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A study of blood pressure and pulse rate between obese and non-obese adults in Bangladesh

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Abstract

According to reports, obesity is linked to a range of cardiovascular ailments. According to some researchers, obesity may increase the prevalence of high blood pressure in young adults. This cross-sectional analytical study was conducted in the Filaria and General Hospital, Savar Bangladesh from May to July 2023 to compare the pulse rate and blood pressure between young obese and non-obesity people. Participants who were obese were aged (mean±SD) 41.76±4.35 (range, 32-54) and those who were not obese were aged 36.43±3.12 (range, 31-52) years. In the obese group, there were 26 (65%) males and 14 (35% females), compared to 24 (60%) males and 16 (40%) females in the non-obese group. The BMI (mean±SD) of the participants who were obese was 27.8±1.56 (range 18-31.3) Kg/m2, while the BMI of the participants who were not obese was 19.9±1.03 (range 16.7-28.0) Kg/m2. The resting pulse rate was higher significantly in obese compared to non-obese participants. The SBP was higher significantly in obese compared to non-obese participants along with same trend in result during DBP measurement. The obese subjects' resting pulse rates were higher than those of the non-obese ones.

Keywords: Blood pressure; Obesity; Hypertension; BMI; Pulse rate; WHO

1. Introduction

Obesity is characterized as an excessive buildup of body fat brought on by an optimal energy balance. It is now a significant public health issue on a global scale. The World Health Organization coined the term "globesity" to describe the global issue because obesity has nearly doubled in the last ten years and is still on the rise in many nations[1,2]. Between 1975 and 2016, there was an approximately threefold increase in the global prevalence of obesity. More than 1.9 billion adult persons worldwide were overweight in 2016, according to data from the World Health Organization (WHO), and more than 650 million were obese. In 2016, there were roughly 13% of adults worldwide who were obese (11% and 15% of men and women, respectively) [3]. Obesity is physiologically defined as having too much body fat, which results in weight gain [4]. Body Mass Index (BMI), which is the same for both sexes and individuals of all ages, provides the most accurate indicator of obesity at the population level. Weight (kg) divided by height (m) squared yields BMI (BMI=kg/m^2 - Quetelet's Equation) [5]. According to WHO, the following BMI ranges represent normal weight, overweight, and obesity: 18.5-24.9, 25-29.9, and 30 kg/m2, respectively. However, the BMI cutoff points for Asian populations for normal weight, overweight, and obesity are lower than the WHO guidelines, which are, respectively, (BMI 18.5-22.9), (BMI 23-27.5), and 26 kg/m^2[6].

Numerous cardiovascular (CV) illnesses, a pro-inflammatory state, irregularities in clotting, and metabolic disturbances such lipid abnormalities, altered glucose metabolism, insulin resistance, and the onset of type 2 diabetes mellitus are all associated with obesity [7]. On the other hand, hypertension is a significant contributor to morbidity and mortality. A large-scale study that examined data on individuals aged 30-79 from 1990 to 2019 found that 34% of men and 32% of

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women worldwide had hypertension [8]. More than 1 billion individuals around the world suffer from hypertension, which accounts for 9.4 million annual fatalities and a significant risk factor for disability [9,10].

Contrary to wealthy countries, developing nations are also experiencing an increase in the prevalence of hypertension without any improvement in awareness or preventative measures [11]. The burden of hypertension and related disorders is greatest in Asia's South Asian nations [12,13]. According to reports, both demographic and socioeconomic shifts have impacted the prevalence of obesity and hypertension in developing nations [14,15] as well as the epidemiologic shift from infectious to non-infectious diseases[16,17]. Bangladesh is a developing nation in South Asia, and as a result of its recent rapid industrialization and urbanization, the frequency of obesity and high blood pressure has significantly increased there. Early studies [18-23] described the incidence of obesity and hypertension among Bangladeshi people. Furthermore, it is still unclear what factors are linked to the development of obesity and hypertension in adult Bangladeshi populations. Therefore, the purpose of this study was to assess the prevalence of hypertension, blood pressure, general and abdominal obesity, and its related risk factors in Bangladesh measured by BMI.

2. Material and methods

This cross-sectional analytical study was conducted in the Filaria and General Hospital Savar Bangladesh from May to July 2023 to compare the pulse rate and blood pressure between adult obese and non-obesity people. From among the employees, attendants of inpatient and outpatient patients in Filaria and General Hospital Savar, 40 obese (BMI ≥26 kg/m^2) and 40 non-obese (BMI 18–22.5 kg/m^2) people between the ages of 20 and 55 were chosen. Excluded from the study were people with hypertension, thyroid problems, chronic kidney disease, diabetes mellitus, evident cardiovascular diseases, chronic obstructive pulmonary diseases, stroke, and other neurological disorders. Sampling was done using non-probability convenient sampling. We used here slightly modified BMI scale to measure and conduct the study. A history and physical examination were used to evaluate each individual. People who met the inclusion criteria were enrolled in the study, whereas those who met the exclusion criteria were not.

