Asian Journal of Medicine and Health

Volume 22, Issue 7, Page 194-203, 2024; Article no.AJMAH.118657
ISSN: 2456-8414

Prevalence of Abnormal Lipid Profile Among Obese People in Mogadisho, Somalia

Abdullahi Abdulkadir Abdiaziz [a], Md. Biplob Hossain [b], Afsana Mahbub [c], Sadia Islam [d], Shohanur Rahaman [b], and Md. Ashiqur Rahman [d*]

[a] Nova Diagnostic and Research, Somalia.
[b] Bangladesh Institute of Health Sciences (BIHS) General Hospital, Bangladesh.
[c] Ad-din Akij Medical College, Khulna, Bangladesh.
[d] Bangladesh University of Health Sciences (BUHS), Bangladesh.

Authors' contributions

This work was carried out in collaboration among all authors. Authors AAA and MdAR did conception and design. Authors SL, BH, and SR did data acquisition, analysis, and interpretation. Authors MdAR, AM, and AAA drafted and revised the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/ajmah/2024/v22i71060

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/118657

Original Research Article

Received: 18/04/2024
Accepted: 20/06/2024
Published: 26/06/2024

ABSTRACT

Background: A lipid profile includes total cholesterol, high-density lipoprotein (HDL) cholesterol, triglycerides, and calculated low-density lipoprotein (LDL) cholesterol. Obesity is defined as excess body weight, and dyslipidemia is abnormal blood concentrations of total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides. HDL carries only one-third to one-fourth of blood cholesterol, while triglycerides store excess energy.
Objective: The aim of this study was to find out the prevalence of abnormal lipid profile among obesity people in Mogadishu Somali.

**Corresponding author: E-mail: ararashiqur@gmail.com;*

Cite as: *Abdiaziz, Abdullahi Abdulkadir, Md. Biplob Hossain, Afsana Mahbub, Sadia Islam, Shohanur Rahaman, and Md. Ashiqur Rahman. 2024. "Prevalence of Abnormal Lipid Profile Among Obese People in Mogadisho, Somalia". Asian Journal of Medicine and Health 22 (7):194-203. https://doi.org/10.9734/ajmah/2024/v22i71060.*

Materials and Methods: A cross- sectional study was performed at selected hospitals. A total of 150 participants was enrolled in this study. 4 ml of venous blood sample was collected from each participant after taking informed written consent from the participants. Serum level of lipid profile test will be measured by using (AOUTUMATED CHEMISTRY MACHINE) techniques to evaluate lipid profile test status. Data analysis was done with statistical package for data analysis (spss).
Results: Among the of 150 participants the predominant age group was 20-30 years (42.7%), followed age group 31- 40 years 20%, and >50 years 20.7%. There was also age groups of 41-50 years (16.7%). According to their level of obesity, out of the 150 participants, 104(69.3%) were class I obesity 25-29.9BMI, 36(24%) were class II obesity 30-35BMI and the last 10(6.7%) were class III obesity >35BMI. In our study, according to laboratory diagnosis, maximum respondents were normal 58(38.7%) followed by 51(34%) were on the border line (HDL<43.7 mg/dl) and 41(27.3%) were abnormal.
Conclusion: The data concluded that the majority of the participants were normal, and also there was abnormal and border line. we do statistically significant, we have found that there's association between abnormal lipid profile and obesity level where the p-value was 0.006.

Keywords: Lipid profile; obesity; Somalia; dyslipidemia.

1. INTRODUCTION

Lipid profile a pattern of lipids in the blood. A lipid profile usually includes the levels of total cholesterol, high-density lipoprotein (HDL) cholesterol, triglycerides, and the calculated low-density lipoprotein (LDL) cholesterol. Obesity is defined as having an excess of body weight. A World Health Organization (WHO) release defined obesity as a chronic disease increasing globally replacing traditional health concerns. It is directly related to cardiovascular problems and children whose parents are cardiovascular patients tend to have higher weight in the childhood and develop obesity as adults. Coronary heart disease (CHD) has been estimated to become the leading cause of death in developing countries by 2020 [1,2,3,4,5,6].

