Lipid Profile in Pre- and Postmenopausal Women and Variations in Lipid Levels According to Menstrual Cycle Phases

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ABSTRACT

Background: The menopausal state is normal physiology in the aging action, and it refers to the stop of reproduction with the end of cyclic ovarian activity. The lipid profile in many research studies was higher in postmenopausal women than in premenopausal women. In premenopausal women, the changes in circulating plasma levels of sex hormones each month are still present, and their potential impacts on Cholesterol, lipoproteins, and ischemic heart risk levels.

Objectives: The current study aims to assess the lipid profile in postmenopausal and premenopausal ladies with normal weights and compare the lipid levels in the follicular and luteal phases of the premenopausal one in Mosul City.

Methodology: The analytic study was carried out on 60 postmenopausal women aged between (49-65) years and (75) premenopausal women ranging from (20-44) years with regular menstrual cycles. The BMI were (23.43±1.04) and (24.80 ±0.01) for pre and postmenopausal groups respectively. Lipid profiles have been done for both groups; samples of the premenopausal women group were taken in the follicular phase between (4- 8) days of the menstrual cycle, and a second sample was taken by asking the women to come back in the luteal phase in 21 - 25 days. Only 68 women shared in the follow-up study.

Results: The current study shows a high serum cholesterol, triglyceride, LDL level Total Cholesterol/HDL ratio, and a low HDL cholesterol level in the postmenopausal group compared to women having a regular cycle ($p<0.001$). In the premenopausal group, significant differences in lipid profile during the cycle phases were not found (follicular and luteal).

Conclusions:

1.Serum cholesterol, triglyceride, LDL, and total Cholesterol/HDL ratio were higher, and serum HDL cholesterol levels were lower in the postmenopausal group compared with ladies with a regular cycle and normal BMI in Mosul city.

2.The triglyceride and LDL were somewhat higher in the follicular phase when the hormone estrogen and progesterone levels were lower than those in the luteal phase, but statistically, they were insignificant.

Keyword: Postmen pause, lipid profile, menstrual cycle phase, Cholesterol.

مستوى الدهون في النساء قبل وبعد انقطاع الطمث والاختلافات في مستويات الدهون وفقًا لمراحل الدورة الشهرية

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الخلاصة

الخلفية : حالة انقطاع الطمث هي حالة فسيولوجية طبيعية في عملية الشيخوخة وتشير إلى توقف الإنجاب مع انتهاء نشاط المبيض الدوري. وقد وجد أن مستوى الدهون في العديد من الأبحاث أعلى عند النساء بعد انقطاع الطمث مقارنة بالنساء قبل انقطاع الطمث. بينما في النساء قبل انقطاع الطمث، حيث لا تزال التغيرات في مستويات البلازما المنتشرة للهرمونات الجنسية كل شهر موجودة وتأثيراتها المحتملة على مستويات الكوليسترول والبروتينات الدهنية، ومخاطر نقص تروية القلب.

الاهداف : الدراسة الحالية لتقييم مستوى الدهون في السيدات في مرحلة ما بعد انقطاع الطمث وقبل انقطاع الطمث ذوي الوزن الطبيعي ومقارنة مستوى الدهون في الطور الجريبي والأصفري في مرحلة ما قبل انقطاع الطمث في مدينة الموصل.

المنهجية : في دراسة تحليلية أجريت على ٦٠ امرأة بعد انقطاع الطمث تتراوح أعمارهن بين (٤٩ - ٦٥) سنة و (٧٥) امرأة قبل انقطاع الطمث تتراوح أعمارهن بين (٢٠ - ٤٤) سنة مع دورة شهرية منتظمة، كان مؤشر كتلة الجسم (٢٣.٤٣ ± ١.٠٤) و (٢٤.٨٠ ±٠.٠١). لمجموعة ما قبل وبعد انقطاع الطمث على التوالي. تم إجراء تحليل الدهون لكلتا المجموعتين، حيث تم أخذ عينات من مجموعة النساء قبل انقطاع الطمث في الطور الجريبي بين (٤-٨) أيام من الدورة الشهرية وتم أخذ العينة الثانية عن طريق مطالبة النساء بالعودة إلى الطور الأصفري في ٢١-٢٥ يومًا فقط بمشاركة ٦٨ امرأة. في متابعة الدراسة .

