International Journal of Health Sciences and Research
Vol.13; Issue: 9; September 2023
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

Screening the Risk of Developing Type 2 Diabetes Mellitus and Cardiovascular Disease Among Peri-Menopausal Women

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DOI: https://doi.org/10.52403/ijhsr.20230903

ABSTRACT

Background: Menopause has different effect on various system in a women's body. Perimenopause refers to the transitional phase in a woman's life leading up to her final menstrual period. During this time, there are physiological shifts that bring about a range of clinical symptoms like hot flashes, unpredictable menstrual bleeding, and alterations in mood. Literature has already proven that Type 2 Diabetes Mellitus (T2DM) and cardiovascular disease (CVD) is prevalent in Post-Menopausal Women and affects Morbidity and Mortality rate. To our knowledge limited literature is focused on systemic effects in Peri-Menopausal Women. Hence the study aimed at estimating the risk of developing T2DM and CVD in future and create awareness in Peri- Menopausal women.
Method: A total of 65 peri- menopausal women falling under age group of 40-50 were the subject population of this study. Participants was selected using purposive sampling technique. Indian Diabetes Risk Score (IDRS) and Waist Hip Ratio (WHR) was performed to find out the risk of developing T2DM and CVD respectively. Data was analysed using SPSS version 16. Descriptive statistic was performed. Chi square test was performed to find out the association between IDRS and WHR.
Results: 22 (14.3%) and 25 (16.25%) out of 65 peri menopausal women were falling under a moderate and severe risk of developing CVD. 34 (22.1%) and 28(18.2%) out of 65 peri menopausal women were found to have intermediate and high risk of developing type 2 diabetes mellitus in future. Among all the symptoms Lethargy had a higher incidence i.e 81% in this study followed by Irritability i.e 68%, Headache i.e 65%, Menstrual irregularities i.e 55%, Anxiety i.e 28% and Palpitation i.e 6% and an extremely significant association was found between IDRS and WHR.
Conclusion: Among 65 peri- menopausal women majority of the peri menopausal women were falling under intermediate and high-risk category of developing T2DM and CVD in future and an extremely significant association was found between these two factors indicating developing a risk of T2DM and CVD in future.

Keywords: *Type 2 diabetes mellitus, Cardiovascular disease, Peri- menopausal women, Waist-Hip Ratio, Indian Diabetes Risk Score*

INTRODUCTION

Menopause is the permanent cessation of menstruation for 12 consecutive months. It occurs due to the natural decline in ovarian follicle function or surgical removal of the ovaries. The average age of menopause among Indian women, as per the Indian Menopause Society, is 46.2 ± 4.9 years [(1)]. Effects of menopause are vascular instability, skeletal changes, cardiovascular and cerebrovascular effects, and psychological changes.

Perimenopause refers to the transitional phase in a woman's life as she approaches reproductive senescence, which is accompanied by various physiological

changes and impacts her health and overall quality of life. Women going through perimenopause commonly experience symptoms such as hot flushes, changes in mood and sleep patterns, as well as alterations in vaginal health and sexual function. (2)

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder marked by hyperglycemia due to insulin secretion dysfunction. It is the most common form of Diabetes Mellitus (DM), affecting over 90% of adults with the condition. The worldwide prevalence of T2DM is a major public health concern due to its considerable morbidity and progressive complications. (3)

In India, chronic diseases like Hypertension and DM are on the rise. The prevalence of T2DM varies widely, ranging from 1.9% to 25.2% (4) The occurrence of diabetes has witnessed a surge in both rural and urban regions of India, with rates escalating from 2.4% and 3.3% in 1972 to 15.0% and 19.0% respectively during the period of 2015-2019. (5)

In 2019, noncommunicable diseases (NCDs) were responsible for 74% of global deaths, as reported by the World Health Organization (WHO). Among these NCDs, diabetes caused 1.6 million deaths, positioning it as the ninth leading cause of death on a global scale. (6) The Indian Diabetes Risk Score (IDRS) predicts diabetes probability based on four parameters, including two modifiable (waist circumference and physical activity) and two non-modifiable risk factors (age and family history of T2DM). (7)

Obesity, defined as having excess body weight for a given height, remains a major worldwide health concern. It is strongly associated with an increased risk of various chronic diseases such as type 2 diabetes (T2D), hypertension, and CVD, which significantly affect daily life and elevate mortality risk (8) Being overweight or obese is linked to a higher risk of developing hypertension and diabetes. The prevalence of these chronic conditions is on the rise in India. Numerous studies have shown that overweight and obesity significantly influence the clinical profile of diabetes and hypertension (9)