2.1. Calculating Body Mass Index

The formula for calculating body mass index (BMI) is weight in kilograms divided by height in metre^2.

2.2. Evaluation of Height and Weight

The individual stood on the weighing balance without shoes or much clothing, and weight was recorded in kilograms. The same weighing scale was used to record the weight of both the patients and the controls. The subject's height was measured in meters while standing with their feet together, backs against the height scale's upright bar, and heads straight ahead in the Frankfort horizontal plane while wearing no shoes. The participants' heads were placed comfortably on the horizontal and vertical wood bars that make up the height measurement scale.

2.3. Measurement of heart rate and blood pressure

Using a standardized clinical sphygmomanometer and the auscultation method on the right arm, blood pressure was measured. A stethoscope was placed over the brachial artery pulse just below the cuff's underside fringe, proximal and medial to the cubital fossa. With the participant seated, blood pressure readings were recorded five minutes after resting. The pressure in the cuff was quickly increased to a level above which the radial pulse could no longer be felt. According to Korotkoff's appearance, the sound was first documented as systolic BP, and then the mercury was permitted to drop further until the sound lost its tapping nature, turned quiet, and eventually vanished. This was then registered as diastolic BP. Two recordings that were separated by one minute each were averaged. After palpating the radial pulse for a minute, the pulse rate was determined.

2.4. Statistical Analysis

The Statistical Package for Social Science (SPSS) Version 22.0 was used to process and analyze the collected data. The Chi-square (X^2) test was used to compare the mean and standard deviation of the quantitative data. Frequency and percentages were used to express qualitative data, and an unpaired t test was used to compare them. P values under 0.05 were considered significant.

2.5. Ethics

Each individual gave informed written consent after being told of the study's purpose. The respondents' right to participate willingly and withdraw from the study at any time was communicated to them in the consent form, along

with the study's aims, methods, risks, and methods of confidentiality for the interview. Before the study began, the research protocol was submitted to the Filaria and General Hospital's ethical review committee, and it was approved.

3. Results

Table 1 Demographic characteristics of study population

Demographic characteristics		Study group	
		Group A (n=40)	Group B (n=40)
Age (mean ± SD) years		41.76±4.35	36.43±3.12
Sex	Male	26	24
	Female	14	16

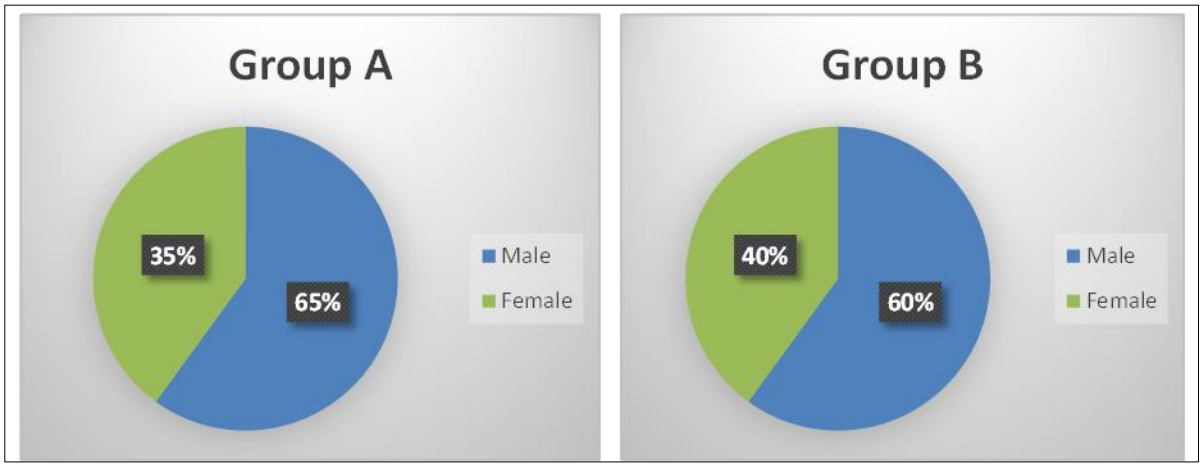

Figure 1 Demographic characteristics

Table 2 Comparison of participants by anthropometric parameters

Anthropometric parameters	Study subjects		P value
	Group A (n=40)	Group B (n=40)	
Weight (Kg)	75.34±5.74	53±2.98	*P<0.0023
Height (m)	1.64±1.21	1.63±0.09	P=0.376
BMI Kg/m^2	27.8±1.56	19.9±1.03	*P<0.0023

Table 3 Participant's resting blood pressure and pulse rate are compared

Parameters	Study subjects		P value
	Group A (n=40)	Group B (n=40)	
Pulse (beats/min)	83.98±3.31	74.11±3.52	*P<0.001
SBP mm Hg	130±12.00	110±12.50	*P<0.001
DBP mm Hg	85±6.44	70±6.00	*P<0.001

Key: n=individual numbers; SD= standard deviation; Group A=obese people; Group B=non obese people; SBP=systolic blood pressure; DBP=diastolic blood pressure; t test was employed to analyze the data.

