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Association Of Quality Of Diet And Lifestyle Factors With Risk Of Obesity And Hypertension Among Postmenopausal Women Of Age 50 To 60 Years

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ABSTRACT

Menopause marks the end of menstruation, followed by twelve months of amenorrhea, initiating postmenopause. Hormonal and metabolic changes during this transition increase the risk of non-communicable diseases like obesity, hypertension, and osteoporosis. Lifestyle factors such as poor sleep, physical inactivity, psychological distress, and also quality of diet elevate these risks. A cross-sectional study was conducted among 100 postmenopausal women using structured interviews, standardized tools, self-designed questions, and clinical assessments. Data were analyzed using SPSS version 25, with $p < 0.05$ considered statistically significant. Results showed that menopausal symptoms (p=0.009), sleep quality (p=0.016), and psychological distress (p=0.001) were statistically significant with blood pressure. Similarly, menopausal symptoms (p=0.015), sleep quality (p=0.001), and psychological distress (p=0.005) were significant with BMI. Participants showed high intake of sweetened beverages, salty snacks, and fried items. Participants with normal BMI had significantly higher Diet Quality Score (p=0.001). BMI was negatively correlated with intake of protein (r=-0.215), calcium (r = -0.283), and iron (r = -0.310), while calcium (r = -0.207) intake was inversely associated with systolic blood pressure. In conclusion, study demonstrates that lifestyle factors such as sleep, psychological distress levels and quality of diet significantly influence the risk of obesity and hypertension during the postmenopausal phase.

KEYWORDS - Postmenopause, Obesity, Hypertension, Lifestyle factors, Quality of diet

INTRODUCTION

Menopause is defined as the end of the menstrual cycle and the following twelve months of amenorrhea. The time after the last menstrual cycle is referred to as the post-menopause (Soules, M. R., et al, 2001). Various systems within the body are impacted by hormonal changes that start with the menopausal transition and abruptly stop producing hormones (Jeong, H. G., et al, 2022). During the menopause transition, changes in body composition and reproductive hormones are linked to an increased risk of cardiovascular disease (CVD) and overall metabolic disorders (Marlatt, K. L., et al, 2022). Postmenopausal women are more likely to be more affected by obesity (Knight, M. G., et al, 2024). Additionally, hormonal changes in the aging-related metabolic changes may significantly impact the rise in blood pressure that occurs after menopause. There is also an increase of sodium sensitivity during menopausal transition, which may lead to fluid retention, hence

contributing to higher cardiovascular risks and hypertension (Silva, T. R., et al, 2021). Postmenopausal women are more likely to suffer from osteoporosis and fractures as compared to others because of the rapid bone loss and drop in ovarian function that occurs during the menopausal transition (Long, G., et al, 2023). High BMI and abdominal obesity in postmenopausal women may lead to difficulties with sleep, affect deep sleep and sleep efficiency (Naufel, M. F., et al, 2018). Promoting physical activity and exercise during menopause seems to enhance cardiovascular health, speed metabolism, prevent weight gain, maintain bone density and balance, elevate mood, and lessen depressive symptoms (Hulteen, R. M., et al, 2023). The stress of menopausal symptoms and fluctuating levels of hormones in the body have been suggested as to why so numerous menopause women experience mood disorders (Kothiyal, P., et al, 2013).

A healthy diet is characterized by nutrient dense foods such as fruits, vegetables, seafood and whole grains and limitations in highly processed foods such as bread and sweets, which are generally high in sodium, saturated fats and added sugars. Eating a healthy diet contributes to better health outcomes including obesity prevention (Troy, L. M., 2020). It is crucial to look at nutrition quality because poor diet quality has been identified as a major contributor to obesity, particularly in more susceptible populations like postmenopausal women (Tardivo, A. P., et al, 2009). During menopausal transition, the decline of circulating estrogens influences energy metabolism resulting in the need to emphasize a healthy diet to obtain adequate amounts of nutrients within lower energy requirements (Troy, L. M., 2020). Higher intake of vegetables, whole grains, and unprocessed foods is associated with a decrease in the severity of psychological symptoms, sleep disturbances, and vasomotor, urogenital, and somatic symptoms (Noll, P. R. E. S., et al, 2020). Postmenopausal women often have poor diet quality, with low intake of fruits and vegetables and excessive sodium consumption and are associated with increased cardiometabolic risk factors, including abdominal obesity and dyslipidemia (De Almeida Ventura, D., et al, 2014).