Central obesity, characterized by a high waist-to-hip ratio (WHR), contributes to myocardial infarction (MI) through multiple pathways involving oxidative stress, inflammation, steroid hormones, free fatty acids, and altered adipocyte-derived hormones. Recent studies using cardiac metabolism imaging in large cohorts, such as the Framingham Heart Study and Jackson Heart Study, have revealed that excessive visceral fat can exceed its storage capacity, leading to lipid spillover into lean tissues like the heart, liver, and intrathoracic fat. This contributes significantly to cardiac and metabolic abnormalities. Additionally, visceral fat promotes atherosclerosis and is associated with insulin resistance, hypertriglyceridemia, highly atherogenic small LDL (low-deficiency Lipoprotein) particles, and low levels of HDL (high-deficiency lipoprotein), all of which are proatherogenic factors. These processes subsequently trigger endothelial dysfunction, a hypercoagulable state, dyslipidaemia, and ultimately, myocardial infarction. (10)

The 1997 WHO Expert Consultation highlighted the significance of abdominal fat mass, known as abdominal, central, or visceral obesity, which can vary significantly within a narrow range of total body fat and Body Mass Index (BMI). A study demonstrated that abdominal obesity, measured as waist-hip ratio, is linked to a higher risk of myocardial infarction, stroke, and premature mortality, whereas these diseases showed no association with measures of generalized obesity like BMI (Larsson et al., 1984). In women, BMI was associated with an increased risk of these diseases, but waist-hip ratio emerged as a stronger independent risk factor than BMI (Lapidus et al., 1984) (11)

Studies have consistently demonstrated that Metabolic Syndrome is prevalent among postmenopausal women and significantly influences their health outcomes and mortality rates in a detrimental manner. (1)

CVD is the leading cause of death and disability worldwide, including India, where it accounts for 28% of all annual deaths. Over the past three decades, there has been a concerning rise in CVD prevalence in India. Notably, peri-menopausal women are now at higher risk of CVD-related mortality, but they are significantly underrepresented in research studies on the subject. [12] However, there is a lack of comprehensive studies on the systemic effects of menopause on women in the peri-menopausal stage. Therefore, the study aimed at screening the risk of T2DM and CVD among peri-menopausal women.

MATERIALS & METHODS

The study was presented to the ethical committee of PES MCOP Pune for approval. Permissions were obtained from all the respective OPDs and hospitals in and around Pune to conduct the study. The cross-sectional survey was employed to investigate the risk of developing T2DM and CVD among peri-menopausal women. The sample size consisted of 65 participants, who were peri-menopausal women. The study was conducted within the period of 6 months at gynecology and obstetrics outpatient departments (OPD) as well as hospitals located in and around Pune. Participants were selected based on predefined inclusion and exclusion criteria. The participants were informed about the study procedures and objectives, and their consent was obtained prior to their involvement. Demographic information of the participants was gathered, including the administration of the Indian Diabetic Risk Score (IDRS) and Waist-Hip Ratio (WHR) measurements. Collected data was then analyzed as part of the study.

STATISTICAL ANALYSIS

The collected data was analyzed using SPSS version 16. Descriptive statistics was obtained and chi-square test was performed to determine the association between the Indian Diabetic Risk Score (IDRS) and Waist-Hip Ratio (WHR). The level of significance was set at a p-value of less than 0.05.

RESULT

Table no 1: Demographic characteristics of the participants (n= 65)

VARIABLES	MEAN ± SD
AGE (yrs)	45.5 ± 3.05
Height	159 ± 6.07
Weight	65.4 ± 7.05
BMI	25.9 ± 3.33
Waist Circumference	90.3 ± 13.06
Hip Circumference	107.8 ± 11.6
Waist- Hip Ratio	0.83 ± 0.072

The study included 65 women in the peri-menopausal stage, As mentioned in table no 1; the age of the participants was found to be 45.5 ± 3.05 years. The calculated body mass index (BMI) had an average value of 25.9 ± 3.33, which falls within the overweight category according to commonly used BMI ranges. Waist circumference was measured at an average of 90.3 ±13.06 cm, indicating high risk.

Table no 2: Risk of CVD based on WHR

WHR Categorization - <0.75: Excellent, 0.75-0.79: Good, 0.80- 0.86: Average, ≤0.86: At risk

VARIABLES	Total (% n)
Excellent	5 (3.25%)
Good	13 (8.45%)
Average	22 (14.3%)
At risk	25 (16.25%)
Total	65

Table no 3: Risk of T2DM based on IDRS

IDRS categorization- Low risk <30, Intermediate 30-59, High risk ≥60

VARIABLES	Total (% n)
Low risk	3 (1.95%)
Intermediate risk	34 (22.1%)
High risk	28 (18.2%)
Total	65

As mentioned in the table 2 and 3; Among 65 participants, 22 (14.3%) were at moderate risk and 25 (16.25%) were at severe risk of developing CVD and 34 (22.1%) were found to have an intermediate risk and 28 (18.2%) had a high risk of developing T2DM in the future.