نتائج : أظهرت الدراسة الحالية ارتفاع مستوى الكولسترول والدهون الثلاثية ومستوى LDL ونسبة الكولسترول الكلي إلى HDL وانخفاض مستوى مستوى الكولسترول HDL في مجموعة ما بعد انقطاع الطمث مقارنة بالنساء ذوات الدورة الشهرية المنتظمة (P<٠.٠٠١). بينما في مجموعة ما قبل انقطاع الطمث لم يتم العثور على فروق ذات دلالة إحصائية في مستوى الدهون خلال مراحل الدورة (الجريبي والأصفري).

الاستنتاجات :

١. كانت نسبة الكوليسترول في الدم والدهون الثلاثية و LDL ونسبة الكوليسترول الكلي إلى HDL أعلى وكان مستوى الكوليسترول HDL في الدم منخفضًا في مجموعة ما بعد انقطاع الطمث مقارنة بالسيدات اللاتي لديهن دورة منتظمة ومؤشر كتلة الجسم طبيعي في مدينة الموصل.

٢. كانت نسبة الدهون الثلاثية و LDL أعلى إلى حد ما في المرحلة الجريبية، عندما تكون مستويات هرمون الاستروجين والبروجستيرون أقل من مستواها في المرحلة الأصفرية ولكن لم تكن ذات دلالة إحصائية.

الكلمات المفتاحية : مرحلة ما بعد انقطاع الطمث، مستوى الدهون، مرحلة الدورة الشهرية، الكوليسترول.

INTRODUCTION

Menopause is a normal physiological state involving the permanent disappearance of menses in women (The exact time of menopause is one year without menses). It represents a normal physiological state in ladies' lives; it is a natural event that refers to the stooping of reproduction in women in the form of no more menstrual cycle that stopped permanently and the resulting from no more ovaries and uterine function in women. [1,2] The postmenopausal state accounts for about one-third of women's lives. The health obstacles in this period are now clear and well-interpreted. [3]

The hormonal changes that occur in menopausal ladies, like low estrogen hormone and an obvious increase in FSH hormone, significantly affect the lipid and lipoprotein metabolism profile. Studies by Swapnali et al. (2011) have proven altered lipid profiles in women in postmenopausal states. [4]

There is a well-known difference in the serum estrogen level in the postmenopausal state where there is continued production of estradiol, some from the ovaries and others from the transformation of androstenedione to estrone, which occurs in fat tissue. [5]

The hormonal changes in menopause (low serum estrogen and high serum LH and FSH levels) affect the lipid profile, lipoproteins, and related cardiac disease, which occurs by atherosclerosis. [6]

Changes in the lipid levels can explain cardiovascular problems during menopause during that period. Low-density lipoprotein and the build-up of fatty particles on vascular walls (arteriosclerosis) have been proven to have a role in the development of Ischemic Heart Diseases (IHD). [7]

While in premenopausal women, where the monthly changes in a plasma sex hormone are still there, and the feasible effects on lipid profile and lipoproteins, and so cardiac disease chance, we want to determine if these levels which differ in the follicular and luteal part of the monthly cycle affect the lipid profile, so, we know that higher level of estrogen is during the luteal compared with the follicular phase level, which is well documented in normal physiology. [8]

The lipid levels were seen to vary according to variations in estrogen levels. As such, some studies suggest that the level of Cholesterol is shown to be lower during the luteal phase than its level in the follicular phase, and around ovulation, the HDL-C was highest. According to these results, the cycle phases should be considered when measuring Cholesterol and lipoproteins in premenopausal ladies. [9,10]

Aims of The Study

The current study will:

1.Assess the (lipid profile levels) in premenopausal and postmenopausal women with normal body weight.