MATERIALS AND METHODOLOGY

A cross-sectional study was conducted among 100 postmenopausal women aged 50–60 years in Mumbai using purposive and snowball sampling. Participants were included if they had experienced complete cessation of menstruation for at least one year. Women who were critically ill, bedridden, or still menstruating were excluded. Ethical approval was obtained from the Inner System Biomedical Ethics Committee (ISBEC), and written informed consent was secured from all participants. Data were collected through face-to-face interviews using a structured questionnaire, covering demographics, medical history, bone health, physical activity, and hormone therapy. Validated tools used included the Menopause Rating Scale (MRS), OSTA, Pittsburgh Sleep Quality Index (PSQI), Kessler Psychological Distress Scale (K10), Diet Quality Questionnaire (DQ-Q), and a 24-hour dietary recall. Blood pressure was measured using a digital monitor. Data analysis was performed using SPSS version 25. Descriptive statistics were computed; chi-square tests were used for categorical variables, and Independent Sample T-tests for continuous variables based on BP and BMI categories. Pearson's correlation assessed associations, with $p < 0.05$ considered statistically significant.

RESULTS

The section presents statistical analysis of the collected data, fulfilling the study's objectives by examining the relationships between dietary quality, lifestyle habits, and the risk of developing obesity and hypertension in the target population.

Table 1 : Socio-demographic characteristics, anthropometric measurements and clinical assessment of study participants

Characteristics	Category	Frequency %	Mean ± Std. deviation
Age	50 - 55 (years)	56	55.0 ± 2.8
	56 - 60 (years)	44	
Education	SSC	15	-
	HSC	35	-
	Graduation	43	-
	Post graduation	7	-
Occupation	Homemaker	69	-
	Self employed	23	-
	Employed	8	-
No. of family members	2-4 members	73	4.1 ± 1.2

	> 4 members	27	
Anthropometric measurements	Height	-	159.8 ± 7.8
	Weight	-	64.6 ± 11.1
	Waist circumference	-	83.7 ± 9.0
	Hip circumference	-	97.4 ± 9.5
Body Mass Index	Normal	30	25.3 ± 4.0
	Grade I	22	
	Grade II	28	
	Grade III	14	
	Grade IV	6	
Waist to Hip Ratio (WHR)	Normal WHR (<0.85)	49	0.84 ± 0.1
	High WHR (≥0.85)	51	
Waist to Height Ratio (WHtR)	Normal WHtR (<0.5)	37	0.525 ± 0.1
	High WHtR (≥0.5)	63	
Systolic Blood Pressure	Optimal BP	64	129.1 ± 9.1
	High normal BP	26	
	Grade I HTN	7	
	Grade II HTN	3	
Diastolic Blood Pressure	Optimal BP	80	77.2 ± 7.4
	High normal BP	19	
	Grade I HTN	1	

Table 1 presents the socio-demographic, anthropometric, and clinical characteristics of the study participants. The mean age was 55 years, with 56 participants aged 50–55 and 44 aged 56–60. Educational levels included SSC (15), HSC (35), graduates (43), and postgraduates (7). Most participants were homemakers (69), followed by self-employed (23) and employed (8). Seventy-three lived in households with 2–4 members, while 27 had >4 members. The mean height was 159.8 cm, weight 64.6 kg, waist circumference 83.7 cm, hip circumference 97.4 cm, and BMI 25.3 kg/m². BMI classification showed 30 normal, 22 Grade I obese, 28 Grade II, 14 Grade III, and 6 Grade IV obese participants. The mean WHR was 0.84 (49 normal, 51 high) and WHtR was 0.525 (37 normal, 63 high). Mean systolic BP was 129.1 mm Hg (64 optimal, 26 high normal, 7 Grade I HTN, 3 Grade II HTN). Mean diastolic BP was 77.2 mm Hg (80 optimal, 19 high normal, 1 Grade I HTN).

