Original Research Article

A cross-sectional study to assess lipid profile & atherogenic index of plasma in premenopausal & post menopausal women in rural Telangana

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A B S T R A C T

Background: Menopause is associated with various hormonal changes which are accountable for the dyslipidemic pattern seen in postmenopausal women. This deranged lipid profile in postmenopausal women is indicative of their susceptibility to various cardiovascular diseases.

Aim: The aim of the study is to estimate and compare serum lipid profile and Atherogenic index of plasma (AIP) among premenopausal and postmenopausal women.

Setting & Design: A cross-sectional study was conducted at Mahavir institute of medical sciences (MIMS), Vikarabad for a period of 3 months.

Materials and Methods: Fasting samples were collected from 100 healthy female volunteers of which 50 were premenopausal women and the other 50 were postmenopausal women. Lipid profile was performed on all samples and AIP was calculated.

Stastical Analysis: Carried out in the two groups using paired t tests. Results were expressed as mean ±SD. p value of < 0.05 was considered to be significant.

Results: Total cholesterol (TC), Triglycerides (TAG), Low density lipoprotein (LDL-C) were statistically significantly increased in postmenopausal women as compared to premenopausal women. Atherogenic index plasma (AIP) was elevated in postmenopausal women's group.

Conclusion: Lipid profile screening should be mandatory in postmenopausal women as the hormonal disturbances make them more vulnerable to cardiovascular diseases and its associated complications.

1. Introduction

Cessation of mensuration for a time period longer than one year is defined as Menopause and it heralds with altered ovarian function.[1] The average age for the menopause is approximately 51years and by this time the ovarian follicular reserve and estrogen levels are considerably reduced.[2,3] Although menopause is a natural phenomenon certain circumstances like surgical removal of ovaries, chemotherapy or high dose radiotherapy or premature ovarian failure may induce it.[4] Post menopausal hormonal changes such as low plasma estrogen level and elevated Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) level have significant impact on plasma lipid and lipoprotein metabolism sequeling in ultimate cardiac related disorders.[5,6]

Cardiovascular diseases(CVD) is one of the leading cause of mortality in India. Coronary heart disease prevalence rates in India have been estimated over the past several decades and have ranged from 1.6% to 7.4% in rural population and from 1% to13.2% in urban population.[7] In 2016 the estimated prevalence of cardiovascular diseases in India was estimated to 54.5 million. One in 4 deaths in India arenow because of cardiovascular diseases with ischemic heart disease and stroke responsible for >80% of this burden.[8] Cardiovascular diseases are more prevalent in women after menopause as hormonal changes associated with menopause are accountable for dyslipidemic pattern that causes cardiovascular diseases and

associated complications.

Lipid profile comprises of a panel of biochemical tests which are instrumental in diagnosing and treating lipid-associated disorders including atherosclerosis.[9,10] A surge in cholesterol, triglycerides(TAG), Low Density lipoprotein cholesterol(LDL-C), apolipoprotein B levels and declined levels of High Density Lipoprotein cholesterol (HDL-C) and apolipoprotein- A are a typical feature of a postmenopausal lipid profile.[11]

Estrogen shows cardio protective effect by nurturing a high level of HDL-C and low level of LDL-C and TAG.Accelerated conversion of hepatic cholesterol to bile acids results in significant clearance of LDL-C from the plasma and increased expression of LDL receptors on cellsurfaces. Increased levels of HDL-C is a consequence of increased production of apolipoprotein A-I and decreased hepatic lipase activity.[12] Moreover hepatic expression of apoprotein gene is caused by Estrogen; consequently it affects lipid and lipoprotein metabolism. As this cardio defensive effect is lost after menopause, postmenopausal women are driven towards high risk of debilitating and often fatal complications of cardiovascular disease (CVD).[13]

Atherogenic index of plasma (AIP) which is calculated as log (TAG/HDL-C) has been used to assess the cardiovascular risk. It has been indicated that AIP values of 0.3 to 0.1 are associated with low, >0.1 to 0.24 with medium and above 0.24 with high CVD risk.[14,15]

2. Aim of the Study

As estrogen plays a pivotal role in lipid and lipoprotein metabolism. It is therefore essential to monitor lipid profile in post menopausal women who tend to have reduced estrogen levels. Therefore the present study is aimed to estimate serum lipid profile and the atherogenic index of plasma among pre and post menopausal women.

3. Materials and Methods

A cross-sectional study was conducted for a period of 3 months by the Department Of Biochemistry, Mahavir Institute Of Medical Sciences (MIMS), Vikarabad. Study subjects included 100 female subjects (50 premenopausal women, 50 postmenopausal women) attending the OPD of Mahavir general hospital & willing to participate in the study & informed consent taken. The institutional ethics committee approval was taken before starting the study.

3.1. Inclusion criteria

50 healthy premenopausal women aged between 25–50 years with regular menstrual cycles, 50 healthy postmenopausal women aged between 51-70 years with a history of natural menopause and had cessation of menstruation for a minimum of one year.

3.2. Exclusion criteria

Women less than 25 years of age and those above 70 years of age, Women with irregular cycles, thyroid disorders, pregnant and lactating women, those with history of cardiovascular diseases and diabetes, on hormone replacement therapy and also those who underwent menopause other than by a natural cause were excluded. The demographic data, health status, lifestyle habits and other personal information was obtained via a comprehensive structured questionnaire.

