

**CENTRAL OBESITY: A RISK FACTOR FOR METABOLIC SYNDROME IN SOUTH INDIAN POPULATION?**

M. Sudheer Kumar, A.Palanisamy*, M.P. Narmadha M. Anuradha, N. Nagajyothi, N. Haribabu

Department of Pharmacy Practice, Swamy Vivekanandha College of Pharmacy, Tiruchengode-637205, TamilNadu, India

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*E-mail: amirpalanisamy@yahoo.co.in

ABSTRACT

Over weight and obesity are considered as risk factors for diabetes, hypertension and it may lead to atherosclerosis, cardiovascular disease and stroke. Body mass index (BMI) is a diagnosing tool available currently and used widely throughout the world by the health care professionals. Recent studies reported that central obesity is an important risk factor of diabetes, hypertension, cardiovascular disease and the awareness about the central obesity is very poor among the public and health care practitioners. Based on this hypothesis, the present study was designed to investigate the comparison of overweight, obesity and central obesity risk in hypertension. A community pharmacy awareness camp was held as part of the 49th national pharmacy week celebration in which 635 responders were examined after their consent. The patients were investigated with the help of various parameters like height, weight, BMI, waist to hip ratio (WHR), and blood pressure. With the help of BMI and Waist to hip ratio the responders were divided in to normal, overweight + obese, centrally obese groups. Comparison of mean systolic and diastolic blood pressures of normal BMI with normal WHR showed significant increase in normal WHR respondents. (116.39±4.287, 72.16±5.119, 131.59±16.62, 84.07±11.2815, $P<0.05$). The mean systolic and diastolic blood pressures of centrally obese respondents were significantly greater than overweight+obese respondents. (131.59±16.162, 81.20±7.991, 116.85±6.346, 75.52±5.819, $P<0.05$). However there is no difference in random blood sugar levels between the groups.

Keywords: Central obesity, Respondents, BMI, Waist to hip ratio.

INTRODUCTION

Obesity is one of the leading preventable causes of death worldwide^{1,2,3}. Obesity increases the risk of many conditions like diabetes mellitus-2, high blood pressure, high blood cholesterol and high triglyceride levels. Over the last decade, prevalence of obesity among individuals in developed countries has increased to 37%. Approximately 250,000,000 individuals that are 7% of adult population are considered to be obese, while the phenomenon is extending even in young adults. It is estimated that in U.S.A more than 50% men and women are overweight, while 25% of them are clinically obese^{4,5}. In India, urbanization and modernization has been associated with obesity. In northern India obesity is prevalent in urban populations (male=5.5%, female=12.6%), followed by the urban slums (male=1.9%, female=7.2%), obesity rates were lowest in rural population (male=1.6%, female=3.8%).⁶ Central obesity, the “apple shaped” obesity commonly referred to as belly fat, is the accumulation of visceral fat (fat deposited between the internal organs torso) resulting in an increase in waist size. Central obesity is an excess accumulation of fat in the abdominal area and this is an especially dangerous place for fat to build up because it is closely located to the vital organs and their blood supply. It has been rightly pointed out that Indians have higher abdominal adiposity measured as waist-to-hip circumference despite their lean body mass. Clinical evidence suggests that association of diabetes with central obesity is stronger than the association with general fat. Waist-to-hip ratios are measures of obesity and are believed to be better predictors of coronary heart disease. Although, body mass index (BMI) as a recommended index of obesity by world health organization⁷ is related to disease risk¹, some studies suggests that the pattern of body fat distribution is a more important determinant of disease risk^{2,3,8} and in individuals with a high proportion of abdominal fat have higher risks for developing diabetes,⁹ hypertension¹⁰ and CVD¹¹. Unfortunately there is no standard measure of abdominal obesity that is widely accepted. Although, majority of studies recommended waist circumference (WC) as a better indicator of abdominal obesity and a better predictor for CVD than either BMI or

waist-to-hip ratio [WHPR],¹²⁻¹⁵ such findings have not been confirmed in Asian³ and ocean countries and the best index of obesity that is predictive for CVD risk still remains as a controversial subject⁸. Currently BMI is considered as a common diagnostic test for obesity than the WHR in Tiruchengode, Namakkal (DT). There is no much practice on monitoring central obesity by using WHR. So this study was planned to monitor the obesity and its risk through both the BMI and WHR in the population. The comparison will provide the clear picture about the sensitivity of BMI and WHR and as well as the risk assessment among the overweight, obese and centrally obese respondents.

METHODOLOGY**Study Site:**

The respondents were identified during the Community Pharmacy Program held at tiruchengode, Namakkal, District, Tamilnadu, India, during the Pharmacy week celebration 2010. All the respondents above 18 years of age were included in the study.