Table 2 : Menopausal symptoms, sleep quality and psychological distress levels of study participants when classified according to Blood Pressure (BP) and Body Mass Index (BMI)

Participants when classified according to Blood Pressure (BP)					
Variables	Score	Optimal BP (n=63)	High BP (n=37)	Total (100)	P value
Menopausal symptoms	Total MRS score	14.1 ± 3.3	15.9 ± 3.4	14.8 ± 3.4	**0.009***
Sleep quality	Global PSQI score	5.3 ± 1.6	6.1 ± 1.4	5.6 ± 1.6	**0.016***
Psychological distress levels	K 10 Test	19.2 ± 3	21.8 ± 3.4	20.2 .± 3.4	**0.001***
Participants when classified according to Body Mass Index (BMI)					
Variables	Score	Normal BMI (n=30)	Obese (n=70)	Total (100)	
Menopausal symptoms	Total MRS score	13.5 ± 3.6	15.3 ± 3.2	14.8 ± 3.4	**0.015***
Sleep quality	Global PSQI score	4.4 ± 1.4	6.1 ± 1.4	5.6 ± 1.6	**0.001***
Psychological distress levels	K 10 Test	18.7 ± 3.4	20.8 ± 3.2	20.2 .± 3.4	**0.005***

Note : * P value being less than the typical significance level of 0.05 indicates statistically significant results, (MRS - Menopause Rating Scale, PSQI - Pittsburgh Sleep Quality Index, K10 - Kessler Psychological Distress Scale)

Table 2 presents menopausal symptoms, sleep quality, and psychological distress levels of the study participants classified by Blood Pressure (BP) and Body Mass Index (BMI). Participants with high BP and obesity had higher mean MRS scores, Global PSQI scores, and K10 test scores compared to those with normal BP and BMI, with the differences being statistically significant ($p < 0.05$). This suggests that participants with high BP and obesity have poorer sleep quality, more severe menopausal symptoms, and higher levels of psychological distress.

Table 3 : Diet quality indicators of study participants when classified according to Blood Pressure (BP) and Body Mass Index (BMI)

Participants when classified according to Blood Pressure (BP)				
Indicators	Optimal BP (n=63)	High BP (n=37)	Total (100)	P value
Diet Quality score	5.7 ± 1.4	5.2 ± 1.0	5.5 ± 1.3	0.085
ALL 5 score	4.6 ± 0.5	4.4 ± 0.6	4.6 ± 0.6	0.079
NCD Protect score	4.6 ± 1.3	4.1 ± 1.1	4.4 ± 1.3	**0.044***
NCD Risk score	2.7 ± 1.1	3.3 ± 1.1	2.9 ± 1.1	**0.019***
GDR score	10.9 ± 2.0	9.8 ± 1.6	10.5 ± 1.9	**0.007***
Participants when classified according to Body Mass Index (BMI)				
Diet Quality score	6.2 ± 1.3	5.2 ± 1.1	5.5 ± 1.3	**0.001***
ALL 5 score	4.7 ± 0.5	4.5 ± 0.6	4.6 ± 0.6	**0.041***
NCD Protect score	4.9 ± 1.3	4.2 ± 1.2	4.4 ± 1.3	**0.017***
NCD Risk score	2.6 ± 1.2	3.1 ± 1.0	2.9 ± 1.1	**0.033***
GDR score	11.5 ± 1.9	10.1 ± 1.8	10.5 ± 1.9	**0.001***

Note : * P value being less than the typical significance level of 0.05 indicates statistically significant results, (NCD - Non communicable disease, GDR - Global Dietary Recommendation)

Table 3 presents diet quality indicators based on Blood Pressure (BP) and Body Mass Index (BMI). The mean Diet Quality score was 5.5, with All 5 score at 4.6, NCD Protect score at 4.4, NCD Risk score at 2.9, and GDR score at 10.5. When classified according to BP, participants with normal BP had significantly higher NCD Protect and GDR scores, and lower NCD Risk scores compared to those with high BP. Therefore, there was a significant difference in scores among participants with normal BP compared to those with high BP ($p < 0.05$). When classified according to BMI, Participants with normal BMI had significantly higher Diet Quality, All 5, NCD Protect, and GDR scores, and lower NCD Risk scores compared to obese participants. Therefore, there was a significant difference in all the indicators of quality of diet among participants with normal BMI compared to obese participants ($p < 0.05$).

