**Original Research Article**

# Essential hypertension in young-association with waist and hip circumferences and BMI

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## Abstract

**Background:** Obesity is one of the most important risk factors for cardiovascular diseases (CVDs) including hypertension (HT) which is itself a risk factor for CVDs. There are very few studies on this subject worldwide. Present study was in young adults with hypertension associated with various risk factors.

**Materials and methods:** It was an observational study in patients coming to tertiary care center either getting admitted or coming to outpatient department for high blood pressure or for different reason and incidentally found to have high blood pressure were assessed according to inclusion and exclusion criteria.

**Results:** Most of the patients in study were obese 52% and 30% over weight. There was no significant association of hypertension in between genders. Waist circumference was significant when compared with normal and increased in hypertensive patients. Waist to hip ratio was significant when compared with normal and increased in hypertensive patients. It was insignificant when compared between genders.

**Conclusions:** Higher waist circumferences and waist to hip ratio were modestly associated with the presence of Hypertension.

## Key words

Waist circumferences, Waist to hip ratio, Obesity.

## Introduction

Obesity has become a growing health concern, an epidemic that affects both developing and developed countries. The prevalence has reached to the level that warrant an immediate attention on the primary and secondary prevention of overweight and obesity in young adults. It is

during the childhood and adolescents period where they develop their eating and activity pattern that can affect their lifestyle in young adults.

Transition that involved availability of fast foods, soft drinks, sedentary lifestyle, physical inactivity, and increase use of technology related gadgets, youngsters were found to be less active and eat more, resulting with increase of body mass index (BMI) and fat [1]. Such unhealthy trends contributed to the increase of comorbidities such as elevated blood cholesterol, type 2 diabetes mellitus, and hypertension.

There were many studies that linked hypertension with overweight and obese among the adolescents. Although the evidences gathered have a mixed conclusion on the relationship between hypertension and body fat, measurement of body fat using anthropometric indicators had proven to be an effective approach in predicting hypertension, particularly in a large population and community-based studies [2]. Beside the use of BMI in assessing nutritional status, other indicators such as waist circumference (WC), waist-height ratio (WHtR), and conicity index (C index) were other common assessment tools where WC measures the overall body fat, WHtR assess the proportion of central fat by height, and C index measures the abdominal fat [3].

Thus, the aim of this study was to determine the prevalence of hypertension and predictive power of anthropometric indicators and recommend cutoff points to discriminate high blood pressure among youngsters.

## Materials and methods

It was an observational study in patients coming to tertiary care center either getting admitted or coming to outpatient department for high blood pressure or for different reason and incidentally found to have high blood pressure were assessed according to inclusion and exclusion criteria.

**Inclusion criteria:** Patient's age group >12 years and <40 years, Patients with diagnosis of hypertension but not having obvious diagnosed or suspected secondary form of hypertension.

**Exclusion criteria:** Patient's age group <12 years and >40 years, Pregnant females, Patients diagnosed or suspected as secondary hypertension.

Data collection was carried out by a team of trained field personnel. Anthropometric measurement was done using SECA body meter and portable weighing scale. Respondents were weighed with light clothing without footwear. When measuring height, the respondents were to stand upright barefooted on a flat surface with their back of the heels and occiput against the equipment. The weight was recorded to the nearest 0.1 kg. Body mass index was calculated as per formula.

Blood pressure was taken using a digital blood pressure monitor, calibrated with auscultation (a mercury sphygmomanometer) with the correct cuff size for arm circumference. Respondents were asked to rest for 5 minutes and check for no intake of caffeine or medication or no exercise before measurement. Two measurements with an interval of one minute were taken. In the case when the differences of the two readings were above 5 mm Hg or the respondent was found to be in the prehypertension or hypertension level, a third reading was taken. The final reading would be based on the average of all readings taken.

The Statistical software namely Open Graphpad was used for the analysis of the data and Microsoft word and Excel had been. Descriptive statistical analysis had been carried out in the present study. Results on continuous measurements were presented on Mean ± SD and results on categorical measurements were presented in Number (%). Significance was assessed at 5% level of significance.

## Results

Most of the patients in study were obese 52 % and 30% over weight (**Table – 1**). There was no significant association of hypertension in between genders (**Table – 2**).

**Table - 1:** Association of BMI and HTN.

| BMI | No. of patients with Essential HTN | % of patients with Essential HTN |
|---|---|---|
| Underweight | 2 | 4 |
| Normal weight | 7 | 14 |
| Overweight | 15 | 30 |
| Obese | 26 | 52 |
| **Total** | **50** | **100** |

Waist circumference was significant when compared with normal and increased in hypertensive patients. It was insignificant when compared between genders (**Table – 3**).

