Evaluating the Comparative Values of Lipid Profile among Premenopausal and Postmenopausal Women

Muhammad Ahmed Alamgir^{1,*}, Ishfaq Ahmed², Hashim Raza¹, Faridudin²

¹Bahawal Victoria Hospital, Quaid-e-Azam Medical College, Bahawalpur, Pakistan

²Senior Registrar Medicine, Civil Hospital Bahawalpur, Pakistan

*Corresponding Author: alamgirkhan916@yahoo.com

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Abstract *Objectives:* The study aims at comparing the changes of serum lipid levels in premenopausal women with that of postmenopausal counterparts. *Study Design:* An observational comparative and prospective study. *Subjects and Method:* One hundred healthy subjects (fifty each pre and postmenopausal women) between ages from 25 to 65 years, were selected for the study. They were nonsmoker, non-addict and not user of any hormonal contraceptive. The subjects were arranged in two age ranges of 25 - 45 years (group A) and 45 -65 years of age (group B) .The quantitative data was collected and applied accordingly. The fasting serum lipids samples consisting of total cholesterol (TC), high density lipoproteins (HDL-C), and triglyceride (TG) were estimated calorimetrically using the enzymatic method. NCEP ATPIII criterion was used to determine their values in normal or high risk category. According to their recommendations, in healthy females, total cholesterol should be < 200mg/dl .The quantitative variables were displayed as mean $\pm$ standard deviation and percentage. The statistical difference for lipoproteins at 5% significance level was assessed by applying one sample “t” test. *Results:* In subjects of group A, the mean total cholesterol and HDL-C levels were 158.14 ± 28.77 mg/dl and 38.98 ± 8.48 mg/dl respectively. Triglycerides level was 142.24 ± 88.387 mg/dl and within normal range. In females with age group B, the mean concentration of total cholesterol and HDL-C were 210.74 ± 59.156 mg/dl, 32.94 ± 7.582 .mg/dl respectively. Triglycerides level was 160.68 ± 68.131 mg/dl. So in subjects of group B, all lipid values were in high risk category when compared to cut off values determined by NCEP/AHA. *Conclusion:* Menopause leads to changes in lipid profile by reducing HDL, and elevating total cholesterol (TC), and triglycerides (TG), thus increasing the risk for cardiovascular events.

Keywords Lipid Profile, Premenopausal, Postmenopausal Women

1. Introduction

According to WHO estimates, 16.7 million people around the globe die of cardiovascular diseases each year -- among them 8.6 million are women [1] .Contemporarily 86% of global burden of cardiovascular diseases are in developing countries including Pakistan [2, 3]. Coronary heart diseases and stroke cause 1 in 3 women’s deaths each year, killing approximately one woman every 80 seconds. It is estimated that in United States one in every two women die of a heart related disorders, which represents more deaths than due to cancer, chronic lung conditions, and accidents combined [4]. These devastating consequences may be prevented by lifestyle changes and education. The medical literature suggests that ovarian hormones like estrogen can protect vascular endothelium, reduce blood fats and help prevent clotting [5, 6, 7] .This lipid lowering with cardio protective effects during reproductive age, are lost after menopause and ultimately account for more than 50% of all deaths in women over 50 years of age [8,9,10].

This panorama is more obvious by considering the fact that central pathological mechanism leading to these complications is atherosclerosis and it is rapidly accelerated due to hyperlipidemia. According to international guidelines hyperlipidaemia is defined as elevations of fasting total cholesterol concentration or reduced HDL levels which may or may not be associated with elevated Triglycerides concentration [11]. There is strong association between raised total cholesterol and coronary heart diseases while higher HDL concentration is considered to be cardio protective. Meta-analysis of large randomized trials concluded that 45% of deaths from CHD in men and more than 47% in women are due to hypercholesterolemia [12, 13]. It is evident that dyslipidemia or atherogenic lipoprotein index in women is unique and characterized by increase in total cholesterol or decrease in HDL and each being independently atherogenic [14,15].

