

Original Research Article

Prevalence of Cardiovascular Disease in Menopausal Women with High Body Mass Index

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ABSTRACT

In menopausal period estrogen levels decline, falling estrogen levels may lead to high cholesterol levels. The aim of study was to assess the nutritional status of menopausal women and prevalence of cardio vascular diseases (CVD) among post-menopausal women than premenopausal women and its control by modification in dietary intake by phytoestrogens to reduce menopausal symptoms and CVD. A comparative cross-sectional study was conducted on 200 women in the age group of 45-55 years (100 premenopausal women and 100 post-menopausal women) from urban Patna of Bihar. Participants were selected by incidental-cum purposive sampling. Anthropometric measurements, 24 hr diet recall, bio-chemically measurement and radiological assessment were conducted by using standardized methodology as recommended by World Health Organization. Data were analyzed using computer software Microsoft Excel for windows and all results were evaluated statistically by applying the SPSSPC package (version 9.0, SPSS, Chicago, Illinois, USA.). Body Mass Index of premenopausal (26.32 ± 1.65) and postmenopausal women (29.38 ± 3.22) were higher than the normal BMI set by W.H.O., but BMI of postmenopausal women were significantly higher than premenopausal women ($t=2.76$) at the level of 5 per cent. The mean total cholesterol and LDL-C was higher in postmenopausal women than premenopausal women, which was statistically non-significant ($\chi^2=3.835$; $p=.052$). Women health be correlated with diet rich in phytoestrogens and antioxidant along with proper physical activity. Hormonal imbalance and enhanced BMI leads to Obesity and CVD more among postmenopausal women than premenopausal women. Therefore cardiac care should be started from premenopausal period positively.

Keywords

Menopausal, estrogen, Body mass index, cardio vascular disease

Introduction

CVD is the leading cause of death in India, (Mukherji, 1995) and its contribution to mortality is rising; deaths due to CVD are expected to double between 1985 and 2015, deaths due to coronary heart disease (CHD) in India rose from 1.17 million in 1991 to 1.59 million in 2000 and 2.03 million in 2010 (WHO, 2002). Cardiovascular disease is one of the leading causes of death in women (Papadopoulou and Kaski, 2013)

The incidence of CVD, which is the leading cause of death in women, increases after menopause, after menopause, a woman's risk of heart disease grows to almost equal the risk of a man. Prevalence of these symptoms varies throughout the world with 1 in 5 women affected in Asia, in contrast to 74% of women reported in Europe. (Mozaffarian *et al.*, 2016). As women transition through menopause, they are

undergo adverse alterations in body fat composition, lipids, lipoproteins and vascular remodelling that could increase their CVD risk. Menopausal status as a risk factor for the development of hypertension, though potentially mediated through increased body mass index (Abdolnour, 2012). Although it has been debated whether the loss of cardiorenal protection in postmenopausal women is related to aging, loss of female hormones or both, substantial studies indicate that reduced levels of ovarian hormones constitute a major risk factor for development of CVD (Mathew *et al.*, 1998)

Menopause is a risk factor for cardiovascular disease (CVD) because estrogen withdrawal has a detrimental effect on cardiovascular function and metabolism. Hormonal changes after menopause such as low plasma estrogen level and elevated Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) level have significant effect on plasma lipid and lipoprotein metabolism resulting in ultimate cardiac related disorders (Deepthi *et al.*, 2012 and Varu *et al.*, 2012). Hypertension and central obesity too play a contributory role (Marjani and Moghasemi, 2012). Menopause is associated with increased fat in abdominal region and around the waist (Hadji, 2008). Premenopausal women also have a much lower incidence and prevalence of heart and renal disease compared to postmenopausal women and men (Reckelhoff and Maric, 2010). This sex difference in favour of women also gradually disappears after menopause, indeed cardiovascular risk becomes even higher in post-menopausal women (Stampfer *et al.*, 1999). Observational studies have demonstrated that both the incidence of CVD and resultant morbidity and mortality are much less in premenopausal women. Menopausal transition could be a critical period for

atherosclerosis acceleration under certain conditions, namely smoking.

Results and Discussion

When Body Mass Index (BMI) of menopausal women rises from desired standard level (WHO standard) then different level of obesity develop in them. Tendency of overweight increases as menopausal phase proceeds from premenopausal to postmenopausal period. Body Mass Index of premenopausal (26.32 ± 1.65) and postmenopausal women (29.38 ± 3.22) were higher than the normal BMI set by W.H.O., but BMI of postmenopausal women were significantly higher than premenopausal women ($t=2.76$) at the level of 5 per cent. (Table 1) Most of the pre-menopausal women belonged to overweight category and higher percentage of post-menopausal women belonged to obese I and obese II category. (Figure: 1) Obesity leads to various health problems along with cardio vascular disease.

