Indonesian Journal on Health Science and Medicine

Vol. 2 No. 3 (2025): Desember
DOI: 10.21070/ijhsm.v2i3.355

IJHSM

Indonesian Journal on Health Science and Medicine

UNIVERSITAS MUHAMMADIYAH SIDOARJO

ISSN 3063-8186 (online), https://ijhsm.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

Indonesian Journal on Health Science and Medicine

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Indonesian Journal on Health Science and Medicine

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ISSN 3063-8186 (online), https://ijhsm.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

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Assessment of Dyslipidemia and Hypercholesterolemia among Patients from two Hospitals in Basra City : Penilaian Dislipidemia dan Hiperkolesterolemia pada Pasien dari Dua Rumah Sakit di Kota Basra

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Abstract

General Background: Cholesterol and triglycerides are essential lipids involved in cellular function and energy metabolism, yet abnormal levels are closely associated with cardiovascular disease. **Specific Background:** Lipid profiles are known to vary with age and gender, but local data from Basra City remain limited. **Knowledge Gap:** There is insufficient hospital-based evidence describing age- and gender-related patterns of dyslipidemia among patients in Basra. **Aims:** This study examined cholesterol and triglyceride levels in relation to age and gender among patients from two major hospitals in Basra City. **Results:** Data from 100 patients aged 13–79 years showed higher triglyceride levels in older adults compared to younger groups. Hypercholesterolemia was more frequent in males than females, with 20% of males and 16% of females exceeding 239 mg/dL. Borderline cholesterol levels were also more prevalent in males. Triglyceride abnormalities followed a similar trend, although gender differences were not statistically significant. **Novelty:** The study provides recent hospital-based lipid profile data specific to Basra City, highlighting demographic variations. **Implications:** These findings support the importance of age- and gender-sensitive screening strategies for dyslipidemia in clinical practice.

Keywords: Triglycerides, Cholesterol, Age Differences, Gender Differences, Basra City

Key Findings Highlights:

1. Lipid abnormalities increased progressively with advancing age among patients.
2. Male patients exhibited higher rates of elevated cholesterol levels than females.
3. Triglyceride distributions showed demographic variation linked to lifestyle factors.

Published date: 2025-12-12

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Introduction

Cholesterol and triglycerides are vital lipid molecules crucial for various physiological functions in the human body. Cholesterol serves as a structural component of cell membranes and acts as a precursor for the synthesis of steroid hormones, bile acids, and vitamin D. Triglycerides function as an energy source, providing the body with fuel for metabolism and cellular activities. Both cholesterol and triglycerides are transported in the bloodstream by lipoproteins, with high-density lipoprotein (HDL) cholesterol known as "good" cholesterol and low- density lipoprotein (LDL) cholesterol considered "bad" cholesterol due to its association with cardiovascular risk. Understanding the metabolism and regulation of cholesterol and triglycerides is essential for comprehending their roles in health and disease, particularly in conditions like atherosclerosis and metabolic syndrome [1][2].

Both their levels can vary based on age, gender, and pregnancy. Cholesterol and triglyceride levels tend to increase with age, particularly during adulthood. This increase is attributed to lifestyle factors, dietary habits, and hormonal changes. Children generally have lower levels compared to adults, and as individuals age, their metabolism may change, impacting lipid profiles. Gender also plays a role in cholesterol and triglyceride levels. Generally, before menopause, women tend to have lower levels of cholesterol and triglycerides compared to men. However, after menopause, women's levels may increase, partly due to hormonal changes [3][4].

Hypercholesterolemia means chemically the elevated concentrations in plasma of cholesterol and low-density lipoprotein (LDL) than the normal range and low concentration in plasma of high-density lipoprotein (HDL)[4]. Hypercholesterolemia is related to many serious diseases that may be fatal, such as atherosclerosis and coronary heart diseases (CHD) [3], Which is related to several factors such as high-fat diets (which we find in abundance in our popular foods that are saturated with fats), sedentary lifestyle and cigarette smoking [5]. High level of cholesterol can affect all ages, even the young children but it's most commonly in people ranging in age between 40 and 60 years depending on their diet and lifestyle. Specifically, the age groups most at risk of high cholesterol are men over 45 years old and women over 50 years old, with a clear increase among older adults above 60 years. As far as gender is concerned, males generally have low HDL and higher LDL than female [6]. During pregnancy the hypercholesterolemia may cause many conditions like increased hypertension, cardiovascular disease, diabetes later in life and low fetal weight [7].

