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# STUDY TO KNOW THE FACTORS AFFECTING THE SERUM LIPIDS AMONG MIDDLE-AGED WOMEN

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**Abstract:**

***Aim:*** *The aim of the study was to reveal quantile-specific associations of serum lipids [triglycerides (TG), total cholesterol (TC), low density lipoprotein cholesterol (LDL-c) and high density lipoprotein cholesterol (HDL-c)] with influencing factors in middle-aged women.*

***Methods:*** *Serum lipids test reports of 5635 patients were collected from the different laboratories of Lahore. Quantile regression (QR) model was performed to identify factors which influenced serum lipids in different quantiles.*

***Results:*** *The influencing factors of TG, TC, LDL-c and HDL-c were different. Waist circumference (WC), menopause, smoking, diabetes and hypertension were positively associated with TG in almost all quantiles; Menopause and age were positively associated with TC in almost all quantiles. WC, living in urban areas and alcohol consumption were positively associated with TC in low and middle quantiles, diabetes was positively associated with TC from P50 to P95. The result of LDL-c was similar to TC; BMI was negatively associated with HDL-c from P50 to P90. WC and diabetes were negatively associated with HDL-c from P5 to P90.*

***Conclusion:*** *Among middle-aged women, menopause, diabetes and WC were the main factors affecting the serum lipids. Postmenopausal women would get more risk in increasing the level of serum lipids.*

***Keywords:*** *Dyslipidemia, Influencing factors, Serum lipids, Quantile regression*

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## INTRODUCTION:

A dyslipidemic profile, characterized by the elevated level of total cholesterol (TC), low density lipoprotein cholesterol (LDL-c) and/or triglycerides (TG), or low level of high-density lipoprotein cholesterol (HDL-c) alone[1]. As dyslipidemia develops, intravascular lipid, cholesterol, and other substances are gradually deposited on the inner wall of vessels to form lipid plaques or fibrous plaques, and those will lead to narrow arterial lumen and wall hardening [2, 3]. If the pathological processes continue, a series of cardiovascular complications, such as myocardial infarction, arrhythmia, cerebral hemorrhage, cerebral infarction, hypertension, diabetes and retinopathy may occur [4, 5], affecting quality of life, or even lead to death. Middle-aged women as a special group of people experiencing estrogen levels decline, many of them are obese, have unhealthy living habits and are susceptible to disease. Thus, it is of great importance to find the mechanism of dyslipidemia and its related influence factors in middle-aged women, to prevent and intervene serious diseases occurring caused by dyslipidemia [6, 7]. At present, most researches on dyslipidemia were performed among adults (both male and female), with little attention to middle-aged women. Therefore, middle-aged women were used as the object of our study to explore serum lipids related factors. Generally speaking, the occurrence and development of dyslipidemia is a continuous and long term process [8, 9]. In this case, factors may play different role in the process of dyslipidemia development. In practice, however, many studies analyzed dyslipidemia as a categorical variable by ordinary least squares regression model, which could only estimate the average levels of changes. Thus, appropriate methods should be got to approach the real value and satisfy the demand of design. Quantile regression (QR) model, has high flexibility for data modeling of heterogeneous condition distribution [10, 11]and can also provide whole pictures of covariates effects by modeling a set of percentiles [12, 13]. Therefore, QR model is more suitable for exploring influence factors of serum lipids in the process of dyslipidemia development. In our study, QR models were performed to explore independent factors associated with four indices of serum lipids such as TG, TC, LDL-c and HDL-c, respectively, when treated them as continuous variables among middle-aged women.

## METHODS:

Data was derived from a cross-sectional study of adult chronic disease and its risk factors in a study conducted in Services Hospital Lahore, Pakistan for the duration of one year from march, 2019 to February, 2020. A multistage, stratified, random cluster sampling method was used to select 23,050 subjects aged 18 to 75 years old and lived in Punjab Province for more than 6 months [14]. Overall, 5,635 middle-aged women (aged 40~65 years old) [15, 16] with full information of four serum lipids indices (TG, TC, LDL-c and HDL-c) and no control over serum lipids were enrolled.

The information was collected by trained investigators. These data included demographics (gender, age, etc.), health-related behaviors and anthropometric measurements (height, weight, etc.). Serum lipids levels (TG, TC, LDL-c and HDL-c) were measured by biochemical analysis machine in the morning after participants fasted for 10 or more hours overnight. Fasting blood glucose levels were measured by the Bayer Bai Ankang fingertip blood glucose monitor machine (Bayer, Leverkusen, Germany). The participants' height, weight and waist circumference (WC) were measured though standardized protocol and process, with clothing but no shoes. Body mass index (BMI) was calculated by the following formula. BMI=Weight (kg) / Height (m2).