During menopause, weight gain is very common. After menopause, the weight gain experienced by many women is steady but slow. Weight gain was significantly more in postmenopausal women (53%) in compared to premenopausal women (25%) at level of $p < .0001$ ($\chi^2=15.33$). Due to decrease in the level of estrogen especially in postmenopausal women, blood pressure becomes abnormal and it may lead to hypertension. Postmenopausal women were significantly more sufferer of hypertension than premenopausal women ($\chi^2=5.28$, $p=0.027$) (Table: 2)

Menopausal women suffer from some of the health problems related to hormone imbalance which in turn leads to elevated levels of lipids (total cholesterol, LDL-C levels) and lower HDL-C levels. Before

menopause, the LDL-C levels are lower and rise after menopause. The cause for this is significant reduction in circulating concentrations of estradiol and estrone. These levels are believed to influence hepatic lipid and lipoprotein metabolism, which in turn increases the heart diseases and atherosclerosis. (Table: 3)

The mean total cholesterol and LDL-C was higher in postmenopausal women (172 ± 29.21 and 120.406 ± 2.549 mg/dl) and minimum for premenopausal women (145 ± 14.94 and 105.756 ± 7.172 mg/dl). The difference between the means of pre and post-menopausal women was found to be significant at 5 per cent level.

The mean triglyceride level was higher in postmenopausal (171.75 mg/dl) compare to premenopausal women (166.87 mg/dl). The mean HDL-Cholesterol, haemoglobin and serum calcium levels were similar for all the two groups.

The mean VLDL-cholesterol levels were higher in post-menopausal women (34.83 mg/dl) when compared to pre (33.7 mg/dl). However, the mean differences between the groups were not found to be significant. Table: 4

There are a standard level of cholesterol, triglycerides and all the lipoprotein for a normal (physically fit) person. If the level of these increases from standard then some problems started and lead to various problems like atherosclerosis and cardiovascular diseases (CVD). Results revealed that majority of premenopausal women total cholesterol, triglyceride.

However the trend was quite opposite in case of post-menopausal women's total cholesterol levels, 68 per cent is in at risk and 32 per cent in desirable group. Majority

of post-menopausal women (71%) and pre (68%) belonged to risk category for triglyceride levels (150-200 mg/dl). Women in both groups belonged to risk category for LDL-C levels (>100 mg/dl).

In the cross sectional study we detected that after transition to menopause the most robust increase was observed in body mass index, waist circumference and plasma triglycerides. Study puts emphasis on comparison of the pattern of lipid profile in pre- and postmenopausal women. The study also highlights the atherogenic indices on the two groups.

The main reason for the absolute increase in LDL may be due to the decrease in estrogen that stimulated the synthesis of LDL receptor which directly causes reduction of LDL receptor after menopause (Kumar and Oommen, 2012), In compare to premenopausal women (30%) majority of postmenopausal women (67%) belonged to risk group (<45 mg/dl) for HDL-C levels.

Almost all study shows increased levels of TC, TAG, and LDL-C in postmenopausal group compared to premenopausal group but there is a wide controversy regarding changes in HDL-C after menopause. Our result was quite similar to the study conducted by Ifueko (2013), in which TC, TAG, HDL-C, and LDL-C were increased significantly with “” value < 0.001 in postmenopausal women than in premenopausal women.

Also a study done by Sapkota *et al.*, in 2015 and Basu *et al.*, 2017 in Nepal showed significantly increased TC, TAG, and LDL-C which is in agreement with the present study and significantly decreased HDL-C in postmenopausal women than in premenopausal women which is in contrast to the present study.

Table.1 Mean body mass index(BMI) and waist hip ratio (WHR) in menopausal women

| Sl. No. | Indices | Stages | Mean | t –value |
|---------|---------|----------------------|-------------|----------|
| 1. | BMI | Premenopausal women | 26.32±1.65 | 2.76* |
| | | Postmenopausal women | 29.38±3.22 | |
| 2. | WHR | Premenopausal women | 0.89±0.046 | 1.34 |
| | | Postmenopausal women | 0.93±0.0526 | |

*Significant

Table.2 Problems of pre-menopausal and postmenopausal women

| Deseases | Stages | | Chi-square | P-value |
|-------------------|---------------------|----------------------|------------|---------|
| | Premenopausal women | Postmenopausal women | | |
| Obesity | 25 | 53 | 15.33 | 0.0001 |
| Diabetes I/II | 3 | 11 | 3.763 | 0.0524 |
| Anaemia | 39 | 57 | 5.789 | 0.0161 |
| Hypertension | 13 | 39 | 5.281 | 0.0266 |
| Mental depression | 17 | 37 | 9.158 | 0.0025 |
| Cardiovascular | 2 | 15 | 0.5922 | 0.4416 |