Obesity prevalence increased significantly between 1976 and 1994, correlated with global trends. Upper body or visceral obesity is a serious public health issue, linked to cardiovascular dysmetabolic syndrome, a combination of risk factors including dyslipidemia, insulin resistance, and hypertension, which is a significant public health problem [2]. Riches' study found that obese men have higher fasting cholesterol, triglycerides, glucose, insulin and dietary fat levels. Elevated hepatic VLDL apoB100 levels correlate with visceral obesity and insulin resistance. This leads to increased VLDL remnants, hepatic lipoprotein lipase activity, and conversion to LDL and IDL particles [7,8]. A study examining serum levels of lipids, lipoproteins, and lipid metabolizing enzymes in Finnish twin cohorts found a genetic component to alteration in lipoprotein metabolism in visceral obesity. Obese co-twins showed a 20% increase in LDL cholesterol, a 20% decrease in HDL2 cholesterol subfraction, and a significant increase in total cholesterol, VLDL, and LDL triglyceride. Obesity exacerbated hyperglycemia, hyperinsulinemia, and elevated blood pressure in an FCH background [9,10]. Lipoproteins, including cholesterol, are transported to tissues in the form of chylomicrons (CM), low density lipoproteins (LDL), and high density lipoproteins (HDL). They are hydrophobic and transport excess fatty acids (FA) into triacylglycerols, packaged into very low density lipoprotein (VLDL) and apo proteins [11].

Pakistan, a country with a unique ethnicity, has a high prevalence of metabolic disorders, including obesity and heart problems. The modernization of lifestyles and transportation, combined with a unique ethnicity, have led to lipid abnormalities, often hyperlipidemia. This study investigates lipid profile patterns in obese and cardiovascular disease (CHD) patients in Pakistani subjects, highlighting the importance of lipid traits in nutritional disorders development [12]. The risk of metabolic syndrome in Asia has increased significantly, posing a significant health challenge and posing a significant risk of mortality [13]. The Working Group on Obesity in China (WGOC) recommends a BMI cut off of 24 kg/m2 for overweight and 28 kg/m2 for obesity due to evidence suggesting Chinese adults have a higher risk of metabolic syndrome and other risk factors for metabolic and cardiovascular disease, including insulin resistance, dyslipidemia, and increased visceral adipose tissue [14]. The International Obesity Task Force (IOTF) has highlighted the global prevalence of overweight

children, with 1 in 10 children affected, accounting for 2-3% of the world's children aged five to 17 years [15].

Obesity is a growing issue in low and middle income countries, particularly in urban settings like Nigeria. Studies show a high prevalence of overweight and obesity in children, with rates ranging from 0.84% to 11.3%. Obesity is influenced by genetic, metabolic, cultural, environmental, socio-economic, and behavioral factors. Obesity in older children is a predictor of adult obesity and increases mortality from coronary heart disease. The mechanisms relating to obesity to cardiovascular risk are not clearly defined, but hyperlipidemia and hypertension form the insulin resistance syndrome [16]. There for there is no published data regarding the status of the prevalence of Abnormal Lipid Profile Among obesity people in Somalia. income countries, particularly in urban settings like Nigeria. Studies show a high prevalence of overweight and obesity in children, with rates ranging from 0.84% to 11.3%. Obesity is influenced by genetic, metabolic, cultural, environmental, socio-economic, and behavioral factors. Obesity in older children is a predictor of adult obesity and increases mortality from coronary heart disease. The mechanisms relating to obesity to cardiovascular risk are not clearly defined, but hyperlipidaemia and hypertension form the insulin resistance syndrome [17-20]. There for there is no published data regarding the status of the prevalence of Abnormal Lipid Profile Among obesity people in Somalia.

2. MATERIALS AND METHODS

2.1 Study settings and Study Population

This study was descriptive cross sectional study design. It was use quantitative data collection method to find out the Abnormality of lipid profile among obesity people. The target population for this study was obese people. This study was conduct at Hodan district Specially (Jazeera university hospital, Jazeera University Campus one and Shaafi Specialist Hospital) Mogadishu Banadir Somalia. The study was carried out from March to September 2023. The study was including only 150 samples. Among them 95 (63.3%) of the respondents were female, while 55 (36.7%) of the respondents were male. Inclusion criteria: This Study was included all Obese people in Mogadishu. Exclusion criteria: People who are not willing to participate.

2.2 Blood sample collection and Laboratory Analysis

This study was used gloves, tubes, maker pen, allergic machine, Centrifuge, paster Pipette. We are using serum a venous blood sample is collected aseptically without additives. Indicate the centrifugation or the presence of fibrin or particulate matter in the sample may cause an erroneous result. Inspect all samples for air bubbles and foaming. Remove any air bubbles prior to assay. Samples may be stored at 2-8c for up to 7 days prior to analysis. The sample required for analysis is 100 ul. Laboratory analysis were done in diagnostic centers Mogadishu Banadir Somalia.