According to the serum lipids status, high TG: TG≥1.7 mmol/L, high TC: TC≥5.2 mmol/L, low HDL-c: HDL-c LDL-c≥3.4 mmol/L(17). Diabetes was defined as fasting blood glucose≥7.0 mmol/L or use the hypoglycemic agents or a self-reported history of diabetes (18). Hypertension was defined as resting systolic blood pressure (SBP)≥140 mmHg and/or diastolic blood pressure(DBP)≥90 mmHg and/or the use of hypo tensor in the past two weeks [17]. The means ± standard deviations (SD) and median (inter-quartile range, IQR) were utilized to describe the continuous variables, QR model was used to identify factors that influence the level of serum lipids in different quantiles. Statistical significance was set at P-value < 0.05.

## RESULTS:

Overall, 5,635 participants were enrolled, including 2,492 premenopausal women and 3,143 postmenopausal women. The median age of participants was 50.0 (IQR: 12.0) year old. A total of 502 participants suffered with diabetes and 2,083 with hypertension. There were 480 drinkers, 803 smokers and 3,041 urban residents. The median value of WC was 81.0 (IQR: 13.2) cm and BMI was 24.3 (IQR: 4.6) kg/m2. Table 1: shows the median and boundary values of four indices of serum lipids. The critical values of TG, TC, LDL-c, and HDL-c in the QR model were P59.2, P61.5, P69.4 and P11.4, respectively. Table 2 to 5 shows coefficients and 95% confidence intervals of factors of TG, TC, LDL-c and HDL-c in middle-aged women, respectively.

**Table 1: Description and boundary values of serum lipids**

| Serum lipids | Median (IQR) | Demarcation Value (mmol/L) | Percentage % |
|---|---|---|---|
| **TG** | 1.49 (1.20) | 1.7 | 59.2 |
| **TC** | 4.90 (1.35) | 5.2 | 61.5 |
| **LDL-c** | 2.97 (1.15) | 3.4 | 69.4 |
| **HDL-c** | 1.38 (0.48) | 1.0 | 11.4 |

TG: triglyceride; TC: total cholesterol; LDL-c: low-density lipoprotein cholesterol; HDL-c: high-density lipoprotein cholesterol

## DISCUSSION:

We found that among middle-aged women, menopause, diabetes and WC were positively associated with TG, TC and LDL-c; BMI, WC and diabetes were negatively associated with HDL-c. Besides, hypertension was positively associated with TG. And on different levels of TG, TC, LDL-c and HDL-c, the extents of the effects of each factor were different. In our study, menopause was positively associated with TG, TC and LDL-c, and the coefficient increased as percentile increasing, especially in high quantiles of TC and LDL-c. That means, as TC rising to higher levels, the associations between menopause and TC were getting more and more stronger, as was also the case with LDL-c. The reason for this was probably because of a decline in estrogen levels among postmenopausal women [20, 21]. Estrogen plays an important role in serum lipids, it can reduce TG synthesis, increase liver uptake of LDL-c and secretion of cholic acid, accelerate cholesterol removal in vivo, thereby reducing the serum TG, TC and LDL-c levels [22]. In addition, when estrogen levels drop, many women will experience weight gain. Redistribution of adipose tissue leads to an increase in abdominal fat deposition [23]. WC is an important indicator of central obesity; our study showed that WC was an independent risk factor of TG, LDL-c and HDL-c in almost all quantiles, and TC from P10 to P75. That means, as TG, LDL-c and HDL-c elevating to high levels, they will be more sensitive to the increasing of WC. That important information cannot be found in traditional model when serum lipids were treated as a categorical variable. A previous study, indicated a close relationship between diabetes and dyslipidemia [24]. In our study, diabetes was an independent risk factor of increased TG and decreased HDL-c in almost all quantiles, with TC from P50 to P95, and with LDL-c from P69.4 to P95. Furthermore, the coefficients increased as TG, TC and LDL-c increasing. That means, as TG, TC, LDL-c and HDL-c elevating to high levels, all the four indices of serum lipids will be more sensitive to diabetes. These probably because patients with diabetes were more likely to had lipid metabolic disorders, which may be associated with insulin resistance and insulin sensitivity [25] while increasing serum lipids levels would lead to dysfunction of pancreatic β-cell function [26]. This indicated that patients with diabetes should pay high attention to serum lipids. In our study, we also found that hypertension was associated with TG in all quantiles, and as TG increasing, the association were getting stronger, especially in high quantiles of TG (P59.2 to P95). Hypertension was related with disorder of lipid metabolism, in turn, TG can be used as an important factor in predicting hypertension. Therefore, middle-aged women with hypertension would attain more risk in TG. Some limitations should be noted in present study. Firstly, this was a cross-sectional study and participants were selected from Jilin Province, hence, selection bias could exist and limit the results generalize to other populations. Secondly, some information was collected by self-report, such as smoking and alcohol consumption, thus, social desirability bias may be present and underestimate the associations between these factors and serum lipids. Thirdly, some potential confounders were not under our consideration, such as gene and physical activity, which might have some effects on our results.

## CONCLUSION:

On different levels of TG, TC, LDL-c and HDLc, the influence degree of each factor was different. Among middle-aged women, menopause, diabetes and WC were the main factors affecting the serum lipids. With the increasing of WC, they would get a higher level of serum lipids. And postmenopausal women would get more risk in increasing the level of serum lipids

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