables	Presence of dyslipidemia (*n*=135) number (%)	OR (95% CI)	*P* value
Age in completed years (↑)		1.05 (1.03,1.07)	<0.001
Gender			0.052
Female (*n*=203)	85 (41.9)	1.54 (0.99,2.38)	
Male (*n*=157)	50 (31.8)	1	
Education			0.014
< Middle (*n*=162)	72 (44.4)	1.71 (1.11,2.63)	
≥ Middle (*n*=198)	63 (28.4)	1	
Per capita income			0.001
>Rs. 2000 (*n*=147)	70 (47.6)	2.07 (1.34,3.20)	
≤Rs. 2000 (*n*=213)	65 (30.5)	1	
Physical activity (50th percentile MET-min/week)			0.013
<2014 (*n*=172)	76 (44.2)	1.73 (1.13,2.66)	
≥ 2014 (*n*=188)	59 (31.4)	1	
Tobacco			0.011
Ever (*n*=130)	60 (46.2)	1.77 (1.14,2.76)	
Never (*n*=230)	75 (32.6)		
Alcohol			0.034
Ever (*n*=51)	26 (51)	1.91 (1.05,3.46)	
Never (*n*=309)	109 (37.5)	1	
Hypertension			<0.001
Yes (*n*=65)	38 (58.5)	2.87 (1.65,4.97)	
No (*n*=295)	97 (32.9)	1	
WHR			<0.001
At risk (*n*=138)	111 (80.4)	33.91 (18.67,61.61)	
Normal (*n*=222)	24 (10.8)	1	
Diabetes			<0.001
Yes (*n*=59)	39 (66.1)	4.16 (2.31,7.52)	
No (*n*=301)	96 (31.9)		

OR: Odds ratio, WHR: Waist-hip ratio, CI: Confident interval

obese was 4.2%. According to waist circumference, most of the participants (33.1%) had central obesity. Overall 38.3% of participants were waist-hip ratio (WHR) at risk.

DISCUSSION

In this study, the proportion of dyslipidemia was found to be 37.5%. High serum TC, high serum total TG, high serum LDL, and low serum HDL found among 25.3%, 26.1%, 23.6%, and 18.3% of the study participants, respectively [Table 1].

Risk factors which remained significant in multivariable analysis were less physical activity (adjusted odds ratios [AOR]=2.75 [1.41, 5.39]), ever user of tobacco (AOR = 2.36 [1.12, 4.97]), hypertension (AOR = 2.52 [1.11, 5.71]), abnormal WHR (AOR = 43.85 [21.62, 88.92]), and type 2 diabetes (AOR = 2.51 [1.20, 6.63]) after adjusting for other variables such as increasing age, lower level of education, higher per capita income, and ever user of alcohol [Tables 2 and 3].

Similar finding was found by Sun *et al*.,[20] among Chinese, 35 years and above (36.9%). A higher proportion of dyslipidemia found by Raj *et al*.,[21] Tamil Nadu, 2016, among 30 years and above was 71.7%, and significant association was found only with higher BMI. Higher proportion of dyslipidemia also observed by Banerjee *et al*.,[22] Siliguri, West Bengal, 2014, among 20 years and above was 78.4%, and significant association was found with tobacco use; they found a proportion of raised TC 15.5%, raised TGs 31.86%, raised LDL 15.04%, and lowered HDL 61.1%. A higher proportion of dyslipidemia observed by Basheikh *et al*.,[23] Saudi Arabia, among Saudi employees in primary health care in Jeddah City in 2014 was 78% and a significant association was hypertension and diabetes, similar to the present study.

Table 3: Association of dyslipidemia with various factors among the study participant: Multivariable logistic regression (*n*=360)

Variables	AOR (95% CI)	*P* value
Physical activity (50^{th} percentile MET-min/week)		
<2014 (*n*=172)	2.75 (1.41,5.39)	0.003
≥ 2014 (*n*=188)	ref	
Tobacco		
Ever (*n*=130)	2.36 (1.12,4.97)	<0.023
Never (*n*=230)	ref	
Hypertension		
Yes (*n*=65)	2.52 (1.11,5.71)	0.027
No (*n*=295)	ref	
WHR		
At risk (*n*=138)	43.85 (21.62,88.92)	<0.001
Normal (*n*=222)	ref	
Diabetes		
Yes (*n*=59)	2.51 (1.20,6.63)	0.017
No (*n*=301)	ref	

Hosmer–Lameshow test gave a *P* value of 0.519, (not significant) indicating good model fit. Nagelkerke R2 was 0.644,
ARO: Adjusted odds ratio, WHR: Waist-hip ratio, CI: Confident interval, MET: Mean metabolic equivalent

CONCLUSION

Community-based study and large sample size were the strength of this study. Recall bias and conscious falsification/social desirability bias on the part of the participants regarding sociodemographic profile, dietary habits, physical activity, and addiction could not be ruled out.

Dyslipidemia grossly damages blood vessels and, therefore, is an established causative factor for heart disease, heart attack, peripheral artery disease, or stroke. In this study, it was observed that the proportion of dyslipidemia was quite high and this finding was among the individuals in the community, many of whom did not have any symptoms or complaints of morbidities which entail dyslipidemia. Therefore, screening among the general population for lipid profile may play a very important role in the prevention of CVD. Along with this the dissemination of behavioral change messages like maintaining optimum body weight, doing regular physical activity and consuming healthy diet which help in obviating dyslipidemia will also ultimately help in prevention and control of CVD.