2.3 Operational Definition

Dyslipidemia National Cholesterol Education Programme (NCEP) guidelines were used for definition of dyslipidemia as follows Hypercholesterolemia – serum cholesterol levels ≥200 mg/ dl (≥5.2 mmol/l). Hypertriglyceridemia – serum triglyceride levels ≥150 mg/ dl (≥1.7 mmol/l). Low HDL cholesterol – HDL cholesterol levels <40 mg/dl (<1.04 mmol/l) for men and <50 mg/dl (<1.3 mmol/l) for women. High LDL cholesterol – LDL cholesterol levels ≥130 mg/dl (≥3.4 mmol/l) calculated using the Friedewald equation. High total cholesterol to HDL-C Ratio This is defined as a total cholesterol to HDL-C ratio of ≥4.5 [21].

2.4 Data Collection

Questionnaire was open-ended questions was administered to every study A participant. Researcher was getting an authority letter from the faculty of Health Science of Jazeera University, Somalia to make the authorization of carrying out research about — Prevalence of Abnormal Lipid Profile Among Obesity People. Questionnaire and investigation (Sample Testing) was used as the main instrument for collecting patient socio-demographic profile.

2.5 Data Analysis

All collected data was analyzed using statistical package for social science software (SPSS version 20). Data analysis began with descriptive analysis. Means with standard deviations was calculated for continuous variables while frequencies and percentages were calculated for Categorical variables.

3. RESULTS

Out of the 150 participants in this study, more than half 95(63%) were female while the remaining 55 (36.7%) were male. The predominant age group was 20- 30 years (42.7%), followed age group 31-40 years 20%, and >50 years 20.7%. There was also age groups of 41-50 years (16.7%). Out of the 150 participants in this study, more than half 92(61.3%) were married while the remaining 58 (38.7%) were single. Nearly half 74(49.3%) were bachelor, followed by secondary level 34(22.7%), and the least were master degree 24(16%) and illiterate 18(12%). According to the below table, out of the 150 participants, 54 (36%) were unemployed, 52 (34.7%) were soft work and the last 44(29.3) were hard workers (Table 1).

Among 150 subjects included in this study, the majority selected not tested lipid profile 109(72.7%) the remaining 41(27.3%) selected yes. The majority selected no family history 93(62%) the remaining 57(38%) selected they have family history of hyperlipidemia. According to their level of obesity, out of the 150 participants, 104(69.3%) were class I obesity 25-29.9BMI, 36(24%) were class II obesity 30-35BMI and the last 10(6.7%) were class III obesity >35BMI. The majority were obesity 89(59.3%) the remaining 61(40.7%) were physical inactivity (Table 2).

Among 150 subjects included in this study on the basis of triglyceride, the majority were normal 130(86.7%) the remaining 20 (13.3%) were abnormal (Fig. 1).

Among 150 subjects included in this study on the basis of LDL, the majority were normal 122 (81.3%) the remaining 28(18.7%) were abnormal (Fig. 2).

Among 150 subjects included in this study on the basis of HDL, the majority were abnormal 79 (52.7%) the remaining 71 (47.3%) were normal (Fig. 3).

Among 150 subjects included in this study on the basis of total cholesterol, the majority were normal 136 (90.7%) the remaining 14(9.3%) were abnormal (Fig. 4).

Among 150 subjects included in this study on the basis of overall lab result test of all lipid profile, the majority were normal 58(38.7%), 41(27.3%) were abnormal an the last 51(34%) were on the border line (HDL <43.7 mg/dl).

Table 1. Distribution of the study subjects on the basis of Demographic characteristics (n=150)

Parameters	Frequency (%)
Gender	
Male	55 (36.7)
Female	95 (63.3)
Age Group	
20-30 years	64 (42.7)
31-40 years	30 (20.0)
41-50 years	25 (16.7)
Above 50 years	31 (20.7)
Marital status	
Married	58 (38.7)
Unmarried	92 (61.3)
Level of education	
Illiterate	18 (12)
Secondary	34 (22.7)
Bachelor	74 (49.3)
Master degree	24 (16.0)
Occupation	
Soft work	52 (34.7)
Hard work	44 (29.3)
Unemployment	54 (36.0)

Table 2. Distribution of the study subjects on the basis of clinical characteristics (n=150)

Parameters	Frequency (%)
Have you ever been tested lipid profile	
Yes	41 (27.3)
No	109 (72.7)
Family history of hyperlipidemia	
Yes	57 (38.0)
No	93 (62.0)
Obesity level BMI	
Class I obesity 25-29.9 BMI	104 (69.3)
Class II obesity 30-35 BMI	36 (24.0)
Class III obesity >35 BMI	10 (6.7)
Risk group of dyslipidemia	
Obesity	89 (59.3)
Physical inactivity	61 (40.7)