According to Table 1, participants who were obese were aged (mean±SD) 41.76±4.35 (range, 32-54) and those who were not obese were aged 36.43±3.12 (range, 31-52) years. In the obese group, there were 26 (65%) males and 14 (35% females), compared to 24 (60%) males and 16 (40%) females in the non-obese group. The participants in the obese and non-obesity groups did not exhibit any statistically significant differences in terms of gender (X^2=1.03; p<0.313).

According to Table 2, the average height (mean±SD) of the obese participants was 1.64±1.21 (range: 1.46–1.78) metres, compared to 1.63±0.09 (range: 1.40–1.75) meters for the non-obese participants. Participants who were obese and those who were not did not have substantially different heights (t=-1.39; p=0.376).

The average weight (mean standard deviation) of the obese participants was 75.34±5.74 (range 51-96) kg, compared to 53±2.98 (range 35-69) kg for the non-obese people. In comparison to people who were not obese(t=19.16; p<0.0023) the weight of the obese participants was higher. The BMI (mean±SD) of the participants who were obese was 27.8±1.56 (range 18-31.3) Kg/m^2, while the BMI of the participants who were not obese was 19.9±1.03 (range 16.7-28.0) Kg/m^2. In comparison to people who weren't fat, obese participant's BMIs were considerably higher (t=21.08; p<0.0023).

Table 4 General overview of findings

Group	BMI	Blood pressure	Pulse rate
Obese	>26	>120	>80
Non-obese	<21	<122	<78

Table 3 shows the resting pulse rate (mean ± SD) was 83.98±3.31 (range 76-91) beats /minute in obese participants and 74.11±3.52 (range 69-82) beats/minute in non-obese participants; the resting pulse rate was higher significantly in obese compared to non-obese participants (p<0.0016). The resting systolic blood pressure (mean ± SD) was 130.20 ± 12.00 (range 110-145) mm Hg in obese participants and was 110±12.50 (range 90-140) mm Hg in non-obese participants; the SBP was higher significantly in obese compared to non-obese participants (p<0.001). Resting diastolic blood pressure (mean±SD) was 70±6.00 mm Hg in non-obesity participants and 85±6.44 mm Hg in obese participants, indicating a substantially higher DBP in the obese group as compared to the non-obese group (p<0.001).

4. Discussion

In this study, participants who were obese were aged (mean±SD) 41.76±4.35 (range, 32-54) and those who were not obese were aged 36.43±3.12 (range, 31-52) years. In the obese group, there were 26 (65%) males and 14 (35% females), compared to 24 (60%) males and 16 (40%) females in the non-obese group. The BMI (mean±SD) of the participants who were obese was 27.8±1.56 (range 18-31.3) Kg/m^2, while the BMI of the participants who were not obese was 19.9±1.03 (range 16.7-28.0) Kg/m^2. The resting pulse rate was higher significantly in obese compared to non-obese participants. The SBP was higher significantly in obese compared to non-obese participants along with same trend in result during DBP measurement.

The obese subjects' resting pulse rates were higher than those of the non-obese ones (p<0.001). This conclusion was consistent with the finding of Chaudhuri et al's study[24], which showed that the obese participants' resting pulse rates were higher than those of the non-obese participants.

According to reports, Age, high body mass index (BMI), location of residence, and insufficient physical activity were all identified to be independent risk factors for hypertension in early studies conducted in Bangladesh and other developing nations[25-27]. Many of the participants in our study had little to no awareness about hypertension. As a result, raising awareness of hypertension and its repercussions on health will also be useful in lowering the prevalence of hypertension in Bangladeshi society. In addition to health professionals, electronic and social media can play a significant role in raising awareness of hypertension by broadcasting and disseminating videos with straightforward messages about what causes hypertension, its effects on health, and ways to prevent it, including eating a healthy diet, exercising regularly, abstaining from alcohol and tobacco use, managing stress, and getting regular blood pressure checks. The prevalence and risk factors for obesity and hypertension in various research may vary depending on the sample period, dietary practices, the region chosen, and the overall socioeconomic and demographic changes in recent decades[28,29]. To break out the underlying causes of the risk of obesity and hypertension throughout the areas of

Bangladesh, area-specific longitudinal studies are required. Therefore, a balanced diet, daily exercise, and frequent body weight and blood pressure checks can lessen the future burden of obesity and hypertension among them.