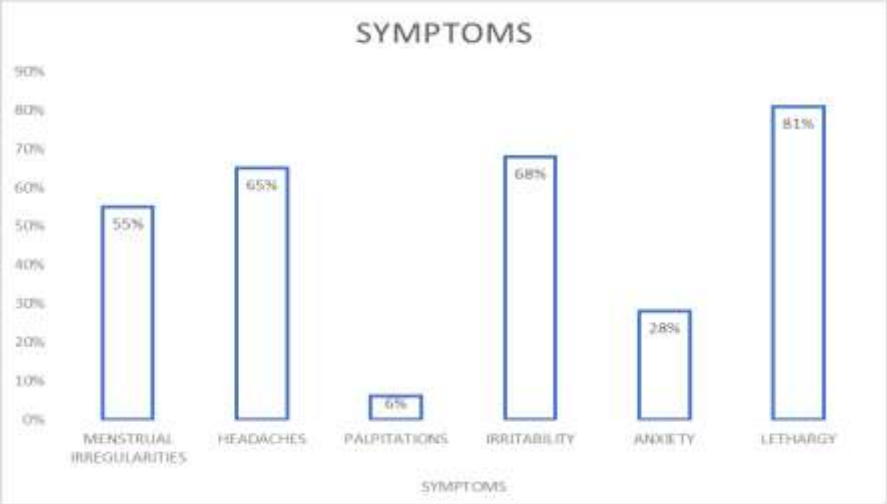
Table no 4: Association between IDRS and WHR

VARIABLES	P value
IDRS and WHR	0.002

As mentioned in the table 4; An extremely significant association was found between IDRS and WHR suggesting a significant correlation between T2DM and CVD.

Graph 1: Participant Reported Symptoms

The study showed that lethargy was the most prevalent symptom (81%), followed by irritability (68%), headache (65%), menstrual irregularities (55%), anxiety (28%), and palpitation (6%).



DISCUSSION

A cross-sectional study was conducted, involving 65 women in the peri-menopausal stage between the ages of 40 and 50. The study revealed that a significant number of these women were categorized as having an average or at-risk waist-to-hip ratio (WHR), indicating a potential risk for developing cardiovascular disease (CVD) in the future. This finding aligns with a similar study conducted by Naina Mehndiratta, which reportedly showed similar results; the component whose incidence was highest in premenopausal and postmenopausal group was hypertension (58%). [(1)]

Out of the 65 peri-menopausal women, 22 (14.3%) were classified as being at a moderate risk, and 25 (16.25%) were classified as being at a severe risk of CVD in the future. Excess production of cytokines by visceral fat, which are protective substances secreted by the immune system, can lead to inflammation and an increased risk of cardiovascular disease. This also negatively affects the cells' sensitivity to insulin, further contributing to diabetes. The regulation of the stress hormone cortisol by the hypothalamic-pituitary-adrenal axis has been linked to higher levels of abdominal fat and, consequently, a higher waist-hip ratio.

Abdominal obesity is increasingly recognized as a significant risk factor CVD. The presence of visceral adipose tissue (VAT) is responsible for the cardio-metabolic risk associated with abdominal obesity. VAT promotes insulin resistance, dyslipidemia, and hypertension. [(13)] A higher WHR indicates increased abdominal fat, which can result in fat accumulation around the liver. This impairs the liver's ability to process glucose, leading to elevated blood glucose levels and an increased risk of developing T2DM.

CVD remains a significant cause of death among individuals with diabetes. The risk of CVD in patients with T2DM is more than twice that of those without diabetes. Despite efforts to prevent CVD in individuals with T2DM, there are still significant challenges in achieving this goal. Several research studies have been conducted to address the reduction of cardiovascular risk in T2DM [(14)]

According to a study, irritability was found to be the most common psychological symptom among peri-menopausal women. The incidence of these symptoms was significantly lower among post-menopausal women, with irritability being the most prevalent at 16%, followed by forgetfulness at 12%, lethargy at 10%, and loss of libido in 3% of women [(15)]

However, in my study, lethargy had a higher incidence of 81%, followed by irritability at 68%, headache at 65%, menstrual irregularities at 55%, anxiety at 28%, and palpitation at 6%

CONCLUSION

A significant number of the 65 peri-menopausal women in the study were classified as being at risk for developing CVD and T2DM in the future. Additionally, a strong correlation was observed between these two factors, indicating a potential risk for developing metabolic syndrome in the future.

Declaration by Authors

Ethical Approval: Approved
Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Aishawarya Sale, Nidhi Ladha. Screening the risk of developing type 2 diabetes mellitus and cardiovascular disease among peri-menopausal women. *Int J Health Sci Res.* 2023; 13(9):12-17.
DOI: *https://doi.org/10.52403/ijhsr.20230903*

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