Waist to hip ratio was significant when compared with normal and increased in hypertensive patients. It was insignificant when compared between genders (**Table – 4**).

## Discussion

High blood pressure is an established risk factor for cardiovascular disease. Furthermore, high blood pressure contributes substantially to cardiovascular disease incidence and premature mortality. Cardiovascular disease events occur most frequently during or after the fifth decade of life but pathophysiological and epidemiological evidence suggests that essential hypertension and the precursors of cardiovascular disease originate in childhood. Hypertension is a growing health problem in Asia. There is a paucity of data on hypertension in teenagers and young adults, as they are deemed to be at lower risk of developing the disease. With a growing problem of hypertension worldwide, there is a concern that hypertension in young adults may also be on the rise and that cases are not detected because of inadequate screening at this age group. While the prevalence of hypertension is relatively low in young adults, it nevertheless constitutes an important problem, as target organ damage is correlated with duration of disease and early detection and management of hypertension may confer reduction in long-term risks of cardiovascular disease [4]. Most of the studies in western world clearly correlates with BMI with CVD risk. Increasing BMI directly correlates with increasing risk of CVD irrespective of other risk factors.

**Table - 2:** Frequency essential hypertension in association with gender.

| BMI | Frequency of HTN in males | Frequency of HTN in Females | P-Value |
|---|---|---|---|
| Underweight | 1 | 1 | >0.05 |
| Normal weight | 3 | 4 | >0.05 |
| Overweight | 7 | 8 | >0.05 |
| Obese | 13 | 13 | >0.05 |
| **Total** | **24** | **26** | **50** |

**Table - 3:** Waist circumference and Essential HTN in genders.

| W. C. | Frequency of HTN in male | Frequency of HTN in Female | Total | % |
|---|---|---|---|---|
| Normal | 8 | 10 | 18 | 36 |
| Increased | 16 | 16 | 32 | 64 |
| **Total** | **24** | **26** | **50** | **100** |

It is important to determine valid anthropometric measurements which may be useful for predicting obesity-related cardiovascular disease risk in young adults. In this study we demonstrated that five anthropometric measurements (BMI, WC, H/P) were more

consistent in predicting CVD risk as determined by presence of HT/pre-HT.

In our study most of the patients in study are obese 52% and 30% over weight. There is no significant association of hypertension in between genders. Waist circumference is significant when compared with normal and increased in hypertensive patients. Després notified that because there is a wide range of WC for every BMI value, it will be simplistic to think that WC is a better measure of CVD risk over BMI especially given that WC may be influenced by subcutaneous or VF [4]. On the other hand, WC and HC correlated moderately with HT/pre-HT in both males and females while VF showed a moderate relationship only in females.

**Table - 4:** Waist to hip ratio and Essential HTN in genders.

| Waist to hip ratio | Frequency of HTN in male | Frequency of HTN in Female | Total | % |
|---|---|---|---|---|
| Normal | 7 | 9 | 16 | 32 |
| Increased | 17 | 17 | 34 | 68 |
| **Total** | **24** | **26** | **50** | **100** |

Choy et al. [5] showed an association between increased WC and raised blood pressure. Although several studies have shown that a larger HC is protective against HT and metabolic diseases [1, 6]. Some of these studies which showed that a large HC confers protection against CVDs also demonstrated that without controlling for BMI or WC, HC was associated with higher blood pressure in females [7, 8]. Indeed, an Australian study showed that HC was independently associated with increased risk for CVD in Aboriginal Australians, this relationship was however lost when BMI and WC were accounted for in their study population [9].

Waist circumference correlated well with higher blood pressure in both males and females. Waist circumference is a measure of abdominal obesity and is related to percentage abdominal fat mass. These results corroborate the findings of Liu, et al. [10], who showed a strong association between WC and cardiometabolic risk in African Americans irrespective of BMI. Indeed several studies have shown that WC may be a more sensitive predictor of CVD risk than the other measures of obesity [11, 12]. However, VF was also associated with higher blood pressures only in females and not males.

Authors also demonstrated the fact that there was a weak relationship between WHR and blood pressure in females. This observation could be explained by the fact that in the effect of WHR the effect of WC is often masked by the increase in HC which generally accompanies a big WC.

## Conclusion

We found that higher waist circumferences and waist to hip ratio were modestly associated with the presence of HT/pre-HT, thus highlighting the importance of weight management in the prevention of cardiovascular diseases in this population.

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