ACKNOWLEDGMENTS

We are thankful to all the participants and the staffs of the Pathology Department of Habra State General Hospital, North 24 Parganas, for their cooperation during the study.

REFERENCES

1. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult treatment panel III) final report. Circulation 2002;106:3143-421.
2. Chaturvedi V, Bhargava B. Health care delivery for coronary heart disease in India-Where are we headed? Am Heart Hosp J 2007;5:32-7.
3. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult treatment panel III). JAMA 2001;285:2486-97.
4. Blood Pressure, Cholesterol, and Stroke in Eastern Asia. Eastern stroke and coronary heart disease collaborative research group. Lancet 1998;352:1801-7.

5. Stamler J, Daviglus ML, Garside DB, Dyer AR, Greenland P, Neaton JD, *et al*. Relationship of baseline serum cholesterol levels in 3 large cohorts of younger men to long-term coronary, cardiovascular, and all-cause mortality and to longevity. JAMA 2000;284:311-8.
6. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: Part I: General considerations, the epidemiologic transition, risk factors, and impact of urbanization. Circulation 2001;104:2746-53.
7. WHO. Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks. World Health Organization; 2009. Available from: http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf. [Last accessed on 2017 May 20].
8. Murray CJ, Lopez AD. Mortality by cause for eight regions of the world: Global burden of disease study. Lancet 1997;349:1269-76.
9. WHO. Global Action Plan for the Prevention and Control of Non Communicable Diseases 2013-2020. Available from: http://www.who.int/nmh/publications/ncd-action-plan/9789241506236_eng.pdf. [Last accessed on 2017 May 20].
10. Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr., Clark LT, Hunninghake DB, *et al*. Implications of recent clinical trials for the national cholesterol education program adult treatment panel III guidelines. Circulation 2004;110:227-39.
11. Reiner Z, Catapano AL, De Backer G, Graham I, Taskinen MR, Wiklund O, *et al*. ESC/EAS guidelines for the management of dyslipidemia: The task force for the management of dyslipidemia of the European society of cardiology (ESC) and the European atherosclerosis society (EAS). Eur Heart J 2011;32:1769-818.
12. Stone NJ, Robinson JG, Lichtenstein AH, Bairey Merz CN, Blum CB, Eckel RH, *et al*. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: A report of the American college of cardiology/American heart association task force on practice guidelines. J Am Coll Cardiol 2014;63:2889-934.
13. Anderson TJ, Grégoire J, Hegele RA, Couture P, Mancini GB, McPherson R, *et al*. 2012 update of the Canadian cardiovascular society guidelines for the diagnosis and treatment of dyslipidemia for the prevention of cardiovascular disease in the adult. Can J Cardiol 2013;29:151-67.
14. Kumar T, Das A. Prevalence of pre-diabetes and diabetes mellitus in a remote village of Eastern India. IOSR J Dent Med Sci 2016;15:29-32.
15. WHO. Waist Circumference and Waist-Hip Ratio: Report of a WHO Expert Consultation. Geneva: WHO; 2008. Available from: https://www.who.int/nutrition/publications/obesity/WHO_report_waistcircumference_and_waisthip_ratio/en. [Last accessed on 2017 May 28].
16. WHO. BMI Classification: Obesity and Overweight. Available from: http://www.who.int/mediacentre/factsheets/fs311/en/. [Last accessed on 2017 May 28].
17. Shaikh Z, Pathak R. Revised Kuppuswamy and B G Prasad socio-economic scales for 2017. Int J Community Med Public Health 2017;4:997-9.
18. Bio-Medical Waste Management Rules, 2016. Government of India. Ministry of Environment, Forest and Climate Change. Available from: http://www.envfor.nic.in/content/gsr-343e-28-03-2016-bio-medical-waste-management-rules2016. [Last accessed on 2017 May 22].
19. Patterson E. International Physical Activity Questionnaire-Short Form. Available from: http://www.sites.google.com/site/theipaq/questionnaire link. [Last accessed on 2017 May 25].
20. Sun GZ, Li Z, Guo L, Zhou Y, Yang HM, Sun YX, *et al*. High prevalence of dyslipidemia and associated risk factors among rural Chinese adults. Lipids Health Dis 2014;13:189.
21. Raj AS, Sivakumar K, Sujatha K. Prevalence of dyslipidemia in South Indian adults: An urban-rural comparison. Int J Community Med Public Health 2016;3:2201-10.
22. Banerjee R, Bhattacherjee S, Ray K, Roy JK, Datta S, Banerjee I. Dyslipidemia and its relation with cardiovascular risk factors in a selected population of Siliguri city, West Bengal, India. Asian J Med Sci 2015;5:1-8.
23. Basheikh K, Felemban AH, Felemban MH, Al-Raddadi RM, Al-Nuqali E, Abaalkhail BA, *et al*. Prevalence of dyslipidemia and its associated factors among employees of primary health care centers, Jeddah, Saudi Arabia. Int J Med Sci Public Health 2016;5:946-51.

How to cite this article: Dasgupta A, Roy K, Roychoudhury N, Datta S, Bandyopadhyay L. Dyslipidemia and its predictors among adult population: A community-based study. Int J Med Sci Public Health 2019;8(4):280-285.

Source of Support: Nil, **Conflict of Interest:** None declared.