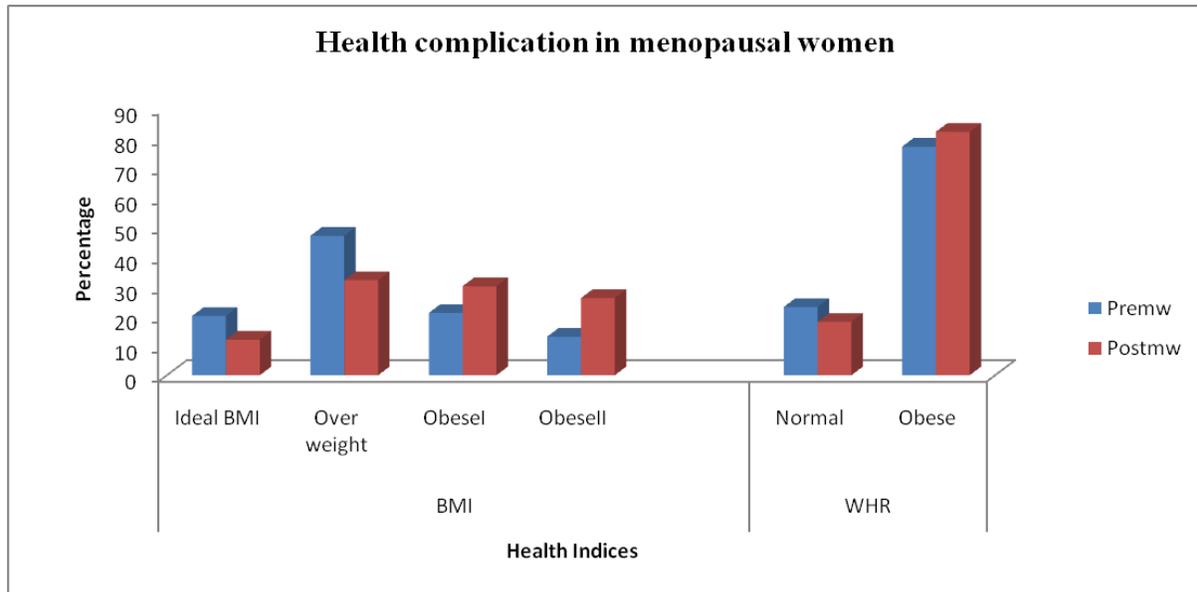
*Significant

Table.3 Biochemical profile of menopausal women

| Sl.No. | Blood profile(mg/dl) | Stages | | T Value | P-Value |
|--------|----------------------|----------------------------|------------------------------|---------|---------|
| | | Premenopausal women(N=100) | Postmenopausal women (N=100) | | |
| 1. | Total cholesterol | 145±14.94 | 172±29.21 | 2.82 | 0.011* |
| 2. | Triglyceride | 166.87±11.29 | 171.75±13.03 | 0.799 | 0.437 |
| 3. | HDL-C | 45.7±1.498 | 47±1.491 | 1.948 | 0.067 |
| 4. | LDL-C | 105.756±7.172 | 120.406±2.549 | 2.129 | 0.047* |
| 5. | VLDL-C | 33.7±1.594 | 34.83±2.317 | 0.987 | 0.034 |
| 6. | Haemoglobin (gm/ml) | 10.073±1.165 | 10.218±1.242 | 0.301 | 0.7671 |
| 7. | Serum calcium | 9.265±0.572 | 8.965±0.5341 | 1.074 | 0.3009 |

Table.4 Classification of menopausal women according to desirable level

| Sl. No. | Lipid parameters(mg/dl) | Stages | | | |
|---------|-------------------------|----------------------------|------|-----------------------------|------|
| | | Premenopausal women(N=100) | | Postmenopausal women(N=100) | |
| | | Desirable | Risk | Desirable | Risk |
| 1. | Total cholesterol | 72 | 28 | 32 | 68 |
| 2. | Triglycerides | 32 | 68 | 29 | 71 |
| 3. | LDL-C | 69 | 31 | 27 | 73 |
| 4. | HDL-C | 70 | 30 | 33 | 67 |



Framingham Heart Study, reported that women aged 50–59 yr who had experienced natural menopause had 4 times the 10-yr incidence of coronary heart disease as premenopausal women in the same age range, but results were not adjusted for age or smoking (Lerner and Kannel, 1986).

Nutrition is a basic human need and a prerequisite to a healthy life, especially in the case of pre and postmenopausal women.

A proper diet (rich in calcium, vitamin, and antioxidant) is essential for menopausal women to overcome the hormonal changes and to remain active. Apart from supplying nutrients, foods provide a host of other components (non-nutrient phytochemicals or phytoestrogen) which have a positive impact on health, they also helps in minimizing the symptoms and problems.

Phytoestrogen containing foods (Soya, linseed, and flaxseed etc) should be encouraged to prevent bone problems, Cardio Vascular Diseases and to relieve menopausal symptoms. Along with balanced diet, regular exercise is a must.

By minimizing caffeine and alcohol intake and avoiding smoking can reduce various risk factors of cancer, cardiovascular disease and osteoporosis during menopause (Warburton, 2007). Cigarette smoker undergo menopause two years earlier than non –smoker (Grady, 2009).

In conclusion adverse changes in lipid profile along with significant increase in cardiac risk ratio in postmenopausal women of the study remark that this group of women is at increased risk of having complications associated with cardiovascular disease in near future. Early and timely detection and primary prevention can avoid morbidity and mortality in this high risk population. Moreover, positive correlation of BMI with CVD in pre- and postmenopausal women concludes that dietary interventions and physical activity are to be encouraged in both the study groups especially when other cardiac risk factors are prevailing. A potential menopause- specific cardio vascular disease risk marker, supporting the need to monitor and target this fat depot for intervention in women at midlife

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