The elevation of triglyceride is determined based on serum laboratory values being greater than 149 mg/dL. Levels greater than 149 mg/dL constitute hypertriglyceridemia. Hypertriglyceridemia is indicative of insulin resistance when present with low high-density lipoprotein (HDL) and elevated low-density lipoprotein (LDL), while elevated triglyceride is a clinical risk factor for coronary artery disease (CAD), especially when low HDL is present [9]. There are some causes of hypertriglyceridemia like obesity, diabetes mellitus, kidney failure, hypothyroidism and lipoprotein-lipase-deficiency [10]. Beside the (CAD) the high level of triglycerides may lead to Non-alcoholic fatty liver disease (NAFLD) or cardiovascular disease [11]. If the concentration of triglycerides in plasma is greater than 500 mg/dL the possibility of developing pancreatitis increases [11]. Triglyceride levels differ by ages; in adult the normal range is below 150 mg/dL while the children and teens below 90 mg/dL [12]. By the gender the triglyceride levels in male higher than female which lead to a greater risk of cardiovascular complications in male than in female [12]. However, in the age of 60 years and more, women tend to have higher levels than men [14]. During pregnancy the triglyceride normally increase in response to estrogen and insulin resistance [13].

The importance of the study lies in knowing the risks resulting from high cholesterol and triglycerides and the resulting diseases that may be fatal, in terms of age, gender, and pregnancy in the city of Basra. The aim of the study is to know the differences in the levels of cholesterol and triglycerides in Basra compared to age and gender, as well as to know the status of pregnancy and the changes that occurs in the levels of the lipid profile during the length of pregnancy.

Sampling

The study relied on a cross-sectional analysis design by taking triglyceride and cholesterol data for 100 patients from two main hospitals in the city of Basra, namely Al-Shifa General Hospital and Ibn Ghazwan Hospital during the period between December 5 and April 15, 2024. The sample consists of 50 male and 50 females of various age groups ranging between 13 -79 years. Blood was collected in tubes supplied with anti-coagulant material (EDTA) of fasting people for more than 12 hours. Blood sample were centrifuged and separated from cells within 2 hours. After separation, the triglycerides sample were kept in refrigerator at 2-8 C and analyzed within 2-5 days.

Analytical Procedures

Triglycerides were determined using GPO method outlined by bio lab kit (www.biolab.fr) according to Fossati and Principe Method associated with Trinder Reaction. Reaction scheme and principals are as follows: The absorbance of the colored complex (quinonimine), proportional to the amount of triglycerides in the specimen, is measured at 500 nm.

Cholesterol levels were determined by Bio lab kit for quantitative determination of total cholesterol in human serum or plasma using GPO method by Biolabo (www.biolabo.fr) according to the enzymatic method. Some of cholesterol and triglyceride data were taken by direct follow-up of the sample or from patient data recorded in hospital laboratories.

Classification	Triglyceride level
Normal	Less than 150 mg/dL

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Borderline	150-199
High	200-500
Very high	500 or higher

Table 1.

For comparison purposes with normal levels of triglycerides and cholesterol data provided by University of Rochester Medical Center (http://www.urmc.rochester.edu) [8] are shown below:

The ranges for total cholesterol in adults: Normal if less than 200 mg/dl, borderline high: 200 to 239 mg/dl and high at or above 240 mg/dL [8].

Statistical analysis

For statistical analysis of the date in this study Xi-square test was used to analyze differences between males and females regarding dyslipidemia or cholesterolemia. This was done according to the Statistical Package for the Social Sciences SPSS for Windows.

Results

Triglycerides and cholesterol data collected from females and males specimens in Basra City are shown in Table 1 and 2 respectively. The data are arranged in an ascending trend depending upon the age of patients.

Impact of age

Data of Table 1 and 2 showed clearly that triglycerides level are higher in older adult versus younger. Adult triglycerides in general vary between different ages, depending on the diet which is followed by the person. In both females and males the incidence of dyslipidemia and cholesterolemia occurred more frequently among people of over 50 years of age. However, those cases were repeated among people of younger ages possibly due to their feeding habits. High cholesterol and triglycerides levels in both males and females were highlighted in Table 1 and 2 after comparison with standard values.

Total cholesterol (mg/dL)	Triglycerides (mg/dL)	Age (years)
163	109	13
124	39	16
158	44	24
133	46	25
173	**215**	29
102	59	32
254	154	32
261	172	40
175	62	42
199	86	42
150	78	42
164	106	42
182	184	45
145	166	45
219	83	46
166	72	50
195	**395**	50
150	62	50
328	**214**	52
183	114	55
220	124	55
198	122	62
234	138	65
153	**248**	65
251	50	70

Table 2. Table 1. Triglycerides and cholesterol data for female specimens from various ages in Basra City

Total cholesterol (mg/dL)	Triglycerides (mg/dL)	Age (years)
83	100	15
143	106	17
139	114	17
289	43	26
201	237	35
208	56	37
193	130	40
137	175	41
134	143	42
245	121	44
151	67	45
249	182	45

ISSN 3063-8186 (online), https://ijhsm.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

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219	178	50
153	157	50
204	123	55
125	**248**	55
172	62	63
124	48	63
224	169	65
181	64	65
100	58	70
302	57	71
238	151	77
107	84	78
176	**263**	79

