DOI: https://doi.org/10.53350/pjmhs2023171783

ORIGINAL ARTICLE

Lipid Profile Changes Among Male and Female Regarding their Body Mass Index and Diet a Comparative Cross-Sectional Study

MUHAMMAD NAVEED NAJEEB[1], ZUNAIRA KANWAL[2], NAZISH MEHMOOD AISHA[3], UMAIRA MUNIR[4], SYED SAIM ALI SHAH [5], HINA MALIK[6], NAVEED SHUJA[7], ARSLAN SHUJA[8]
[1]Associate Professor/Head of Biochemistry Department Quaid-e-Azam Medical College Bahawalpur, Pakistan.
[2]Associate Professor Department of Biochemistry Allama Iqbal Medical College Lahore, Pakistan.
[3]Associate Professor / Head of Biochemistry Department Services Institute of Medical Sciences Lahore, Pakistan.
[4]Medical Officer Bahaval Victoria Hospital Bahawalpur, Pakistan.
[5]Postgraduate trainee (PG), Nishtar Medical University and Hospital Multan, Pakistan.
[6]Assistant Professor Department of Physiology, Rawal Institute of Health Sciences, Islamabad-Pakistan
[7]Associate Professor Department of Biochemistry Lahore Medical & Dental College Lahore, Pakistan.
[8]M.Phil Biochemistry (Scholar), Institute of Molecular Biology and Biotechnology (IMBB), The University of Lahore, Lahore, Pakistan.
Corresponding author: Naveed Shuja, Email: rananaveedshuja@gmail.com, Cell: +923334205687

ABSTRACT

Objective: The hypothesis that body mass index and diet has direct influence on plasma lipids. The aims and objectives of present study were to highlight the relationship between, BMI, diet and components of lipid profile in male and female individuals.

Study Design: This was a cross-sectional comparative study in which blood samples were collected from both male and female individuals.

Place and Duration: Present study was conducted in medical units of Jinnah hospital Lahore, Services hospital Lahore and Bahawal Victoria hospital Bahawalpur from February 2022 to November 2022.

Methodology: Total 500 individuals were divided into different groups such as Group-A with 100 normal individuals were control while in Group-B 100 male individuals of 30-45 years with low fat balanced diet, in Group-C 100 male individuals with fat rich imbalanced diet, in Group-D 100 female individuals of 30-45 years with low fat balanced diet whereas in Group-E 100 female individuals with fat rich imbalanced diet were selected and BMI, Cholesterol, Triglyceride, LDL and HDL levels were measured respectively.

Results: The findings of present study indicated different levels of cholesterol, triglycerides, low density lipoproteins and high density lipoproteins with comparative significant ($P \leq 0.05$) changes in different groups as compared with control Group-A. A remarkable changes in cholesterol, triglycerides, LDL, HDL levels in Group-B and Group-C were seen (160.1±0.02, 112.1±0.01, 106.1±0.01, 40.1±0.01) (210.2±0.01, 152.1±0.02, 120.2±0.03, 37.4±0.01) respectively. While in Group-E as compared with Group-D the cholesterol, triglycerides, LDL, HDL levels (230.2±0.04, 192.1±0.02, 130.1±0.01, 42.1±0.02) (170.2±0.04, 112.1±0.02, 110.2±0.03, 50.4±0.01) were high as compared with the individuals of Group-D.

Practical implication: The regular health awareness programs were not available for local population from health administration while lipid profile is directly proportional to the cardiac medical complications in all over the world. The main task of present study was to provide exact medical awareness to the people about diet related variations of cholesterol, triglycerides, LDL and HDL levels and ultimately it was concluded that dyslipidemia can occur in those with a normal BMI as well as those who are obese or overweight.

Conclusion: The findings of current study were described that cholesterol, triglycerides, LDL and HDL levels have correlation with BMI and intake diet. Therefore comparative significant ($P \leq 0.05$) changes in fat rich imbalanced groups were seen as compared with low fat balanced diet groups. According to the findings of this study, dyslipidemia can occur in those with a normal BMI as well as those who are obese or overweight.