Large population studies, expertly steered by researchers, revealed that in women HDL-C was strong predictors of

*Muhammad Ahmed Alamgir: Assistant professor in Bahawal Victoria Hospital, Quaid-e-Azam Medical College

CVD than total cholesterol and women who had HDL-C levels less than 50 mg/dl had a 30% increased risk for cardiovascular mortality. Because HDL has more cardio protective effect in females as compared with males. [16, 17, 18]. Hence there is scientific and logical reason that lipid lowering drugs or preventive life style interventions are beneficial in midlife women. Evidence based medicine we all allude to practice is research based and needs adherence to designed guideline. So considering the USPSTF recommendations, there is a general consensus to screen women aged 45 and older for lipid disorders if they are at increased risk for coronary heart disease [19]. In Pakistan, authorities also promote screening based strategies and bringing about an improvement in health outcome [20].

Our concept is thought provoking and innovative. Previously no research data exists to compare the components of lipid profile in women of south Punjab on above mentioned subject. The present study did not aimed to assess other risk factors but it focused to explore the level of lipids among women and to compare with cut off values already known internationally.

2. Aims and Objectives

To evaluate the comparative values of total cholesterol, HDL-C, and triglyceride (TG) between premenopausal and postmenopausal women.

To calculate the TC: HDL ratio among above mentioned subjects

3. Materials and Methods

This comparative and observational work was carried out in medical outdoor department, BVH Bahawalpur, during period from 1.1.2016 to 30.6.2016. One hundred apparently healthy females, 50 premenopausal (aged between 25-45 years) and 50 postmenopausal (aged between 45-65 years) were recruited for study after having formal consent.

Exclusion criteria: The subjects with hypertension, diabetes mellitus, hepatic disease, having lipid lowering drugs and those with obesity or overweight, were excluded from study. In the evaluation, the investigators had detail clinical history including current drug use and recording of gynecological events.

Anthropometric measurements were obtained by measurements of weight and height in light clothing. Body mass index (BMI) was calculated by dividing weight in kg by height in meters (square). Normal BMI ranges from 18 to 24. Fasting samples of total cholesterol, triglycerides, and HDL levels were taken and centrifuged within 15-minutes. Their laboratory values were determined by ELIZA (Rendox Labs). These collected data was analyzed through computer software SPSS version 11. Current classification schemes for hyperlipidaemia, based on National Cholesterol Education Panel (ATP III), were used to consider the normal cut off values of lipoproteins as ready reckoner because these are internationally agreed upon [21, 22]. According to their recommendations, in healthy females, total cholesterol should be < 200mg/dl.

They suggest that HDL-C levels less than 50 mg/dl should be considered a CHD risk factor in women; this is 10 mg/dl higher than the recommended level for men. For HDL-C values in women high risk, border line and low risk were < 40mg/dl, 40-45 mg/dl and > 50mg/dl respectively [12, 13]. It is noteworthy that TC: HDL ratio is a valuable tool to predict cardiovascular risk and acceptable ratio for men is 5 or below and for females it is 4.5 or below. [4, 11]

One sample 'T' test was applied for lipid levels and mean value of quantitative data were represented as mean SD. Their values were tested at 5% significance level and the P value <0.05 was considered as significant.

4. Results

The study population was divided into two complementary groups – Group A (25-45 years) and Group B (45 – 65 years). The remarkable data was obtained. The baseline demographic variables are shown in table-1: Both groups had equal height and weight and similar BMI.