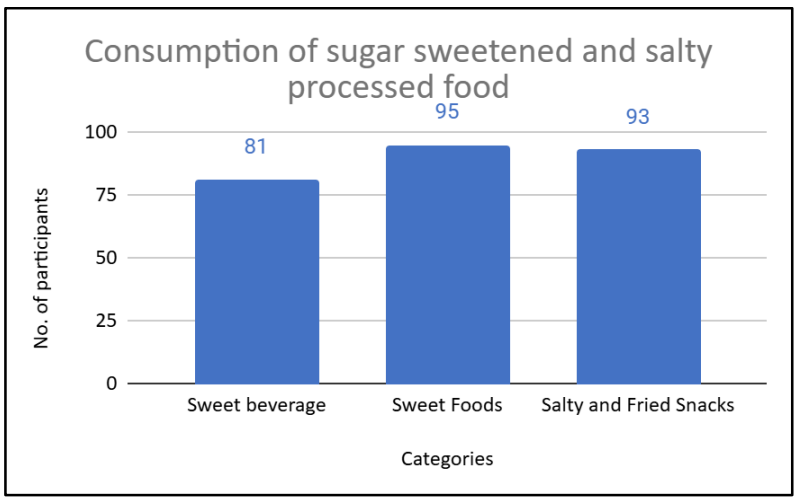

Figure 1 : Consumption of sugar sweetened and salty processed food of study participants

Figure 1 illustrates the consumption of sugar-sweetened and salty processed foods among study participants. A total of 81 participants consumed sweetened beverages, 95 consumed sweet foods, and 93 consumed salty and fried snacks.

Table 4 : Correlation of obesity and blood pressure with anthropometric measurements and lifestyle factors of study participants

Characteristics	Body Mass Index (BMI)		Systolic BP		Diastolic BP	
	R value	P value	R value	P value	R value	P value
Age	0.084	0.406	0.132	0.19	0.163	0.104
Weight	**0.774****	0.001	**0.285****	0.004	**0.320****	0.001
Waist Circumference	**0.751****	0.001	**0.251***	0.012	**0.267****	0.007
Hip Circumference	**0.716****	0.001	**0.267****	0.007	**0.265****	0.008
Waist to Hip Ratio	**0.397****	0.001	0.117	0.247	0.182	0.069
Waist to Height Ratio	**0.796****	0.001	0.126	0.21	0.112	0.265
Psychologic score	0.051	0.611	0.124	0.218	0.185	0.065
Somatic score	0.089	0.379	0.278**	0.005	0.151	0.134
Urogenital score	-0.084	0.408	0.072	0.474	0.073	0.473
Total MRS score	0.018	0.861	**0.204***	0.042	0.169	0.092
Global PSQI Score	**0.414****	0.001	**0.284****	0.004	0.062	0.542
K10 Score	0.08	0.431	0.172	0.087	**0.244***	0.014

* Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed), (MRS - Menopause Rating Scale, PSQI - Pittsburgh Sleep Quality Index, K10 - Kessler Psychological Distress Scale)

Table no 4 shows the correlation of obesity and blood pressure with anthropometric measurements and lifestyle factors of study participants. There was a statistically significant positive correlation of BMI with weight (r = 0.774, p = 0.001), waist circumference (r = 0.751, p = 0.001), hip circumference (r = 0.716, p = 0.001), waist to hip ratio (r = 0.397, p = 0.001), waist to height ratio (r = 0.796, p = 0.001) and Global PSQI Score (r = 0.414, p = 0.001). There was also a statistically significant positive correlation of systolic BP with weight (r = 0.285, p = 0.004), waist circumference (r = 0.251, p = 0.012), hip circumference (r = 0.267, p = 0.007), somatic score (r = 0.278, p = 0.005), total MRS score (r = 204, p = 0.042) and Global PSQI Score (r = 0.284, p = 0.004). There was also a statistically significant positive correlation of diastolic BP with weight (r = 0.320, p = 0.001), waist circumference (r = 0.267, p = 0.007), hip circumference (r = 0.265, p = 0.008) and K10 scores (r = 0.244, p = 0.014).