Keywords: Body mass index, Cholesterol, Triglycerides, Low density lipoproteins, High density lipoproteins

INTRODUCTION

The term dyslipidemia refers to an abnormally high level of lipids in the blood. Triglycerides, phospholipids, and cholesterol are some of these lipids1. The most prevalent form of dyslipidemia is hyperlipidemia, which is an increase in blood lipid levels. Diet and lifestyle are two important aspects that have a role in this. 1 Increased total cholesterol, increased LDL, increased TC, and decreased HDL are the most often used classifications for dyslipidemia (HDL).[1,2] A lipid profile, which is a panel of blood tests that serve as a screening tool for abnormalities in total lipids and approximate risk of developing cardiovascular disease and other disorders, is necessary for the screening of dyslipidemia.[2,3]

Pakistan is more likely to have higher than average levels of total cholesterol (TC), triglycerides (TG), and high density lipoprotein cholesterol due to the high prevalence of dyslipidemia in this region (HDL-C)[3,4.] Increased levels of lipid parameters in blood are associated with the formation of atherosclerotic plaques, and dyslipidemia is a common finding in the obese population. Blood tests are used to screen for abnormalities in total lipids and to estimate the risk of developing cardiovascular disease and other diseases.[4,5]

High consumption of red meat is linked to a higher risk of morbidity and mortality from CVD4. Animal sources include vital nutrients that may not be readily available from plant sources. Along with elevated cholesterol levels, such diets may also be high in total and saturated fats[6,9]. Diets heavy in fruit, vegetables, whole grains, and fish, as well as those low in red meat, high-fat dairy products, trans- and saturated fats, have been shown in numerous studies to offer health benefits. The results of the research conducted highlight the significance of diet reliance on the enhancement of the standard of care and nutrition for individuals with this kind of condition[6,8.]

Rationale of study: The aims and objective of present study were to find out the association of dyslipidemia in male and female individuals regarding age and diet intake for proper health awareness among local population.

MATERIALS AND METHODS

Study design: This was a cross-sectional study in which blood samples were collected from both male and female individuals. Total 500 individuals were divided into different groups such as Group-A with 100 normal individuals were control while in Group-B 100 male individuals of 30-45 years with low fat balanced diet, in Group-C 100 male individuals with fat rich imbalanced diet, in Group-D 100 female individuals of 30-45 years with low fat balanced diet whereas in Group-E 100 female individuals with fat rich imbalanced diet were selected respectively.

Sample collection method: Blood samples of male and female individuals were collected in fasting from median cubital vein through disposable syringe in vials for biochemical analysis.

Exclusion and inclusion criteria: Free-living participants in the study came to the clinic on an outpatient basis. The subjects were given a low-fat diet (250 mg/day of cholesterol, 25% of calories as fat). In order to evaluate population health consciousness, nutritional status and health behavior the sample is weighted to reflect sampling rate, population demographics and response rate. The linear relationships of cholesterol, triglycerides, low density lipoproteins and high density lipoproteins with age and diet were basic findings.

Biochemical analysis: Cholesterol, triglycerides, low density lipoproteins, high density lipoproteins and Body mass index levels in each group were measured respectively.

Bio- statistic presentation: Raw data of each parameter was statistically analyzed with the help of ISSP version 2020. The findings of each group were presented with mean±standard deviation (SD), whereas (P<.05) was considered statistically significant value.

RESULTS

The findings of present study indicated different levels of cholesterol, triglycerides, low density lipoproteins and high density lipoproteins with comparative significant (P≤0.05) changes in different groups as compared with control Group-A shown in Table-1 and Table-2.