Table 1. Demographic data of the subjects (n=100)

Demographic indicators	Premenopausal (Group A)	Postmenopausal (Group B)
Age	25 to 45 years	Above 45 years
Weight (kg)	53 ± 10.14	52 ± 11.75
Height (m)	1.651 ± 0.127	1.6 ± 0.30
BMI(kg/m ²)	19.44	20.31

Table 2. Comparative values of Lipid profile among both groups

Lipid Parameters	Group A (Premenopausal)	Group B (Postmenopausal)	T –test	P-value
Serum cholesterol	158.14 ± 28.779	210.74 ± 59.156	34.606	P<0.001★
Serum TGS	142.24 ± 88.387	160.68 ± 68.131	19.158	P <0.001★
Serum HDLC	38.98 ± 8.484	32.94 ± 7.582.mg/dl	42.004	P <0.001★
TC : HDL-C ratio (normal<5)	4.1	6.5		

★=highly significant.

The table no .2. has elaborated the data comprehensively. It shows the mean values of total cholesterol, HDL and triglycerides concentrations among both groups along with calculated TC: HDL-C ratio. It is noteworthy that its normal value should be <5 and it is useful tool to predict the risk of cardiovascular disease.

In the age group A (25-45 years.), the total cholesterol was 158.14 ± 28.779 and HDL-C was 42.00 ± 4 mg/dl respectively. Triglycerides level was 142.24 ± 88.387 mg/dl. All these findings turned out to be within normal range.

For the age group B (45-65 years), the total cholesterol was 210.74 ± 59.156 mg/dl. ($P < 0.001$) and HDL-C was 32.94 ± 7.582 mg/dl ($P < 0.001$) respectively. Both these values were raised and statistically highly significant. The values of triglycerides were 160.68 ± 68.13 mg/dl (highly significant at $P < 0.001$).

The atherogenic index (TC/HDL ratio) was also significantly increased in post-menopausal women as well. Moreover, HDL-cholesterol/total cholesterol ratio could be a better marker of coronary heart disease and suggest the importance in subjects without risk factors for atherosclerotic disease.

5. Discussion

A number of valuable trials have suggested that in developed countries, postmenopausal women are four to eight times more likely to die of CAD than of cancer (including breast cancer), chronic lower respiratory disease, Alzheimer disease and accident combined[1,4]. Dyslipidaemia is the established surrogate marker of vascular risks. Elizabeth Cady Stone once said “the heyday of women life is Shadyside of fifty.” So the chronology of their healthier midlife events can be skillfully depicted through crafted preventive measures of dyslipidaemia. The present study endeavors to investigate this paradigm. In these prospects we obtained the remarkable findings. Let us distinctly recall the international cut off values as determined by NCEP ATP III and AHA .They have recommended that HDL-C (good cholesterol) should be essentially more than 50mg/dl for women and more than 35mg/dl in men. While women who had HDL-C levels less than 50 mg/dl had a 30% increased risk for cardiovascular mortality, Total fasting cholesterol (bad cholesterol) should be below 200mg/dl, lower the cholesterol beneficial it is[21,22]. Moreover TGs should also be ≤ 150 mg/dl as well. All the above mentioned values were significantly raised in our female cohort of group B and were in high risk category when compared to cut off values determined by NCEP/AHA.

ATP III recognizes that risk for CHD is influenced by other factors not included among the major, independent risk factors Among these are *life-habit risk factors* and include obesity, physical inactivity, atherogenic diet, and evidence of subclinical atherosclerotic disease. The *life-habit risk factors* are direct targets for clinical intervention. Several research

trials had correlated the relationship of dyslipidemia in midlife women. A Pakistani research work conducted by Faryal and Rashid et al [23] had shown the lipid values in reproductive age group. Their mean concentration of serum total cholesterol was 177.9 ± 40.8 , and triglycerides were 129.1 ± 27 . Serum HDL-C was 53.1 mg /dl and all values were within normal limits.

On comparison between women of reproductive age group and post-menopausal women with normal BMI, Rajesh k et al [24] has contributed to the better understanding of lipid profile status in postmenopausal group. They found that “the levels of TC (200.74 ± 79.27) and TG (160.96 ± 48.12) were significantly higher in post-menopausal women ($P < 0.0031^{**}$). Although, HDL-C levels (37.8 ± 9.20 mg %) were significantly high risk category in this group as compared with premenopausal subjects ($P 0.0113^{*}$). LDL-C levels were also significantly higher in later group comparatively ($P < 0.001$).”

