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AN OBSERVATIONAL STUDY ON CORRELATION BETWEEN BLOOD PRESSURE AND BODY FAT MEASURES IN COMMON POPULATION

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ABSTRACT **Objective:** This study explores the effect of correlation between blood pressure and body fat measures in common adult population visiting a cardiology clinic. **Design:** A longitudinal observational study in which the patterns of systolic, diastolic blood pressure, body mass index and body fat were analyzed. **Subject & Setting:** The systolic, diastolic and body fat parameters of 56 subjects visiting the cardiology clinic of both the sexes between 21-75 age group were assessed. The subjects with any other associated comorbidities were also included in the study. The subjects were the regular patients who were prescribed the medications as per the condition of their general health and comorbidities. **Results:** Data from 56 clinic patients (21.4% female, 78.5% male) showed that most were overweight or obese (76.8%), with 3.6% underweight and 19.6% of normal weight. Systolic BP distribution included 14.3% healthy, 23.2% elevated, 26.8% stage 1, and 35.7% stage 2 hypertension, while diastolic BP included 23.2% healthy, 14.3% elevated, 30.4% stage 1, and 32.1% stage 2, indicating slightly higher severity in systolic BP. Mean values were: age 48.2 years, systolic BP 131 mmHg, diastolic BP 82.8 mmHg, pulse 81.7 bpm, weight 75.1 kg, BMI 27.9 kg/m², and percent body fat (PBF) 33.1%. No statistically significant association was found between blood pressure (systolic or diastolic) and either BMI or PBF**. Conclusion:** The study did not reveal any close correlation between the blood pressure and body fat parameters among the subjects studied.

KEYWORDS : Hypertension, Body Mass Index (BMI), Percent Body Fat (PBF), Obesity.

INTRODUCTION:

Hypertension, often termed a "silent killer," is a major public health concern in both developing and developed countries.[1] It is a serious condition and a leading risk factor for cardiovascular diseases (CVD). The causes of hypertension are multifactorial and are commonly associated with being overweight, changes in dietary patterns, prolonged stress, reduced physical activity, and other lifestyle factors. Elevated blood pressure contributes significantly to global morbidity and mortality.

According to the World Health Organization (WHO), around 1.28 billion adults aged 30 to 79 years worldwide have elevated blood pressure, and approximately 46% of them are unaware of their condition.[2] Over the past three decades, the global prevalence of obesity has nearly doubled. The mean body mass index (BMI) has increased by 0.4 kg/m² per decade in men and 0.5 kg/m² per decade in women. Although obesity is only one among several CVD risk factors, it has gained increasing attention due to its rising global prevalence.[3]

This increase is largely driven by the greater consumption of energy-dense, highly processed foods that are rich in sugar, salt, and saturated fats, combined with a reduction in physical activity.[4] In the United States, more than 40% of obese individuals and 25% of those who are overweight also have hypertension, compared to only 15% among normal-weight individuals. This reflects a clear, stepwise increase in hypertension risk as body mass increases.[3]

The link between obesity and hypertension is complex and bidirectional, often referred to as “vicious twins,” highlighting their interdependent contribution to CVD risk.[3] Excess adiposity influences blood pressure regulation through several mechanisms, including increased sympathetic nervous system activity, activation of the renin–angiotensin–aldosterone system, endothelial dysfunction, and impaired renal sodium handling.[5]

While BMI is commonly used to estimate body adiposity, it does not capture variations in body composition. The percentage of body fat (BF%) offers additional insight into obesity-related cardiovascular risk.[6] Several studies have shown significant positive associations between BMI, BF%, and blood pressure.[7] For instance, a cross-sectional study conducted among medical students in Nepal found that both systolic (SBP) and diastolic blood pressure (DBP) were significantly correlated with BMI and body fat composition, indicating the early risk of hypertension associated with adiposity.[4]