Table-1: Group-A, n=50, age (30y-45y) normal healthy male

Parameters	Units	Mean±SD	P≤0.05
Body Mass Index	kg/m^2.	10.1± 0.01	0.01
Serum Cholesterol levels	mg/dl	140.2±0.04	0.04
Serum Triglycerides levels	mg/dl	102.1±0.02	0.02
Serum LDL levels	mg/dl	98.2±0.03	0.03
Serum HLD levels	mg/dl	37.4±0.01	0.01

Table-2: Group-A, n=50, age (30y-45y) normal healthy female

Parameters	Units	Mean±SD	P≤0.05
Body Mass Index	kg/m^2.	11.1± 0.01	0.01
Serum Cholesterol levels	mg/dl	130.2±0.04	0.04
Serum Triglycerides levels	mg/dl	100.1±0.02	0.02
Serum LDL levels	mg/dl	88.2±0.03	0.03
Serum HLD levels	mg/dl	39.4±0.01	0.01

It was seen that Body Mass Index and nature of diet is directly proportional to the remarkable changes of lipid profile in male individuals which was presented in Table-3 and Table-4 comparatively. It was concluded that male individuals how were taking fat rich imbalanced diet in Group-C as compared with the individuals of Group-B. A remarkable changes in cholesterol, triglycerides, low density lipoproteins and high density lipoproteins, in Group-B and Group-C were seen (160.1±0.02, 112.1±0.01, 106.1±0.01, 40.1±0.01) (210.2±0.01, 152.1±0.02, 120.2±0.03, 37.4±0.01) respectively.

Table-3: Group-B, n=100, age (30y-45y) male individuals taking low fat and balanced diet

Parameters	Units	Mean±SD	P≤0.05
Body Mass Index	kg/m^2.	12.1± 0.01	0.01
Serum Cholesterol levels	mg/dl	160.1±0.02	0.02
Serum Triglycerides levels	mg/dl	112.1±0.01	0.01
Serum LDL levels	mg/dl	106.1±0.01	0.01
Serum HLD levels	mg/dl	40.1±0.01	0.01

Table-4: Group-C, n=100, age (30y-45y) male individuals taking fat rich imbalanced diet

Parameters	Units	Mean±SD	P≤0.05
Body Mass Index	kg/m^2.	14.1± 0.02	0.02
Serum Cholesterol levels	mg/dl	210.2±0.01	0.01
Serum Triglycerides levels	mg/dl	152.1±0.02	0.02
Serum LDL levels	mg/dl	120.2±0.03	0.03
Serum HLD levels	mg/dl	37.4±0.01	0.01

Similarly significant (P≤0.05) changes of lipid profile in female individuals which were showed in Table-5 and Table-6 noted comparatively. Present research find out that female individuals how were taking fat rich imbalanced diet in Group-E as compared with the individuals of Group-D have major differences in cholesterol, triglycerides, low density lipoproteins and high density lipoproteins levels (230.2±0.04, 192.1±0.02, 130.1±0.01, 42.1±0.02) (170.2±0.04, 112.1±0.02, 110.2±0.03, 50.4±0.01) as compared with the individuals of Group-D respectively.

Table-5: Group-D, n=100, age (30y-45y) Female individuals taking low fat balanced diet

Parameters	Units	Mean±SD	P≤0.05
Body Mass Index	kg/m^2.	15.1± 0.01	0.01
Serum Cholesterol levels	mg/dl	170.2±0.04	0.04
Serum Triglycerides levels	mg/dl	112.1±0.02	0.02
Serum LDL levels	mg/dl	110.2±0.03	0.03
Serum HLD levels	mg/dl	50.4±0.01	0.01

Table-6: Group-C, n=100, age (30y-45y) Female individuals taking fat rich imbalanced diet

Parameters	Units	Mean±SD	P≤0.05
Body Mass Index	kg/m^2.	18.1± 0.01	0.01
Serum Cholesterol levels	mg/dl	230.2±0.04	0.04
Serum Triglycerides levels	mg/dl	192.1±0.02	0.02
Serum LDL levels	mg/dl	130.1±0.01	0.01
Serum HLD levels	mg/dl	42.1±0.02	0.02

