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Unveiling the Risk: Age, Diabetes, HTN and BMI as Predictors of Atherosclerosis in Postmenopausal Women

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A B S T R A C T

This study aimed to predict atherosclerosis in menopausal women based on independent variables such as age, diabetes mellitus (DM), hypertension (HTN), and body mass index (BMI). A total of 105 postmenopausal women attending the gynaecology outpatient department at SMS Medical College, Jaipur, were included in this observational study. Carotid intima-media thickness (cIMT) was measured using ultrasound to assess subclinical atherosclerosis. The results indicated that age, DM, HTN, and BMI were significant predictors of increased cIMT. Women with higher BMI, diabetes, and hypertension had significantly greater cIMT values, suggesting a higher risk of atherosclerosis. This study highlights the importance of early screening and management of these risk factors to prevent cardiovascular diseases in menopausal women.

Keywords: Atherosclerosis, Menopause, Carotid Intima-Media Thickness (cIMT), Diabetes Mellitus, Hypertension, Body Mass Index (BMI)

INTRODUCTION

Atherosclerosis is a leading cause of cardiovascular diseases (CVD), which are the primary cause of morbidity and mortality in postmenopausal women[1]. The decline in estrogen levels during menopause is associated with an increased risk of CVD, as estrogen has protective effects on the cardiovascular system. Early detection of subclinical atherosclerosis is crucial for preventing future cardiovascular events. Carotid intima-media thickness (cIMT) is a widely used non-invasive marker for assessing subclinical atherosclerosis[2].

This study aimed to predict atherosclerosis in menopausal women based on independent variables such as age, diabetes mellitus (DM), hypertension (HTN), and body mass index (BMI). By identifying the relationship between these factors and cIMT, we can better understand the risk of atherosclerosis in this population and implement early preventive measures.

METHODOLOGY

This was a hospital-based observational study conducted in the Department of Obstetrics and Gynaecology at SMS Medical College, Jaipur, from January 2023 to December 2023. A total of 105 postmenopausal women who had attained menopause within the last five years were included in the study. Women with a history of coronary heart disease, hormone replacement therapy, or use of sex steroids in the last three months were excluded.

Inclusion Criteria:

- Menopause within the last five years.
- Intact uterus and at least one ovary.
- Willingness to participate with written informed consent.

Exclusion Criteria:

- History of coronary heart disease.
- Use of hormone replacement therapy or sex steroids in the last three months.

Data Collection:

A detailed medical history was taken, including age, presence of DM, HTN, and BMI. Carotid intima-media thickness (cIMT) was measured using a B-mode ultrasound system. Blood tests, including random blood glucose and lipid profiles, were conducted to assess diabetes and other metabolic parameters[3].

Statistical Analysis:

Data were analyzed using statistical software. Continuous variables were summarized as mean and standard deviation (SD). Differences between groups were analyzed using ANOVA and Chi-square tests. Binary logistic regression was used to predict atherosclerosis based on independent variables. A p-value of <0.05 was considered statistically significant.

RESULTS

The study included 105 postmenopausal women with a mean age of 49.54 ± 3.38 years. The majority of participants were in the age group of 46-50 years (54.29%). The mean BMI was 25.42 ± 2.49 kg/m², with 71.43% of women being pre-obese (BMI 25-29.9 kg/m²). Diabetes mellitus was present in 22.85% of participants, and hypertension was present in 35.24%.