Study Duration:

As a Part of the 49th National Pharmacy week celebration, Swamy Vivekanandha College of Pharmacy and Disha medicals, Tiruchengode jointly conducted the patient awareness camp in the community Pharmacy in which more than 635 respondents voluntarily participated during the one week program.

Selection of Study Population:

The people visiting the Community Pharmacy were included in the study after obtaining their consent and all the study population were considered as respondents.

Interview of the respondents:

Respondents were interviewed by the investigator to collect their history. The respondent history includes their educational status, marital status, present complaints, past medication history, past medical history, social habits (like drinking, smoking, alcoholism etc).

Investigation:

Respondents height and weight were measured and BMI and WHR were calculated. The Blood pressure and random blood

glucose were monitored with the help of sphygmomanometer and aquatech glucometer.

Data entry format:

A Pre designed data entry format has been used to document investigational details.

Patient Education Programme:

During this community pharmacy programme, respondents were educated about the risk and complication of central obesity. This program emphasized mainly about the risk factors involved in obesity like diabetes and cardiovascular disorders. The respondents were educated about the importance of life style modifications like smoking, alcoholism and the need for regular exercise like walking, jogging & playing for improvement of their health particularly in case of obesity. Leaflets and pamphlets were

issued to create awareness about the chronic diseases and risk factors of chronic diseases.

Data Analysis:

Comparative analysis was made between Body mass index and Waist-to-hip ratio in normal and obese patients in order to categorize as Overweight, obesity and central obesity. The comparison was made between Overweight+ obesity (according to BMI >25-29 considered as overweight and >30 considered as obese) and Central obesity (according to WHR >0.9 in male and >0.8 in female).

Statistical Analysis:

Values were expressed as mean $\pm$ SEM, $P < 0.05$, with 95% confidence interval considered extremely significant. Data were compared using unpaired 't' test. Graph pad Instat prism software package was used for statistical analysis.