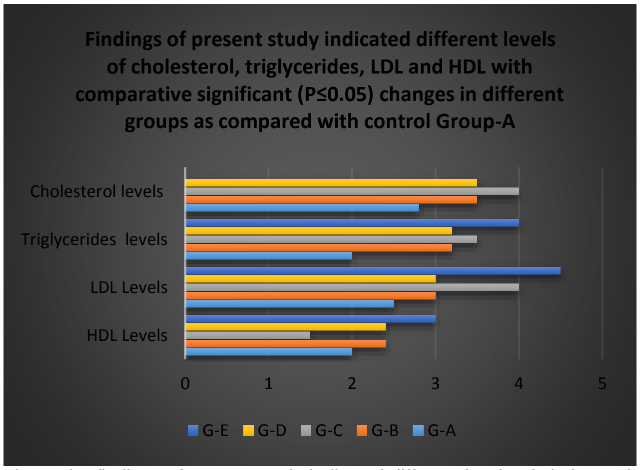

Fig-1: The findings of present study indicated different levels of cholesterol, triglycerides, low density lipoproteins and high density lipoproteins with comparative significant (P≤0.05) changes in different groups as compared with control Group-A.

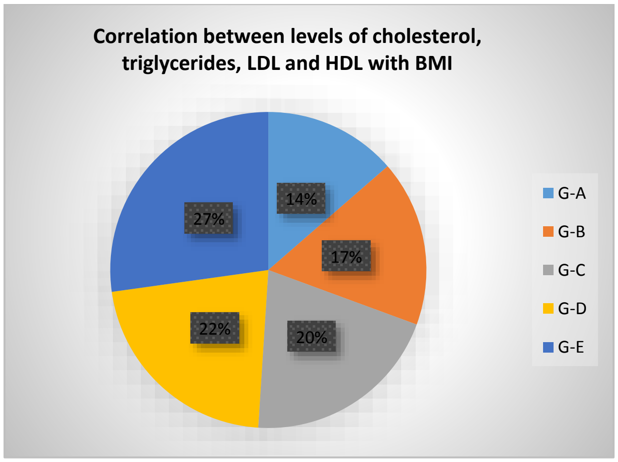

Fig-2: Correlation between levels of cholesterol, triglycerides, LDL and HDL with BMI

In fig-2 the correlation between different levels of cholesterol, triglycerides, low density lipoproteins and high density lipoproteins and body mass index was represented graphically which indicated a significant (P≤0.05) changes in different groups as compared with control.

DISCUSSION

According to the World Health Organization (WHO), obesity is the buildup of extra fat that directly endangers health[9,11]. Body mass index (BMI), a rudimentary demographic indicator of obesity[10.] The connection between dyslipidemia and obesity and high BMI has been supported by a number of studies.[11] However, some researches have made the reverse claim, claiming that males were more likely to report the higher prevalence[12]. Individuals can be divided into four groups based on BMI, which is a handy way to check for obesity and is viewed as a good substitute for a direct measure of body fat. It was desired to conduct more research to uncover additional signs of early lipoprotein impairment.[13,16]

Several conditions that exhibit altered lipoprotein metabolism, elevated levels of LDL-C, TGs, and total cholesterol, and lower levels of HDL-C collectively are referred to as dyslipidemia[12]. A case-control research conducted in Pakistan looked into the accuracy of BMI in predicting abnormal lipid profiles[4]. In a study LDL cholesterol levels were found to be higher and HDL cholesterol levels to be lower in people with high BMI. There was found to be no connection between gender and alterations in lipid profiles[3,7]. On the other hand, different researchers described that the increased BMI factors had an directly proportionate connection with daily diet.[15,17]