Table 1: Demographic and Clinical Characteristics of Participants

Variable	Number (n=105)	Percentage (%)
Age (years)		
40-45	12	11.43%
46-50	57	54.29%
51-55	33	31.43%
56-60	3	2.86%
BMI (kg/m²)		
Normal (18-22.9)	7	6.67%
Overweight (23-24.9)	16	15.24%
Pre-obese (25-29.9)	75	71.43%
Obese (≥30)	7	6.67%
Diabetes Mellitus	24	22.85%
Hypertension	37	35.24%

Table 2: Association of Age, BMI, DM, and HTN with Carotid Intima-Media Thickness (cIMT)

Variable	Mean cIMT (mm)	p-value
Age (years)		
40-50	0.67 ± 0.13	0.0004
51-60	0.75 ± 0.09	
BMI (kg/m²)		
Normal (18-22.9)	0.67 ± 0.011	<0.0001
Overweight (23-24.9)	0.55 ± 0.004	
Pre-obese (25-29.9)	0.73 ± 0.11	
Obese (≥30)	0.78 ± 0.17	
Diabetes Mellitus		
Present	0.77 ± 0.11	0.0002
Absent	0.68 ± 0.12	
Hypertension		
Present	0.73 ± 0.12	0.019
Absent	0.68 ± 0.12	

Table 3: Binary Logistic Regression Analysis for Factors Influencing Carotid Intima-Media Thickness

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)
Age (years)	0.205	0.087	5.511	1	0.019	1.228	1.034 - 1.457
Presence of DM	2.015	0.774	6.772	1	0.009	7.498	1.644 - 34.19
Presence of HTN	-1.696	0.62	7.481	1	0.006	0.184	0.054 - 0.618
BMI	3.438	1.222	7.909	1	0.005	31.121	2.835 - 341.681
Constant	-9.628	4.262	5.104	1	0.024	0	-

Binary Logistic Regression Analysis:
Binary logistic regression was conducted to predict thickened cIMT based on age, DM, HTN, and BMI. The results showed that age, DM, HTN, and BMI were significant predictors of increased cIMT. For each year increase in age, the odds ratio (OR) for thickened cIMT was 1.23 (p=0.019). Women with diabetes were 7.5 times more likely to have thickened cIMT (OR=7.5, p=0.009). Similarly, women with higher BMI had a significantly increased risk of thickened cIMT (OR=31, p=0.005). However, hypertension showed an inverse relationship with cIMT (OR=0.18, p=0.006).

DISCUSSION

This study highlights the significant role of age, diabetes mellitus, hypertension, and body mass index in predicting atherosclerosis in menopausal women. The findings are consistent with previous studies that have shown a strong association between these risk factors and increased carotid intima-media thickness (cIMT), a marker of subclinical atherosclerosis[4].

As women age, the risk of atherosclerosis increases due to age-related vascular changes. Our study found that women aged 51-60 years had significantly higher cIMT values compared to younger women (p=0.0004). This is consistent with the natural progression of vascular aging, which involves smooth muscle cell hyperplasia and fibrocellular hypertrophy, leading to arterial thickening.

Diabetes is a well-known risk factor for atherosclerosis. In our study, women with diabetes had a mean cIMT of 0.77 mm, significantly higher than non-diabetic women (p=0.0002). The odds ratio for thickened cIMT in diabetic women was 7.5, indicating a strong association between diabetes and atherosclerosis.

Hypertension is another critical risk factor for cardiovascular diseases. However, in our study, hypertension showed an inverse relationship with cIMT (OR=0.18, p=0.006). This finding contrasts with previous studies, which have shown a positive association between hypertension and cIMT. Further research is needed to explore this unexpected result.

Obesity is a significant risk factor for atherosclerosis. In our study, women with a BMI ≥30 kg/m² had the highest mean cIMT (0.78 mm), followed by pre-obese women (0.73 mm). The odds ratio for thickened cIMT in obese women was 31, indicating a strong association between obesity and atherosclerosis.

CONCLUSION

This study demonstrates that age, diabetes mellitus, hypertension, and body mass index are significant predictors of atherosclerosis in menopausal women. Early screening and management of these risk factors are crucial for preventing cardiovascular diseases in this population. Carotid intima-media thickness (cIMT) measurement is a simple, non-invasive method that can be used to identify women at risk of atherosclerosis and implement early interventions.

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