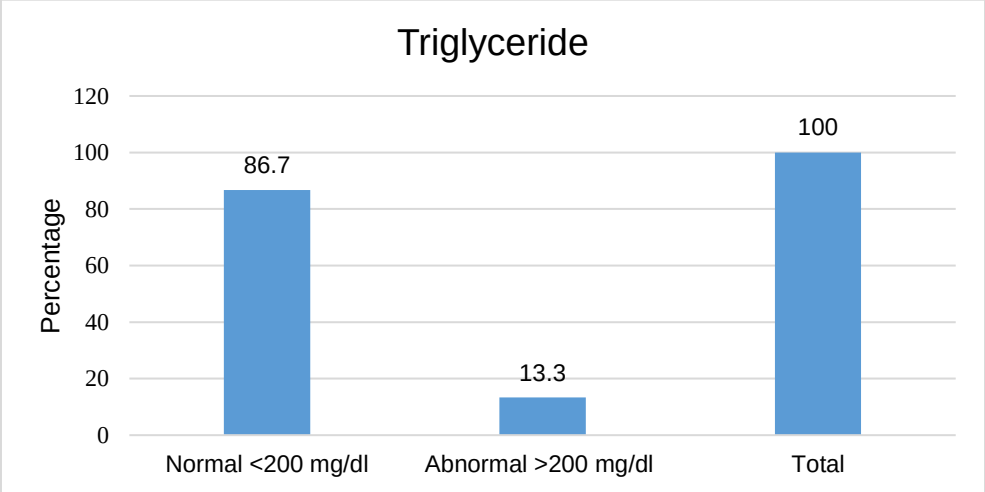

Fig. 1. Distribution of the study subjects on the basis of triglyceride

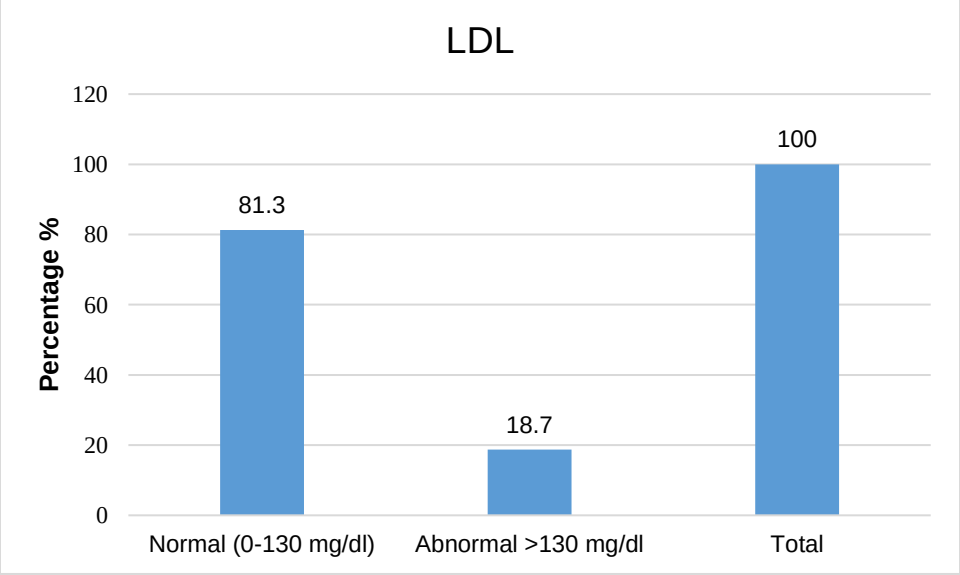

Fig. 2. Distribution of the study subjects on the basis of LDL

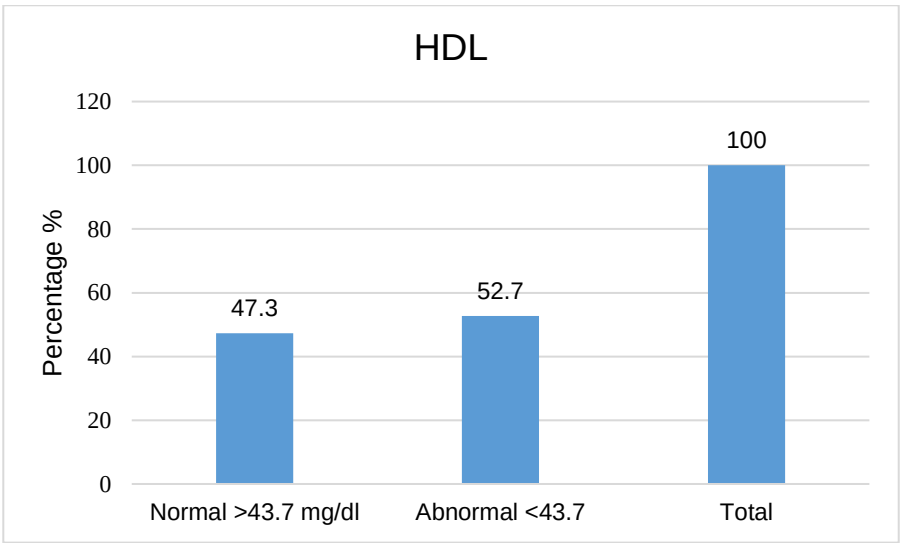

Fig. 3. Distribution of the study subjects on the basis of HDL

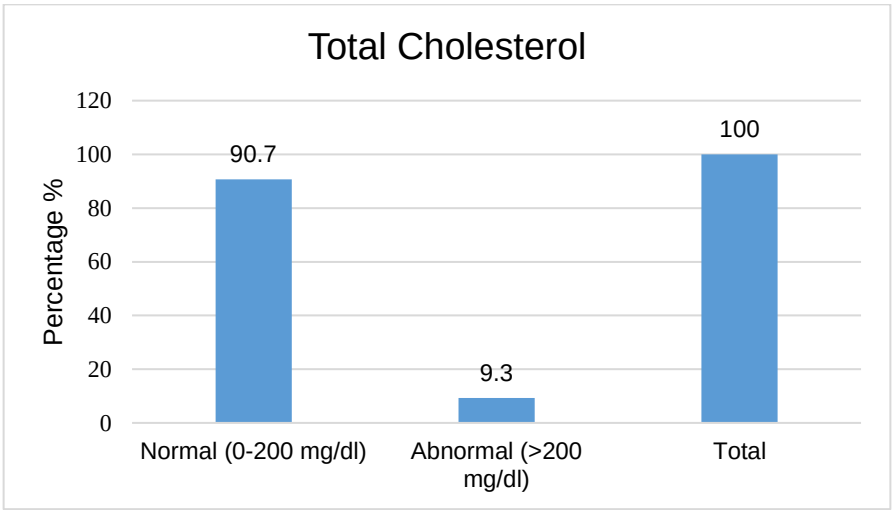

Fig. 4. Distribution of the study subjects on the basis of total cholesterol

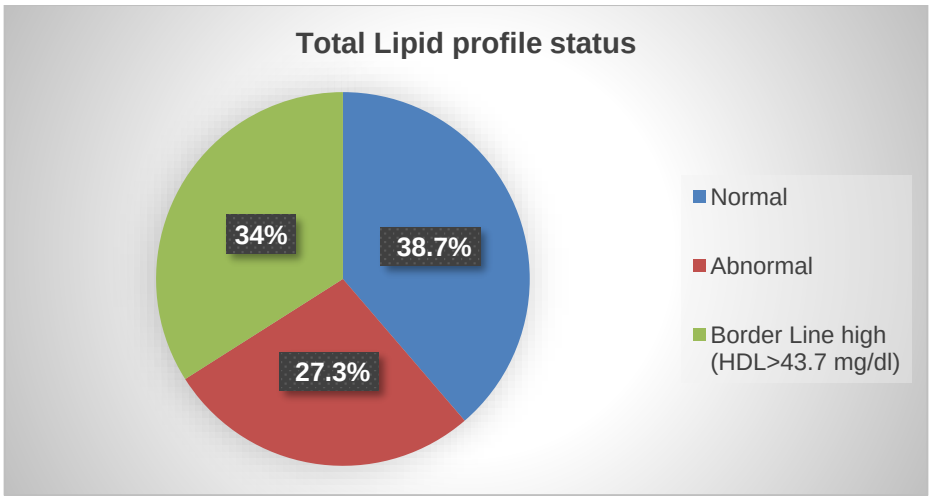

Fig. 5. Distribution of the study subjects on the basis of lipid profile status

Table 3. Associations between abnormal lipid profile and obesity level

	Distribution of the study subjects on the basis of lab result test of lipid profile			Total	Chi-Square (P – value)
	Normal	Abnormal	Border line (HDL<43.7mg dl)		
Class I Obesity (25-29 years)	46 (79.3%)	20 (48.8%)	38 (74.5%)	104 (69.3%)	**14.547 (0.006)**
Class II Obesity (30-35 years)	10 (17.2%)	18 (43.9%)	8 (15.7%)	36 (24.0%)	
Class III Obesity >35 years	2 (3.4%)	3 (7.3%)	5 (9.8%)	10 (6.7%)	
Total	58 (38.6%)	41 (27.3%)	51 (34.0%)	150 (100.0)	