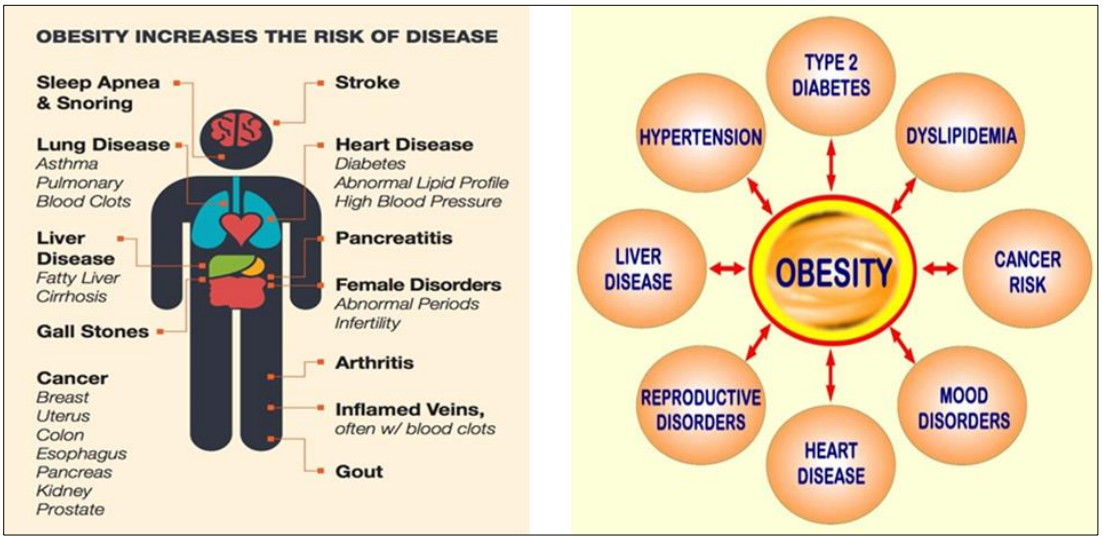

Figure 2 Risk & complication of obesity (source: NCBI)

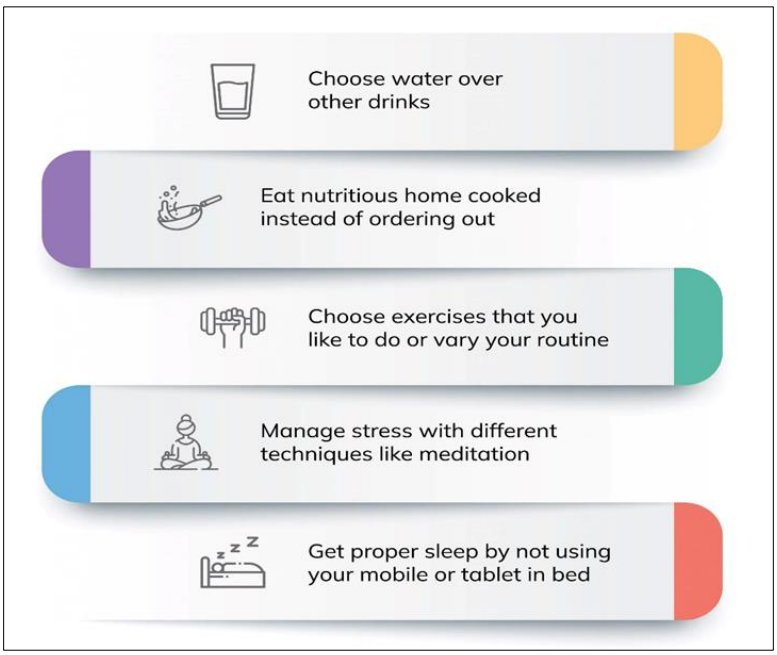

Figure 3 Prevention of obesity, (source: Bajaj finserv health)

Limitations of study

This study was conducted at a single tertiary care institution, with non-random sampling and a small sample size due to time constraints.

5. Conclusion

In adult obese people, obesity is associated with elevated pulse rate and blood pressure. Young obese individuals therefore have a higher risk of developing hypertension or other cardiovascular problems later in life. Our findings highlight the need for comprehensive and integrated intervention programs to raise patient and healthcare professional

awareness of obesity and hypertension. These treatments would involve alterations to communal eating and daily routines to lessen the prevalence of obesity and hypertension. That is why additional research involving multiple centers and a substantial sample size is absolutely necessary to get a reliable result.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest regarding this paper.

Availability of data and materials

The data and materials used to support the findings of this study are publicly available.

Author contribution

All author contributed significantly to design and development of this work.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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