Table 5 : Correlation of obesity and blood pressure with indicators of diet quality of study participants

Indicators	Body Mass Index (BMI)		Systolic BP		Diastolic BP	
	R value	P value	R value	P value	R value	P value
Diet Quality score	-0.179	0.075	**-0.239***	0.017	-0.116	0.252
ALL 5 scores	-0.076	0.449	**-0.302****	0.002	-0.119	0.238
NCD Protect score	-0.106	0.293	**-0.213***	0.033	-0.156	0.122
NCD Risk score	0.096	0.343	0.117	0.246	0.031	0.762
GDR score	-0.168	0.095	**-0.250***	0.012	-0.12	0.234

* Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed), (NCD - Non communicable disease, GDR - Global Dietary Recommendation)

Table 5 shows the correlation of obesity and blood pressure with indicators of diet quality of study participants. BMI and diastolic blood pressure did not show a statistically significant correlation with any indicators of diet quality. There was a statistically significant negative correlation of systolic BP with diet quality score (r = -0.239, p = 0.017), ALL 5 scores (r = -0.302, p = 0.002), NCD Protect score (r = -0.213, p = 0.033) and GDR score (r = -0.250, p = 0.012).

Table 6 : Correlation of obesity and blood pressure with macro and micronutrient intake of study participants

Macronutrients and micronutrients	Body Mass Index (BMI)		Systolic BP		Diastolic BP	
	R value	P value	R value	P value	R value	P value
Energy	-0.06	0.554	-0.067	0.51	-0.069	0.497
Energy % of EAR	-0.06	0.554	-0.067	0.51	-0.069	0.497
Protein	**-0.215***	0.032	-0.067	0.507	0.029	0.777
Protein % of RDA	**-0.215***	0.032	-0.067	0.507	0.029	0.777
Protein % of EAR	**-0.215***	0.032	-0.067	0.507	0.029	0.777
Carbohydrates	-0.11	-0.276	-0.032	0.755	0.05	0.623
Fats	-0.008	0.938	0.02	0.843	-0.021	0.832
Calcium	**-0.283****	0.004	**-0.207***	0.039	-0.103	0.307
Calcium % of RDA	**-0.283****	0.004	**-0.207***	0.039	-0.103	0.307
Calcium % of EAR	**-0.283****	0.004	**-0.207***	0.039	-0.103	0.307
Iron	**-0.310****	0.002	-0.162	0.107	-0.16	0.112
Iron % of RDA	**-0.310****	0.002	-0.162	0.107	-0.16	0.112
Iron % of EAR	**-0.310****	0.002	-0.162	0.107	-0.16	0.112

* Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed), (RDA - Recommended Dietary Allowance, EAR - Estimated Average Requirement)

Table 6 shows correlation of obesity and blood pressure with macro and micronutrient intake of study participants. There was a statistically significant negative correlation of BMI with protein (r = -0.215, p = 0.032), calcium (r = -0.283, p = 0.004) and iron (r = -0.310, p = 0.002). There was also a statistically significant negative correlation of BMI with protein % of RDA and EAR (r = -0.215, p = 0.032), calcium % of RDA and EAR (r = -0.283, p = 0.004) and iron % of RDA and EAR (r = -0.310, p = 0.002). Also there was a statistically

significant negative correlation of systolic BP with calcium intake (r = -0.207, p = 0.039). Calcium % of RDA and EAR showed significant negative correlation of systolic BP with calcium intake (r = -0.207, p = 0.039). Diastolic blood pressure did not show a statistically significant correlation with any macro or micronutrients.