2.Assess the lipid profile of the premenopausal group in two phases (follicular and luteal phases).

SUBJECTS,MATERIALS AND METHODS

This prospective analytic study was conducted from October 2020 to October 2021 in Mosul City. The study was guided after getting approval from the ethical committee in the College of Medicine/ Mosul.

Inclusion Criteria :

1. 60 postmenopausal women aged between(49 - 65) years old have had no menses for at least one year with normal body weight.
2. A 75 premenopausal woman (20-44) years old with regular menstrual cycles (three previous regular and normal cycles) and normal body weight.

Measurements for anthropometry were taken. Weight was recorded in kg, and height was measured in meters, so the BMI was calculated. (BMI = Weight in Kg / Height in M2). [11]

The overweight and obese women (BMI ≥ 25), Pregnant, diabetic, hypertension and IHD women, Patients taking drugs for lipids or taking hormonal drugs a minimum of three months before the trial, and patients with a history of hysterectomy, oophorectomy were excluded from the research.

Before participating in or withdrawing from the study, all women give their written agreement.

5 ml of venous blood was drawn while fasting from all women in plane tubes after fasting for 12-14 hours (eat nothing, only drink water). Samples of the premenopausal women group were taken in the follicular phase between (4–8) days of the menstrual cycle, and 2nd sample was taken by asking the women to come back in the luteal phase on (21-25) days of the cycle with 7 of them not coming back, while post-menopausal women gave a sample for one time.

The serum was separated by centrifugation and then tested for:

1.(TC) Total serum Cholesterol was set on by (CHOD-PAP) colorimetric enzymatic technique.
2.Serum (TG) Triglyceride was set by (GPO-PAP) enzymatic technique.
3.Serum (HDL-C) High-density lipoprotein using the precipitation method to estimate.
4.Serum (LDL-C) Low-density lipoproteins using the Friedewald formula.

Statistical Analysis

The mean and standard deviation were used to express all values. An unbiased samples t-test was used to compare means. The SPSS 21 version was used to conduct the statistical analysis. At P 0.05, statistical significance existed.

RESULTS

In this study, the premenopausal women aged (20–44) years age ± SD) and postmenopausal women aged ranged from (49-65) years. Both groups were within normal Weight.

Table (1): General characteristics of the two groups in the study

Variables	Premenopausal (n =75) Mean ± SD	Postmenopausal (n= 60) Mean ± SD	P value
Weight	58.63 ± 0.28	60.59 ± 0.35	0.190
Height	155.78 ± 1.39	156.08 ± 1.40	0.064
BMI	23.43 ± 1.04	24.80 ± 0.01	0.195

The lipid panel in (premenopausal and postmenopausal) women shows statistically significant differences in all parameters, as shown in Table No. (2)

Table: (2) the lipid profile compression in normal Weight pre-and postmenopausal women (BMI 18.9-24.9).

Lipid profile	Premenopausal (n= 75)	Postmenopausal (n= 60)	P value
Cholesterol (mg\dl)	201.0 ± 5.1	242.4 ± 5.8	<0.001
TG Triglycerides (mg\dl)	144.5 ± 6.3	169.2 ± 6.1	<0.001
HDL(mg\dl)	41.0 ± 2.5	33.2 ± 3.2	<0.001
LDL(mg\dl)	133.8 ± 5.4	158.0 ± 4.2	<0.001
Total Cholesterol/ HDL ratio	4.9	7.3	< 0.01

No statistically significant differences exist in serum lipid levels in the follicular and lung phases in premenopausal women, as shown in Table No.(3)

Table :(3) Lipid profile comparison in normal Weight Premenopausal in follicular phase and luteal phase.