Chi square test e fisher exact test was performed to calculate significant statisticalassociation. P < 0.05 was considered as level of statistical significance

Within the BMI status of the respondents who were in class I obesity were normal 46 (79.3), 20 (48.8%) were abnormal, and 38 (74.5%) were border line The similar pattern was observing in respondent who had class II obesity most of them were abnormal 18 (43.9%) and class III obesity were also border line. To see the differences, we did a chi square test. The distribution showed statistical significant difference (P =0.006) between abnormal lipid profile and obesity (Table 3).

4. DISCUSSION

Imbalance of lipid including (LDL) and (HDL) can increase the risk of cardiovascular events, including myocardial infarction and stroke. Elevated LDL-C can lead to a buildup of plaques within the arteries and is associated with an increased risk of atherosclerotic cardiovascular disease (ASCVD). including coronary artery disease [22],

Dyslipidaemia is defined as the presence of abnormal blood concentrations of one or more of the following: total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides [23]. Obesity is defined as having an excess of body weight. HDL carries LDL (bad) cholesterol away from the arteries and back to the liver, where the LDL is broken down and passed from the body. But HDL cholesterol doesn't completely eliminate LDL cholesterol [24]. Only one-third to one-fourth of blood cholesterol is carried by HDL. Triglycerides are the most common type of fat in the body. They store excess energy from your diet. The remainders of the studies of interest were conducted in Mozambique, Zambia, Senegal, Uganda, Togo, and Malawi [25]. The highest prevalence of dyslipidemia was reported in a study from South Africa (89.9%), and from Kenya (85.6%). On the other hand, the lowest prevalence of dyslipidemia of 5.2% was reported in a study from Ethiopia. The highest percentage of LDL-C data was reported in a study from Ethiopia (79.7%) [26,27]. The prevalence of obesity across Asia has increased rapidly over the last two decades. This has become a major health challenge, given the associated elevated risk of disease, including type-2 diabetes mellitus, hypertension, metabolic syndrome, and an increased risk of mortality. About 13% of the world's adult population (11% of men and 15% of women) were obese in 2016 [28-30]. Coronary heart disease (CHD) is the leading cause of morbidity and mortality in the United States, causing nearly 500,000 deaths annually and requiring 12 million hospital days of care. It is the leading cause of disabled life-years and second only to injuries as a cause of life-years lost. The lifetime risk of having a CHD event is estimated to be 49% for men and 32% for women in the United States. Cardiovascular disease (CVD) is one of the most prevalent and debilitating chronic diseases, with approximately half of the global burden located in the Asia Pacific region. The prevalence of specific risk factors for CVD among Asian populations differs from Western populations in the same geographical region, such as Australia and New Zealand. The Cardiovascular Risk Prevention (CRISP) in Asia network aims to develop strategies to tackle the rising burden of CVD in the region [27,31].

Among the of 150 participants the predominant age group was 20-30 years (42.7%), followed age group 31-40 years 20%, and >50 years 20.7%. There was also age groups of 41-50 years (16.7%). In our study, according to laboratory diagnosis, maximum respondents

were normal 58(38.7%) followed by 51 (34%) were on the border line (HDL <43.7 mg/dl) and 41(27.3%) were abnormal. According to their level of obesity, out of the 150 participants, 104(69.3%) were class I obesity 25-29.9BMI, 36(24%) were class II obesity 30-35BMI and the last 10(6.7%) were class III obesity >35BMI through findings were no statistically significant, we have found that there's significant association between abnormal lipid profile and obesity. Also we done family history of hyperlipidemia of the respondents according to their family history of hyperlipidemia where about the majority 93(62%) of respondents had stated that they have no family history of hyperlipidemia while the remaining 57(38%) of the respondents had claimed tohave family history of hyperlipidemia.