Fig. 1 Percentage of responders according to BMI

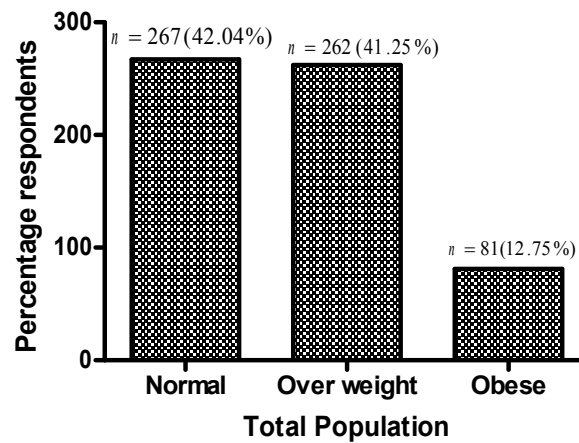


Fig. 2 Percentage of responders according to Waist to hip ratio

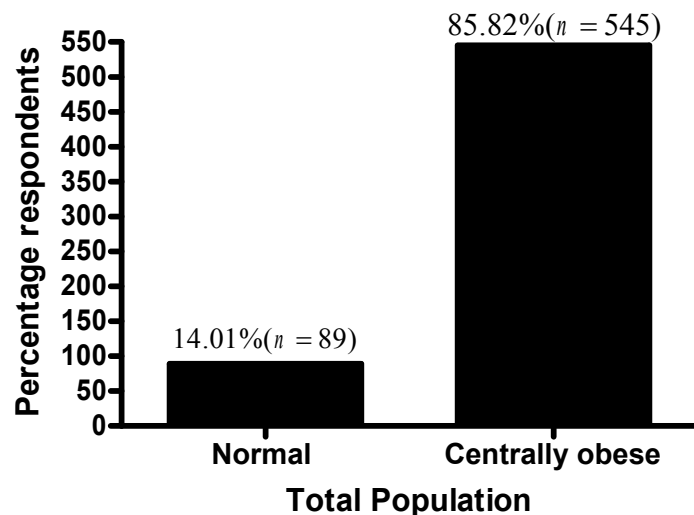


Fig.3 Blood pressure level in the respondents

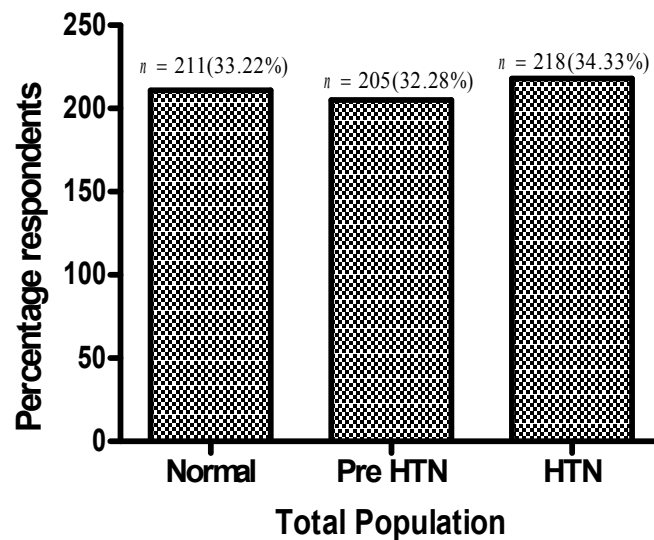


Table - 1 Comparison between normal (BMI & WHR) respondents

S.No	Particulars	BMI	W.H.R	P value
		Normal (n=267) (Mean $\pm$ SEM)	Normal (n=89) (Mean $\pm$ SEM)	
1.	Age	44.902 $\pm$ 15.150	45.981 $\pm$ 14.078	0.392
2.	Systolic B.P	116.39 $\pm$ 4.287	131.59 $\pm$ 16.62	< 0.05
3.	Diastolic B.P	72.16 $\pm$ 5.991	84.07 $\pm$ 11.281	< 0.05
4.	B.M.I	21.386 $\pm$ 2.276	25.300 $\pm$ 4.984	< 0.05
6.	W.H.R	0.935 $\pm$ 0.046	0.8766 $\pm$ 0.048	< 0.05

Values were expressed as mean $\pm$ SEM, $P < 0.05$, with 95% confidence interval considered extremely significant. Data were compared using Unpaired 't' test.

Table - 2 Comparison of Mean B.P, Blood Sugar in the study population with Overweight+Obese and Centrally Obese

S.No	Particulars	Over Weight + Obese (n=343) (Mean $\pm$ SEM)	Centrally Obese (n=545) (Mean $\pm$ SEM)	P Value
1.	Age	46.592 $\pm$ 12.555	45.413 $\pm$ 13.625	0.2039
2.	Systolic B.P	116.85 $\pm$ 6.346	131.59 $\pm$ 16.162	< 0.05
3.	Diastolic B.P	75.52 $\pm$ 5.819	81.20 $\pm$ 7.911	< 0.05
4.	Blood sugar	173.94 $\pm$ 87.177	167.44 $\pm$ 83.823	0.4685
5.	B.M.I	28.51 $\pm$ 6.548	25.61 $\pm$ 6.402	< 0.05
6.	W.H.R	0.94 $\pm$ 0.0737	0.95 $\pm$ 0.05770	0.0457

Values were expressed as mean $\pm$ SEM, $P < 0.05$, with 95% confidence interval considered extremely significant. Data were compared using unpaired 't' test.

RESULTS

Body mass index:

According to BMI calculation 42.04% (n=267) were normal and 41.25 % (n=262) considered as overweight. Most importantly 12.75% (n=85) were obese. So the predominant study population are in the risk of metabolic syndrome.(Fig 1)

Waist to hip ratio:

Study results shows that 85.82% respondents (n=545) were centrally obese and only 14.01% (n=89) were normal indicating majority of study population belongs to the central obese category. (Fig 2)

Blood pressure:

It has been observed that 34.33% (n=218) respondents were hypertensive, 32.28% (n=205) were pre hypertensive and 33.22% (n=211) were found to be normal. This result indicates that 2/3rd of the respondents were in the risk of hypertension and or pre hypertension. The results reveal that 2/3rd of the respondents are in the risk of hypertension i.e. 1/3rd in Pre hypertension and 1/3rd in hypertension.(Fig 3)

Comparison between Blood pressure of Normal,

Overweight, Obese and Centrally obese respondents:

Systolic blood pressure was found to be comparatively less in normal BMI respondents (116.39 $\pm$ 4.287) as compared to normal WHR respondents (131.59 $\pm$ 16.62, $P < 0.05$). Similarly the diastolic blood pressure was comparatively less in normal BMI respondents (72.16 $\pm$ 5.991) as compared to normal WHR respondents (84.07 $\pm$ 11.281, $P < 0.05$). Centrally obese people showed significantly higher systolic and diastolic blood pressure than people of overweight and obese (131.59 $\pm$ 16.162/81.20 $\pm$ 7.991; 116.85 $\pm$ 6.346/75.52 $\pm$ 5.819; $P < 0.05$). According to BMI measurement centrally obese people showed a lesser BMI than overweight and obese people (Table 2). Interestingly the BMI was also high in the so called normal WHR groups (Table 1). However WHR was grater in people with normal BMI as compared to normal WHR people.