Table 3. **Table (2):** Triglycerides and cholesterol data for male specimens of various ages in Basra City

Impact of gender

As far as gender is concerned, data showed that the percentage of hypercholesterolemia is greater in males than in females. In our sample, percentage of female with normal cholesterol levels (72 %) exceeds significantly ($p<0.05$) that of males (60%). Percentage of males with cholesterol levels beyond normal range (boarder line & hypercholesterolemia) reaches 40% compared with 28% in females ($p<0.05$) (Table 3). Further details appeared in the percentage of men suffered from hypercholesterolemia (> 239 mg/dL) reaching 20% of the total number of males, while the percentage of females is about 16% of the total number of females. Furthermore, high cholesterol status, referred to as borderline (200-239 mg/dL), was found in about 20% of males and 12% in females (Table 3).

P atient s with hypercholesterol emia (> 239 mg/dL) No %	**P atients border line cholesterol (200-239 mg/dL No %**	**P atients with normal range No %**	**Total number of patients**	**Gender**
5 20	5 20	15 60	25	**Male**
4 16	3 12	18 72	25	**Female**

Table 4. **Table (3):** Status of cholesterolemia in male and female of Basra City

Triglyceride followedsimilar trend as that of the cholesterol regarding differences between males and females. The percentage of patients with normal triglyceride levels was 68% in females and 64% in males with no significant difference ($p>0.05$). Dyslipidemia in males as appeared in the boarder & high triglyceride levels was higher in males (36 %) than females (32%). However differences were not significant ($p>0.05$). Furthermore, percentage of males with boarder line levels of triglycerides is greater than that of females. It reaches 24% compared with 16% in females (Table 4). Number of females and males patients with hyper-triglycerides were nearly similar (4 and 3 respectively).

P atients with hyper - triglycerid es (> 200 mg/dL) No %	**P atients with boarder line (150-200 mg/dL) No %**	**P atients with normal range < 150 mg/dL No %**	**Total number of patients**	**Gender**
3 12	6 24	16 64	25	**Male**
4 16	4 16	17 68	25	**Female**

Table 5. **Table (4):** Status of dyslipidemia in male and female of Basra City

Discussion

Impact of age

Results of the present investigation showed that among Basra population, triglycerides (TG) levels are higher in older adult versus younger adult. These findings are in agreement with similar observation recorded by Karlson et al. (2017)[15] regarding the role of age on triglycerides levels which might be attributed to metabolic disorders as the age increases. Among other reasons, obesity stands out as one of the most prevalent conditions associated with high triglyceride levels. Obesity is characterized by excessive accumulation of adipose tissue due to an imbalance between energy intake and expenditure. In obese individuals, adipose tissue becomes resistant to insulin, which subsequently leads to increased lipolysis. As a result, free fatty acids and glycerol are released into the bloodstream, contributing to the development of high triglyceride [16]. Therefore, the variation in TG levels between different ages, may be explained in terms of the dietary habits of various individuals. Sedentary lifestyle and weight gain due to age-related decline in metabolic rate and hormonal changes during age phases may also contribute to increased TGs.

The present findings on dyslipidemia in Basra are comparable with previous research work in other Iraqi cities such as that of Mula-Abed & Chilmeran (2007) [17], and Al-Koofee et al. (2019)[18]in Najaf. Different recommendations criteria have been suggested to identify the case [17]. Variations in lipid profile was attributed to potentially modifiable factors such as obesity, physical activity and dietary intake.

The incidence of hypercholesterolemia usually increases after the age of forty, and that it is uncommon in young people under 18, and it may be related to a decrease in the conversion of cholesterol into bile acid, which contributes to the increase in blood cholesterol with age [19]. In addition, there are other reasons that may lead to high cholesterol, such as the reduction in hepatic LDL receptor activity. Among young and middle age people, high fat diet might be a reason for high cholesterol, as pointed out by some studies which indicate that changes in cholesterol levels may begin as early as the age of thirty, depending on diet and lifestyle factors [16][20]. There is a hormonal reason, such as in women, as with age, total

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cholesterol levels increase, and HDL cholesterol levels may decrease due to a decrease in estrogen production before menopause [21].

Impact of gender

The present data showed that the percentage of hypercholesterolemia is greater in males than in females. As for triglyceride levels, dyslipidemia was more prevalent among males than females. Gender can influence triglycerides and cholesterol levels in humans, due to hormonal and physiological differences [21][22]. Women tend to have lower triglyceride levels than men before menopause. Decline in estrogen levels during menopause can lead to increased triglycerides [21]. Women also tend to be at lower risk for developing high cholesterol in their younger years, primary because of the protective effect of the female hormone estrogen [3][4]. Another reason for gender differences is the relationship between triglycerides and left ventricular mass which differs between men and women, suggesting a possible gender-specific modulatory effect [23]. According to the (AACC) [24], cholesterol levels for the non-pregnant population should be below 200 mg/dL to keep the risk of heart disease low.

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