5. CONCLUSION

Hypertriglyceridemia and low HDLC levels are significant predisposing factors for various diseases, including obesity, diabetes, and cardiovascular diseases. Obesity is the most common cause of death worldwide, and its development is critical for coronary heart disease. The global spread of unhealthy lifestyle factors, such as smoking, overweight, and type 2 diabetes, contributes to the obesity epidemic. Over 25% of the adult population in middle-income countries is obese, a significant change from two decades ago. The study concluded that the majority of the participants were normal, and also there was abnormal and border line and do statistically significant this study have found that there's association between abnormal lipid profile and obesity level.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

This study was approved by the Institutional Ethics Review Committee (IERC) of Nova Diagnostic & Research Institute, Benadir Region, Somalia.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anderson KM, Wilson PW, Garrison RJ, Castelli WP. Longitudinal and secular trends in lipoprotein cholesterol measurements in a general population sample The Framingham offspring study. Atherosclerosis. 1987;68(1-2):59-66.
2. Chou R, Dana T, Blazina I, Daeges M, Bougatsos C, Jeanne T. Screening for Dyslipidemia in Younger Adults. del Mar Bibiloni M, Salas R, Yolanda E, Villarreal JZ, Sureda A, Tur JA. Serum lipid profile, prevalence of dyslipidaemia, and associated risk factors among Northern Mexican adolescents. Journal of pediatric gastroenterology and nutrition. 2016;63(5):544-9.
3. Aborisade, Oluyinka Bamidele, Mabel Ayebatonyo Charles–Davies, Mayowa Ojo Owolabi, and Emmanuel Oluyemi Agbedana. 2022. Obesity and dyslipidemia as risk factors of vascular cognitive impairment in adult hypertensive Nigerian. Journal of Advances in Medicine and Medical Research 34 (23):334-42.
4. Mehder ASA, Alenazi HS, Alqahtani SA, Hammad NK, Alenezi SY, Alajmy SA, Alotaibi KM, Lahsah AEA, Alshak AMS, Alsayed AI, Alzahrani RA. Diagnostic criteria and lipid screening of dyslipidemia in children. Journal of Pharmaceutical Research International, 2021;33(56B): 333–339.
5. Hudson SE, Feigenbaum MS, Patil N, Ding E, Ewing A, Trilk JL. Screening and socioeconomic associations of dyslipidemia in young adults. BMC Public Health. 2020;20:1-9.
6. Franssen R, Monajemi H, Stroes ES, Kastelein JJ. Obesity and dyslipidemia. Endocrinology and metabolism clinics of North America. 2008;37(3):623-33.
7. Denke MA, Sempos CT, Grundy SM. Excess body weight: an underrecognized contributor to high blood cholesterol levels in white American men. Archives of internal medicine. 1993;153(9):1093-103.
8. Dowling HJ, Pi-Sunyer FX. Race-dependent health risks of upper body