DISCUSSION

The study explored the link between diet quality, lifestyle factors, and the risk of obesity and hypertension among postmenopausal women aged 50 to 60 years. Hormonal changes during menopause can increase vulnerability to conditions like obesity and hypertension. The following section discusses key findings in relation to existing literature, emphasizing the role of diet, sleep, and psychological health. The results underscore the impact of modifiable lifestyle factors on risk of obesity and hypertension.

In the present study, 30% of participants had a normal BMI, while 70% were classified as obese. The mean BMI was 25.3 kg/m². A statistically significant difference was observed when participants were classified according to blood pressure (p = 0.034) and body mass index (p = 0.001). Similarly, Bhurosy, T., et al, 2013, in his study, reported that the postmenopausal stage is a risk factor for obesity. Although postmenopausal women consumed a better-quality diet, their mean BMI was higher than that of premenopausal women.

Sixty three percent of participants were classified as having optimal BP while 37% had high BP. The mean systolic and diastolic blood pressures were 129.1 mm Hg and 77.2 mm Hg, respectively. Both systolic and diastolic blood pressures showed statistically significant differences (p = 0.001) when participants were classified according to blood pressure status. Similarly, a study conducted by Begum, A., et al, 2019, reported that the mean ± SD of systolic and diastolic blood pressure was higher in postmenopausal women compared to women in the reproductive age group, concluding that both systolic and diastolic blood pressure tend to increase after menopause.

Maximum participants reported poor sleep quality and was statistically significant when participants were classified according to both blood pressure (p = 0.008) and BMI (p = 0.000). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), and the mean PSQI score was 5.6. In a study conducted by Wiranda, T., et al, 2023, among 44 postmenopausal women, 90.91% of participants reported poor sleep quality, while only 9.09% reported good quality sleep.

With respect to psychological distress levels among the study participants, the mean score of the Kessler Psychological Distress Scale (K10) was 20.2. These scores were statistically significant when classified according to blood pressure (p = 0.001) and Body Mass Index (BMI) (p = 0.005). Similarly, a study conducted by Mulhall, S., et al, 2017, indicated that being postmenopausal was associated with an increased risk of experiencing greater symptoms of anxiety. The study also found that both perimenopausal and postmenopausal status were linked to a higher risk of developing symptoms of depression and anxiety in women without a prior history of probable major depressive disorder or generalized anxiety disorder.

Sixty percent of participants with normal BMI and 90% of those classified as obese consumed sweet beverages, a difference that was statistically significant (p = 0.000). Additionally, 80% of participants with normal BMI and 98.6% of obese participants reported consumption of salty and fried foods, which was also statistically significant (p = 0.001). The consumption of salty and fried foods showed a statistically significant association when participants were classified according to blood pressure (p = 0.036). Similarly, research conducted by Samuthpongtorn, C., et al, 2023, indicated that participants with high intake of ultra-processed foods (UPFs) had higher BMI, and a higher prevalence of comorbidities such as diabetes, hypertension, and dyslipidemia. The study further suggested that increased consumption of UPFs, particularly artificial sweeteners and artificially sweetened beverages is associated with a greater risk of developing depression.

CONCLUSION

The study highlights the association between diet quality and lifestyle factors with the risk of obesity and hypertension among postmenopausal women aged 50 to 60 years. Most participants were obese with elevated waist-to-hip and waist-to-height ratios. While many had optimal blood pressure readings, a notable proportion showed borderline or high levels. Obese and hypertensive participants reported more severe menopausal symptoms, poor sleep, and higher psychological distress. Findings from the Diet Quality Questionnaire showed high intake of sweetened beverages, salty snacks, and fried items. Participants with normal BP and BMI had better diet quality scores.

In conclusion, the study provides compelling evidence that lifestyle factors such as sleep, psychological distress levels and quality of diet significantly influence the risk of obesity and hypertension during the postmenopausal phase. These findings underscore improving nutritional intake through a balanced diet, reducing the consumption of processed foods, and promoting healthy lifestyle practices including proper sleep hygiene, and stress management are essential strategies for reducing the risk of non-communicable diseases and enhancing overall well-being in postmenopausal women.

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