LDL cholesterol levels were found to be higher and HDL cholesterol levels to be lower in people with high BMI[5,7,13]. There was found to be no connection between gender and alterations in lipid profiles. The goals of various studies were to determine the relationships between the different body mass index (BMI) groups' lipid profile components and to look into the relationship between gender and BMI. In a study, persons in higher BMI groups were shown to have high levels of LDL and low levels of HDL, with enhanced cholesterol levels being observed in patients with increasing weight.[3,4,20]

The research on replacing the energy from saturated fat with carbs has produced far more nuanced results[13,17.] Regarding micronutrients, phytochemicals, fibers, and other bioactive ingredients, diets high in carbohydrates vary greatly from one another on both a quantitative and qualitative level, which could have varied impacts on plasma lipids[18.] Regarding the impact of dietary carbohydrates on plasma lipids, diabetic individuals have reported conflicting outcomes.[19] Compared to a diet high in carbohydrates, a diet low in carbohydrates dramatically reduced triglyceride levels. The distribution of dietary fatty acids appears to have a significant role in modulating the effects of carbohydrate restriction on LDL-C and HDL-C.[15,16]

A quantitative meta-analysis of metabolic ward studies (395 dietary trials with a median duration of one month, among 129 groups of people) found that removing 60% of dietary cholesterol and substituting other fats for 60% of saturated fats would reduce total cholesterol (TC) by about 31 mg/dL, or 10-15%[10,12,16], with LDL-C dropping by about 4/5 of this reduction. According to numerous research, increased fish diet is advised to increase intake of omega-3 fatty acids and to lower the risk of metabolic diseases[17,19]. No correlation between consumption of milk products and an elevated risk of CHD, stroke, or other heart and vascular illnesses was discovered in the observational study's findings, regardless of the amount of milk fat present.[13,14,17]

CONCLUSION

The findings of current study were described that cholesterol, triglycerides, LDL and HDL levels have correlation with BMI and intake diet. Therefore comparative significant (P≤0.05) changes in fat rich imbalanced groups were seen as compared with low fat balanced diet groups. According to the findings of this study, dyslipidemia can occur in those with a normal BMI as well as those who are obese or overweight.

Acknowledgements: I am as thankful of all persons how participate directly or indirectly to complete the task of research and final draught of the work has been read and approved by all authors.

Conflict of Interest: There aren't any competing interests.

Funding: No any external funding

Author’s contribution: All authors contributed to the data interpretation and analysis, authoring the manuscript, language editing, and critical review.