Parameters	Premenopausal in Follicular phase (n= 68)	Premenopausal in Luteal phase (n= 68)	P value
Cholesterol (mg\dl)	201.1 ± 4.1	203.0 ± 3.1	NS
TG Triglycerides (mg\dl)	144.4 ± 5.3	142.2 ± 5.3	NS
HDL(mg\dl)	41.2 ± 2.3	45.0 ± 2.3	NS
LDL(mg\dl)	135 ± 4.4	134 ± 1.4	NS

DISCUSSION

This study focused on normal-weight women to get red any sequel of overweight on serum lipid level and to concentrate on the effect of menopause and menstrual cycle on the lipid level in Mosul city. The current study shows a statistically high reading of Cholesterol, triglyceride, LDL level, and total Cholesterol/HDL ratio, and HDL cholesterol level was low in the post-menopausal group in contrast with that of the regular cycle premenopausal group; this may be explained by the reduction in estrogen release from ovaries which lead to changes in lipoprotein profile, body fat spread and adverse changes in insulin and glucose metabolism. [12]

This result is in agreement with Kilim et al. (2013), who found that estrogen positively correlated with HDL and negatively correlated with TC, TG, and LDL, also found significantly higher levels of (LDL, VLDL, total Cholesterol (TC), and (TG)), in women with no cycle than that in women with regular cycle group. [13] Estrogens are a protective agent against cardiovascular disease through their effects on altering the tone of vessels by increasing the release of nitrous oxide and boosting antioxidant properties, which are decreased when menopause begins, which explains the increase in lipids. [14]

Kumari et al. 2018 discovered that menopause impacted women's lipid profiles, and these changes have been linked to aging and the level of TC and LDL, so the atherogenic index increases with age. [15] The second part of the current study was on normal-weight women who had regular menstrual cycles. After they gave blood samples in the follicular phase, they informed me to come back in the luteal phase, and the lipid profile had been measured.

Focusing on changes in lipid levels during the women's cycle is beneficial because it may provide clinical insights into the best time to conduct testing and recommendations for planning and interpreting research in female reproductive life if such differences exist.

In the current study, lipid levels did not statistically vary throughout the menstrual cycle, despite the triglyceride and LDL being somewhat higher in the follicular phase, when weighed up to the secretory (luteal) phase of the women's menstrual cycle, in which estrogen and progesterone hormone levels are lower. But statistically, it was not significant. this finding agrees with Shirin Z. Bouri et al. (2019) [16]. Their findings demonstrated a strong negative correlation between estrogen and Cholesterol (P= 0.01) . The non-significance in the current study may result from variations in study design, such as a small sample size or a single-time follow-up, which did not calculate correlations between lipoprotein levels and hormone levels. Another one explains their results as physiological fluctuation of sex hormones is likely to directly or indirectly affect changes in serum lipids throughout the cycle. [17]

Other studies found that lipid profiles did not change throughout the cycle when measured on different days throughout the same cycle. [18-20]

The current study with the other researchers suggested that the menstrual cycle phase should be considered when evaluating Cholesterol and other lipoproteins in reproductive-aged females. The best time may be during menses due to less fluctuation and the easier recognition of this phase (menstrual phase) compared to others to enable fair comparisons.

Conclusions

1.Total cholesterol/HDL ratio, triglyceride, LDL level, and Cholesterol all increased significantly also, a drop in HDL cholesterol level in postmenopausal women in Mosul city contrast to those with regular cycles and normal weights.

2.The triglyceride and LDL were somewhat higher in the follicular phase, the period of the menstrual cycle when levels of the hormones estrogen and progesterone are lower than during the luteal phase , but it was statistically non-significant. the time of the cycle when sex hormone (estrogen and progesterone) levels are lower than in secretory phase but statistically not significant.

RECOMMENDATIONS

1.Study large sample size of women in reproductive age in multiple points of the cycle , and measure lipid profile in compares to estrogen level in Mosul city.

2.Study lipid profile in women taking exogenous estrogen before and after treatment to confirm any relations .

3.Follow up of same women studying lipid profile in her reproductive life and after she get menopause but her Weight must be within normal BMI.

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