Some studies have also assessed the relationship between blood pressure and indirect adiposity indicators.[8] Higher BMI and BF% are consistently linked to increased blood pressure.[7] In Western populations, every 1 kg/m² increase in BMI has been associated with a 1 mm Hg rise in blood pressure.[9]

A large-scale study using dual-energy X-ray absorptiometry (DXA) further supported these findings. It showed that systolic BP was positively associated with visceral (android) fat in both men (3.16 mmHg per SD) and women (2.81 mmHg per SD). However, the study did not find significant effects of subcutaneous android or gynoid fat on systolic BP.[8]

The aim of this study is to explore the potential relationship between systolic and diastolic blood pressure with anthropometric measures of body adiposity, particularly BMI and body fat percentage.

Methods:

This is an observational study evaluating the possible correlation between the systolic, diastolic blood pressures and the body fat parameters like body mass index (BMI) and percentage of body fat (PBF). The reading of 56 randomly selected subjects visiting a cardiology clinic were considered. The readings were recorded as a part of routine and follow up assessments. The assessment parameters that were recorded includes blood pressure, pulse, weight, total body composition analysis, Muscle fat analysis that includes body weight, skeletal muscle mass and body fat mass; Obesity analysis that includes body mass index and percent of body fat. In the present study, the correlation between blood pressure and percentage of body fat were considered.

RESULTS:

The data from 56 subjects regularly visiting the clinic were analyzed and discussed. Out of 56, 12 (21.4%) were female and 44 (78.5%) were male.

According to the BMI classification data, 3.6% of the patients (2 individuals) are underweight, while 19.6% (11 individuals) have a normal weight. A significant portion of the patients falls into higher BMI categories, with 39.3% (22 individuals) classified as overweight and 37.5% (21 individuals) classified as obese. This shows that the majority of the patients, totaling 76.8%, are either overweight or obese. (see Figure 1)

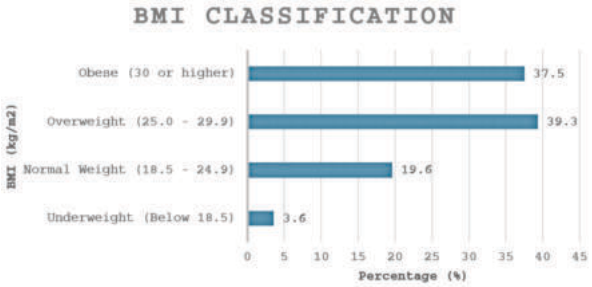

Figure 1: Distribution Of Patients By BMI Classification

The analysis of systolic and diastolic blood pressure (BP) among the patients reveals that for systolic BP, 14.3% (8 patients) were in the healthy range (<120 mmHg), 23.2% (13 patients) had elevated BP (120–129 mmHg), 26.8% (15 patients) were in stage 1 hypertension (130–139 mmHg), and 35.7% (20 patients) were in stage 2 hypertension (≥140 mmHg) (see Table 1). For diastolic BP, 23.2% (13 patients) were healthy (<80 mmHg), 14.3% (8 patients) had elevated BP (<80 mmHg), 30.4% (17 patients) were in stage 1 hypertension (80–89 mmHg), and 32.1% (18 patients) were in stage 2 hypertension (≥90 mmHg) (see Table 2). This indicates a higher prevalence of stage 2 hypertension in both systolic and diastolic measurements, with systolic BP showing slightly higher severity compared to diastolic BP. (see Figure 2)

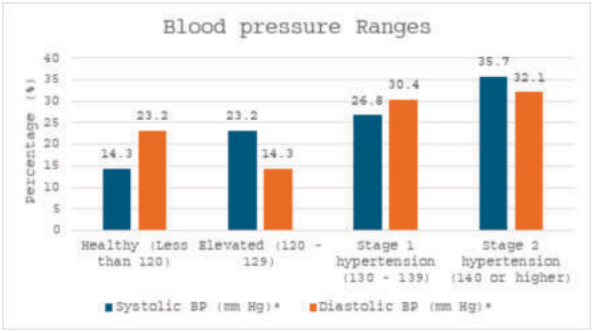

Figure 2: Distribution of Patients Across Hypertension Stages Based on Systolic and Diastolic Blood Pressure