obesity. Diabetes. 1993;42(4):537-43.
9. Eke CB, Ogbodo SO, Onyire NB, Muoneke UV, Ukoha MO, Amadi OF, Eze JN, Ibekwe RC. Association of Body Mass Index and Serum Lipid Profile among Adolescents in Enugu, Nigeria. Ann Med Health Sci Res. 2018;8.
10. Chanda M, Biswas T, Amiruzzaman M, Begum H, Tabassum F, Munmun ST, Rahman A, Akram A. Association of Serum Uric Acid and Liver Enzymes in Adults at Tertiary Level Hospital in Bangladesh. Bangladesh Medical Journal. 2024;51(3):18–27.
11. Fung MD, Canning KL, Mirdamadi P, Ardern CI, Kuk JL. Lifestyle and weight predictors of a healthy overweight profile over a 20-year follow-up. Obesity. 2015;23 (6):1320-5.
12. Fung TT, Pan A, Hou T, Chiuve SE, Tobias DK, Mozaffarian D, Willett WC, Hu FB. Long-term change in diet quality is associated with body weight change in men and women. The Journal of nutrition. 2015;145(8):1850-6.
13. Germeroth LJ, Levine MD. Postcessation weight gain concern as a barrier to smoking cessation: Assessment considerations and future directions. Addictive behaviors. 2018;76:250-7.
14. Golubic R, Wijndaele K, Sharp SJ, Simmons RK, Griffin SJ, Wareham NJ, Ekelund U, Brage S. Physical activity, sedentary time and gain in overall and central body fat: 7-year follow-up of the ProActive trial cohort. International journal of obesity. 2015;39(1):142-8.
15. Howard BV, Ruotolo G, Robbins DC. Obesity and dyslipidemia. Endocrinology and Metabolism Clinics. 2003;32(4):855-67.
16. Islam S, AshiqurRahman M, Anam Chowdhury S, Rahaman S. A review: Serum lipid profile status in cardiovascular disease. Molecular Mechanism Research. 2023;1(1).
17. Hu D, Hannah J, Gray RS, Jablonski KA, Henderson JA, Robbins DC, Lee ET, Welty TK, Howard BV. Effects of obesity and body fat distribution on lipids and lipoproteins in nondiabetic American Indians: The Strong Heart Study. Obesity Research. 2000;8(6):411-21.
18. Joshi SR, Anjana RM, Deepa M, Pradeepa R, Bhansali A, Dhandania VK, Joshi PP, Unnikrishnan R, Nirmal E, Subashini R, Madhu SV. Prevalence of dyslipidemia in urban and rural India: the ICMR–INDIAB study. PloS one. 2014;9(5): e96808.
19. Karr S. Epidemiology and management of hyperlipidemia. The American Journal of Managed Care. 2017;23(9Suppl):S139-48.
20. Khera AV, Won HH, Peloso GM, Lawson KS, Bartz TM, Deng X, van Leeuwen EM, Natarajan P, Emdin CA, Bick AG, Morrison AC. Diagnostic yield and clinical utility of sequencing familial hypercholesterolemia genes in patients with severe hypercholesterolemia. Journal of the American College of Cardiology. 2016;67 (22):2578-89.
21. Khera AV, Won HH, Peloso GM, Lawson KS, Bartz TM, Deng X, van Leeuwen EM, Natarajan P, Emdin CA, Bick AG, Morrison AC. Diagnostic yield and clinical utility of sequencing familial hypercholesterolemia genes in patients with severe hypercholesterolemia. Journal of the American College of Cardiology. 2016;67 (22):2578-89.
22. Kumanyika SK, Obarzanek E, Stettler N, Bell R, Field AE, Fortmann SP, Franklin BA, Gillman MW, Lewis CE, Poston WC, Stevens J. Population-based prevention of obesity: the need for comprehensive promotion of healthful eating, physical activity, and energy balance: a scientific statement from American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (formerly the expert panel on population and prevention science). Circulation. 2008;118(4):428-64.
23. Lee ZV, Llanes EJ, Sukmawan R, Thongtang N, Ho HQ, Barter P, Cardiovascular RISk Prevention (CRISP) in Asia Network. Prevalence of plasma lipid disorders with an emphasis on LDL cholesterol in selected countries in the Asia-Pacific region. Lipids in health and disease. 2021;20:1-2.
24. Chanda M, Biswas T, Roy MN,Sampa SR, Saha P, Sharna RJ, Islam S, Mahbub A, Rahman MA. Association of Liver Enzymes and Lipid Profile in Adults at Tertiary Level Hospital in Bangladesh. J Natl Inst Lab Med Ref Bangladesh. 2021;1(1):17-24
25. Lu Y, Li N, Kamishima T, Jia P, Zhou D, Hind K, Sutherland K, Cheng X. Visceral Obesity and Lipid Profiles in Chinese Adults with Normal and High Body Mass Index. Diagnostics. 2022;12(10):2522.

26. Mach F, Baigent C, Catapano AL, Koskinas KC, Casula M, Badimon L, Chapman MJ, De Backer GG, Delgado V, Ference BA, Graham IM. Corrigendum to "2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk"[Atherosclerosis 290 (2019) 140–205]. Atherosclerosis. 2020;294:80-2.
27. Mach F, Baigent C, Catapano AL, Koskinas KC, Casula M, Badimon L, Chapman MJ, De Backer GG, Delgado V, Ference BA, Graham IM. 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk: the Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS). European heart journal. 2020;41(1):111-88.
28. Mach F, Baigent C, Catapano AL, Koskinas KC, Casula M, Badimon L, Chapman MJ, De Backer GG, Delgado V, Ference BA, Graham IM. 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk: the Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS). European heart journal. 2020;41(1):111-88.
29. AshiqurRahman M, Islam S, Rahaman S, RajibEmran M. Assessment the Levels of Serum Ferritin and Some Biochemical Parameters in Type 2 Diabetic Subjects Attending A Tertiary Hospital in Bangladesh. Molecular Mechanism Research. 2023;1(1).
30. Noubiap JJ, Bigna JJ, Nansseu JR, Nyaga UF, Balti EV, Echouffo-Tcheugui JB, Kengne AP. Prevalence of dyslipidaemia among adults in Africa: A systematic review and meta-analysis. The Lancet Global Health. 2018;6(9):e998-1007.
31. Chanda M, Biswas T, Tannim N, Mahbuba A, Yasmin R, Islam S, Rahman MA. Association of Serum Uric Acid and Lipid Profile in Adults at a Tertiary Level Hospital in Bangladesh. Ad-din Sakina Women's Medical College Journal. 2024; 5(1): 28-37.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/118657