Pakisani authors Nazeer M and Naveed T et al [25], in their study population of 198 female subjects, have concluded that despite its high prevalence in total female (53%) and premenopausal group (59%) hyperlipidaemia did not reach statistical significance in these subgroups. It showed a statistically significant relationship in postmenopausal group only.

Analogous findings were observed by Bade S and SHAH S [26].They found that, “the levels of TC (246.62 ± 29.19 mg %) and TG (131.22 ± 18.99 mg %) were significantly higher in post-menopausal women than those of pre-menopausal counterparts ($P < 0.05$). HDL-C levels were significantly lower (moderate risk category $P < 0.001$) and LDL-C (224.21 ± 30.98 mg %) levels were also significantly higher in postmenopausal group.($P < 0.001$).” There is paucity of Pakistani studies on his subject and substantial data was not available.

Varu DS and Vegad DM [27] have shown the same observations. As compared to their reproductive age subjects, the mean level of serum total cholesterol (14.97 ± 0.99 mm/l) and serum LDL (3.37 ± 1.08 mm/l) were significantly higher in postmenopausal women and level significantly increased with age.

Our results are also in conformity to Mallik M et al [28]. Their postmenopausal group had a statistically significant increased levels of TC ($211.67 \pm 21.35^{*}$) LDL-C ($137.65 \pm 21.03^{**}$) and significantly decreased HDL C when compared to those in reproductive phase. The serum TG levels, although increased in postmenopausal women, but statistically not significant.

Reddy Kilim S and Chandala SR [29] have reported approximately matching observation. Their study aimed to rediscover the influence of menopause on lipid profile in women. Among their pre and postmenopausal subjects, the mean values of TC was 153.38 ± 17.44 and 211.24 ± 29.58 mg (p value < 0.001) while HDL-C was 46.66 ± 7.27 and 27.7 ± 5.6 mg (p value < 0.001) respectively. They suggested that after menopause, the risk of cardiovascular

disease is due to established link of deranged lipids with atherosclerosis.

The results are not always same among different population groups. There are racial/ethnic differences in dyslipidemia and heterogeneity in CVD risk among subgroups. Most minority groups had increased prevalence of low HDL and high TGs except for Japanese and African Americans. The prevalence of high LDL-C was increased among Asian Indians, Filipinos, Japanese, and Vietnamese; there is a paucity of studies on dyslipidemia in South Asians.

South Asian has shown lower risk factors than the urban westernized. This may be due to physically active occupations and high fiber diet. Asians from India or Pakistan may have different CVD risk profiles compared with those from China or Japan. [30, 31]

Some contrary results were obtained in few research studies. Swarna M et al [32] revealed no significant difference in cholesterol and LDL but statistically significant difference were observed in triglycerides and HDL values. Hassan et al. [33] had concluded that biochemical parameters were mostly non-significant changed ($P > 0.05$) while physical parameters were deviated significantly ($P < 0.001$) when comparisons were made between mean values of various study groups.

Despite vernacular diversity of this research along with cosmopolitan quality, our work is limited by its cross-sectional nature; therefore, causal pathways underlying hormonal relationships cannot be inferred as this paper presents analyses of work done as part of routine lipoprotein analysis. William Osler once declared “The good physician treats the disease; the great physician treats the patient who has the disease”. This encourages initiating the process for educating the public and devising local preventive measures and guidelines to effectively combat the risk factors along with devastating consequences.

6. Conclusions

The present study has dynamically concluded that menopause has established link with altered lipid levels. So it is legitimate that every middle aged women should opt for screening of lipids as preventive measure and its treatment accordingly.

7. Disclosure of Interest

This paper is submitted for academic purposes and we have no conflicts of interest to disclose

8. Ethical Review Statement

We do not have formal ethics review committees. The study protocol followed in accordance with the principles of Declaration of Helsinki.

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