Table 1: Association Of Body Mass Index With Systolic Blood Pressure Categories

BMI Classification (kg/m^2)	Healthy (Less than 120)	Elevated (and Less than 80)	Stage 1 hypertension (or 80 - 89)	Stage 2 hypertension (or 90 or higher)	Total
Underweight (Below 18.5)	1	0	0	1	2
Normal Weight (18.5 - 24.9)	4	2	3	2	11
Overweight (25.0 - 29.9)	6	5	4	7	22
Obese (30 or higher)	2	1	10	8	21
Total	13	8	17	18	56

Table 2: Association Of Body Mass Index With Diastolic Blood Pressure Categories

BMI Classification (kg/m^2)	Healthy (Less than 120)	Elevated (and Less than 80)	Stage 1 hypertension (or 80 - 89)	Stage 2 hypertension (or 90 or higher)	Total
Underweight (Below 18.5)	0	1	0	1	2
Normal Weight (18.5 - 24.9)	4	4	2	1	11
Overweight (25.0 - 29.9)	3	4	7	8	22
Obese (30 or higher)	1	4	6	10	21
Total	8	13	15	20	56

The mean, standard deviation, minimum and maximum measures of age, systolic BP, diastolic BP, pulse, weight, BMI and PBF are tabulated in table 3.

Table 3: Descriptive Statistics

Parameters	Mean	Standard Division	Minimum	Maximum
Age	48.2	12.47	21	76
Systolic BP	131	27.7	13	174
Diastolic	82.8	12.7	56	116
Pulse	81.7	12.7	58	114
Weight	75.1	15.4	44.4	119
BMI	27.9	5.23	16.9	44.8
PBF	33.1	10.2	5.9	50.8

There was no statistically significant association between systolic and diastolic blood pressure with percent body fat and BMI.

DISCUSSION:

This study assessed the relationship between blood pressure and adiposity measures (BMI and PBF) in 56 cardiology clinic patients. Most participants were male (78.5%), and the majority were overweight (39.3%) or obese (37.5%). A high prevalence of hypertension was noted, with 35.7% in stage 2 systolic and 32.1% in stage 2 diastolic categories. Despite this overlap, no significant correlation between BMI, PBF, and blood pressure was observed.

These results contrast with several studies reporting strong associations between obesity and hypertension. Das et al[1] found a clear link between overweight/obesity and hypertension in Bangladeshi adults, while Saha et al[2] and Tiwari et al[4] demonstrated significant correlations between BMI, PBF, and blood pressure in young populations. Large-scale studies also support this relationship: Malden et al[7] showed visceral fat, but not subcutaneous fat, significantly raised systolic BP, and Whitlock et al[9] linked higher BMI to cardiovascular mortality via elevated blood pressure.

The lack of association in our study may be due to the small sample size, uncontrolled confounders, and limitations of BMI and PBF in reflecting fat distribution. Mechanistically, obesity contributes to hypertension through sympathetic activation, renin-angiotensin-aldosterone system stimulation, endothelial dysfunction, and impaired sodium handling.[3,5] Thus, our null findings likely reflect methodological constraints rather than absence of a biological link.

Nevertheless, the coexistence of high obesity (76.8%) and hypertension (>60% in stage 1–2) in this study highlights a clinically significant overlap consistent with global evidence. Future larger, prospective studies in Indian populations, using refined adiposity measures, are warranted to clarify these associations.

CONCLUSION:

The correlation between blood pressure and the body fat in the diverse group of subjects needs robust research with larger sample sizes. The confounding factors like lifestyle, exercises, different medications need to be considered to further narrow down the inclusion criteria, to obtain a significant correlation, if any.

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