REFERENCES

1. Yan J, Horng T. Lipid metabolism in regulation of macrophage functions. Trends in cell biology. 2020 Dec 1;30(12):979-89.
2. Dai H, Alsalhe TA, Chalghaf N, Riccò M, Bragazzi NL, Wu J. The global burden of disease attributable to high body mass index in 195 countries and territories, 1990–2017: An analysis of the Global Burden of Disease Study. PLoS medicine. 2020 Jul 28;17(7):e1003198.
3. Broadfield LA, Pane AA, Talebi A, Swinnen JV, Fendt SM. Lipid metabolism in cancer: New perspectives and emerging mechanisms. Developmental Cell. 2021 May 17;56(10):1363-93.
4. Finocchiaro G, Papadakis M, Dhutia H, Cole D, Behr ER, Tome M, Sharma S, Sheppard MN. Obesity and sudden cardiac death in the young: Clinical and pathological insights from a large national registry. European journal of preventive cardiology. 2018 Mar 1;25(4):395-401.
5. Hedayatnia M, Asadi Z, Zare-Feyzabadi R, Yaghooti-Khorasani M, Ghazizadeh H, Ghaffarian-Zirak R, Nosrati-Tirkani A, Mohammadi-Bajgiran M, Rohban M, Sadabadi F, Rahimi HR. Dyslipidemia and cardiovascular disease risk among the MASHAD study population. Lipids in health and disease. 2020 Dec;19:1-1.
6. Jin D, Zhu DM, Hu HL, Yao MN, Yin WJ, Tao RX, Zhu P. Vitamin D status affects the relationship between lipid profile and high-sensitivity C-reactive protein. Nutrition & Metabolism. 2020 Dec;17(1):1-1.
7. Zhou J, Liu C, Francis M, Sun Y, Ryu MS, Grider A, Ye K. The causal effects of blood iron and copper on lipid metabolism diseases: evidence from phenome-wide Mendelian randomization study. Nutrients. 2020 Oct 17;12(10):3174.
8. Barros AN, Dourado ME, Pedrosa LD, Leite-Lais L. Association of copper status with lipid profile and functional status in patients with amyotrophic lateral sclerosis. Journal of nutrition and metabolism. 2018 Oct;2018.
9. Naranjo MC, Millan-Linares MC, Montserrat-de la Paz S. Niacin and hyperlipidemia. InMolecular Nutrition 2020 Jan 1 (pp. 263-281). Academic Press.
10. Hamza RZ, EL-Megharbel SM, Altalhi T, Gobouri AA, Alrogi AA. Hypolipidemic and hepatoprotective synergistic effects of selenium nanoparticles and vitamin. E against acrylamide-induced hepatic alterations in male albino mice. Applied Organometallic Chemistry. 2020 Mar;34(3):e5458.
11. Biniaz V, Tayebi A, Ebadi A, Sadeghi Sharmeh M, Nemati E. Effect of receiving intravenous vitamin C on dyslipidemia in patients undergoing hemodialysis. Evidence Based Care. 2013 Jul 1;3(2):55-62.
12. Vahid F, Hekmatdoost A, Mirmajidi S, Doaei S, Rahmani D, Faghfoori Z. Association between index of nutritional quality and nonalcoholic fatty liver disease: the role of vitamin D and B group. The American journal of the medical sciences. 2019 Sep 1;358(3):212-8.
13. Doaei S, Gholami S, Rastgoo S, Gholamalizadeh M, Bourbour F, Bagheri SE, Samipoor F, Akbari ME, Shadnoush M, Ghorat F, Mosavi Jarrahi SA. The effect of omega-3 fatty acid supplementation on clinical and biochemical parameters of critically ill patients with COVID-19: a randomized clinical trial. Journal of translational medicine. 2021 Dec;19(1):1-9.
14. Boden WE, Sidhu MS, Toth PP. The therapeutic role of niacin in dyslipidemia management. Journal of cardiovascular pharmacology and therapeutics. 2014 Mar;19(2):141-58.
15. Gupta S, Mangal R, Grover A. Lipid profile pattern in controlled and uncontrolled diabetic patients in a tertiary care center 2020.
16. Pati S, Krishna S, Lee JH, Ross MK, Claire B, Harn Jr DA, Wagner JJ, Filipov NM, Cummings BS. Effects of high-fat diet and age on the blood lipidome and circulating endocannabinoids of female C57BL/6 mice. Biochimica et Biophysica Acta (BBA)-Molecular and Cell Biology of Lipids. 2018 Jan 1;1863(1):26-39.
17. Heintz MM, Kumar R, Maner-Smith KM, Ortlund EA, Baldwin WS. Age-and Diet-Dependent Changes in Hepatic Lipidomic Profiles of Phospholipids in Male Mice: Age Acceleration in Cyp2b-Null Mice. Journal of Lipids. 2022 Mar 29;2022.
18. Averna M, Stroes E, Ogura M, Postadzhiyan A, Cercek M, Calabrò P, Suppressa P. How to assess and manage cardiovascular risk associated with lipid alterations beyond LDL. Atherosclerosis Supplements. 2017 Apr 1;26:16-24.
19. Sidhu D, Naugler C. Fasting time and lipid levels in a community-based population: a cross-sectional study. Archives of internal medicine. 2012 Dec 10;172(22):1707-10.
20. Wang S, Ji X, Zhang Z, Xue F. Relationship between lipid profiles and glycemic control among patients with type 2 diabetes in Qingdao, China. International Journal of Environmental Research and Public Health. 2020 Aug;17(15):5317.