3.3. Laboratory investigations

Fasting venous samples were collected from all subjects into plain tubes. Serum was separated by centrifugation at 3000rpm for 15 minutes The serum was analyzed for Total cholesterol, triglycerides and HDL- Cholesterol by enzymatic methods in biochemistry ERBA Auto analyzer EM-200. LDL- Cholesterol was calculated by using Friedwald's formula[16] and Atherogenic index of plasma was calculated using the formula (log TAG/HDL -C).[14]

3.4. Statistical analysis

The data collected was analyzed statistically using unpaired t- test and the two groups were compared.

4. Results

The present study was carried in 100 healthy women, among them 50 were premenopausal and 50 postmenopausal. Statistically significant increase in serum TC, TAG and LDL-C was observed in postmenopausal women (p - value <0.05). It was noted in the study that HDL-C was lower in postmenopausal women than in premenopausal women. AIP was significantly increased in postmenopausal compared to premenopausal women. The results are shown in Table 1.

5. Discussion

The hormonal changes which are a sequel to menopause play a significant role in most cardiac related disorders associated with it. Variation in the distribution of serum lipids and lipoproteins has been implicated in the etiology of atherosclerosis and cardiovascular diseases.[17]

Our present study gives an insight of lipid profile in postmenopausal women which indicates that menopause alters the lipid profile in women thus predisposing them to high risk of incidence of cardiovascular diseases.

The post menopausal women in our study exhibited higher serum TC, TAG, LDL-C, AIP and a lower HDL-C when compared to premenopausal women. These findings are in accordance with studies of Berg et al.,[18] Nwagha et al.[10] and Carr et al.[19]

Table 1: Lipid profile & AIP in premenopausal & postmenopausal women

Serum Biochemical parameters	Pre-menopausal Women n=50 (mean±SD)	Post-menopausal women n=50 (mean±SD)	p- value
TC (mg/dl)	160.5 ± 35.25	185.57 ± 40.25	0.04
HDL-C(mg/dl)	48.3 ± 8.49	36 ± 8.86	0.001
LDL-C(mg/dl)	74.17 ± 18.1	94.4 ± 22.0	0.001
TAG(mg/dl)	106.96 ± 27	144.2 ± 42.5	0.011
AIP	1.01 ± 0.14	0.22 ± 0.2	0.001

TC-Total Cholesterol, HDL-C High Density Lipoprotein Cholesterol, LDL-C Low Density Cholesterol, TAG- Triglycerides, AIP- Atherogenic Index of Plasma

The significant increase in serum TC in postmenopausal women may be attributed to estrogen deficiency seen in the postmenopausal period. Estrogen have various cardio protective mechanism and it is lost with the onset of menopause. Some studies have revealed occurrence of genetic variances of some lipids.[20] Similar finding was also observed in a study conducted by Shenoy and Vernekar.[21]

Statistically significant increase in TAG has been observed in postmenopausal women in our study which agrees with observation made by Welty.[22] Some studies have found that the increase in the level of TAG was not significant. The variation in increasing pattern may be attributed to variation in study population and different age groups of postmenopausal women enrolled in the study. The rationale behind the increase in TAG in postmenopausal women is the effect of estrogen on adipose cells and lipoprotein lipase activity. The deficiency of Estrogen enhances the increase in adipose cell size and also it increases the lipoprotein lipase activity.[23]

The premenopausal women in our study manifested low LDL-C levels compared to postmenopausal women and this could be attributed to increase HDL -C levels which scavenges cholesterol esters, thus reducing its availability for LDL-C formation. Studies of Kalavathip[24] and Swapnilp[25] have shown similar findings. Moreover, lipoprotein lipase catalyzes the hydrolysis of VLDL resulting in intermediate density lipoprotein and later LDL. Estrogen deficiency after menopause causes a surge in the plasma LPL and hepatic TAG lipase activity causing plasma LDL to accumulate and this leads to LDL receptors down regulation.[26,27]

Some studies have revealed significant decrease in HDL-C in the postmenopausal women thereby supporting our present study where as some studies have exhibited an increase in HDL-C in the postmenopausal women. This discrepancy may be as a result of variation in study population, duration of menopause and life style interventions. The longitudinal study done by Derby et al exhibited that there was a gradual increase in HDL-C from premenopause through menopausal transition to post menopause. However, there was slight decrease in HDL level at late menopause.[28]

The AIP was estimated and compared between the groups. The AIP which is a mathematical association between TAG and HDL and is a successful index in assessing cardiovascular risk factor.[29]

The AIP obtained in the present study indicated that the postmenopausal women in the study group are more susceptible to cardiovascular diseases compared to premenopausal women. This data is in line with studies done by Pascot et al. and Grady et al.[30,31]

Our study has implicated that the hormonal changes associated with menopause play a significant role in remodeling the lipid profile in women and making them vulnerable to cardiovascular diseases.

6. Conclusion

The incidence of cardiovascular disease is more common in men than women up to the age of 50 years but the scenario is reversed later making cardiovascular diseases more prevalent in postmenopausal women. Thus this group of women needs to be regularly monitored so as to have early intervention and prevent cardiovascular diseases. This primary prevention can avoid morbidity and mortality in the vulnerable population. Calculating AIP will further aid in monitoring the high risk groups. Dietary intervention and increased physical activity must be promoted in both the group so as to improve the quality of life. Many studies have also implicated use of Hormone replacement therapy in order to improve the lipid profile in postmenopausal women.

8. Conflicts of Interest

The authors declare that they have no conflicts of interest.

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