DISCUSSION

According to the results of present study, BMI and WHR assessment showed that 42.04% of respondents were normal, while 41.25% were overweight and 12.75% were obese according to BMI. According to WHR 14.01% were normal and 85.82% were centrally obese. A study conducted by the

Hellenic Medical Association turned up with similar results, concluding that 41.1% of men were overweight, and 26% were obese. It was found that obesity was prominent in 11.4% of those included in the 20-30 years old age group, while its proportion firmly varied between 26.0% and 28.0% within the 21-70 years old age group.¹⁶ This demonstrates that WHR may be accurate tool among the respondents in order to diagnose the central obesity.

The results revealed that 2/3rd of the respondents being hypertensive and pre hypertensive. Lakka *et al*¹⁷ in a prospective study on Finnish men aged 42-60 years suggested that WHR as a better index to predict coronary heart disease than waist and BMI. Dobbelsteyn *et al*¹⁷ in a study on Canadian adult men and women showed that WHR can predict CVD risk factors. Others also have reported WHR to be a better indicator of CVD risk,¹⁹⁻²² a finding that has been confirmed in Japan²³ and Australia²⁴ recently. The social history of patients which includes alcohol consumption (19.37%), smoking (17.95%), tobacco (4.25%) may produce a slight impact on blood pressure and blood glucose. Hertmink *et al* found that the studies that adjusted for variables of age, smoking, physical activity and family history of diabetes have slightly lower risk of diabetes compared to studies that did not adjust for these variables²⁵. The comparative analysis revealed that the respondents with normal BMI (n=267) in systolic blood pressure, diastolic blood pressure normal, but WHR reported slightly above normal. But respondents (n=99) with normal WHR shows systolic blood pressure, diastolic blood pressure level slightly above normal. Negative correlation was obtained due to normal respondents (According to WHR) results border line overweight risk with normal WHR (0.8766±0.048). But normal BMI (21.386±2.2760) respondents reports with raised WHR (0.935±0.046). According to this result BMI is more sensitive rather than WHR in terms of diagnosing diabetic and hypertensive risk among the normal individuals. So BMI would be the initial assessment tool to diagnose followed by WHR under consideration.

WHR has been suggested to be a superior predictor of CVD risk because it includes a measurement of hip circumference, which is inversely associated with dysglycemia, diabetes, hypertension and CVD¹⁸⁻²². WHR is superior to WC as a measure of CVD risk.²⁶ Investigation on overweight +obese (n=358) (according to BMI) and centrally obese (n=536) (according to WHR) results revealed slightly above the normal level in systolic blood pressure and the normal level in diastolic and blood sugar was reported. Smoking increased the systolic and diastolic BP and heart rate significantly in both chronic and non-chronic smokers as compared with baseline levels or controls and pulse pressure did not increased significantly.²⁷ Negative correlation resulted while comparing WHR and BMI among the two groups (Overweight+obese and centrally obese) due to elevated BMI (28.51±6.548) with WHR (0.94±0.0737) in overweight +obese respondents. But normal BMI (25.61±6.402) was obtained with elevated WHR (0.95±0.05770) in centrally obese respondents and statistical difference between both the groups were obtained.

The negative correlations between the BMI and WHR resulted among the respondents indicates that the entire overweight + obese are not considered as centrally obese and also all the centrally obese are not overweight+obese. So this studies unable to found the difference between BMI over WHR especially the features of WHR over BMI. The study has several limitations that selection of respondents with

limited inclusion and exclusion criteria. All the respondents who visited to the community pharmacy with an age of above 18years were included in the study. Hypertensive respondents under medication also included in the study may influence the results of blood pressure. The findings from the study help to know the importance of routine monitoring of BMI, WHR, and blood sugar level.

This study recommends considering both BMI and WHR should be involved in the preliminary investigation to identify the cardiovascular risk in obese and /or centrally obese population. Future researchers should concentrate on selecting the respondents with specific inclusion and exclusion criteria to minimize the controversy result and provide the exact picture on the impact of central obesity (by using WHR) and overweight +obesity (by using BMI) as a diagnostic tool .

CONCLUSION

Central obesity is an equal risk factor for diabetes and hypertension when compared with overweight and obesity. So both should be taken in to consideration of each individual after 30 years of age. Both body mass index and Waist to hip ratio should be included in the diagnosing criteria to overweight +obesity and central obesity respectively. The routine monitoring or measuring the BMI and WHR will definitely indicates the risk of cardio vascular disease among the public. This indication is good enough to minimize the risk of cardiovascular disease in diabetic and/or hypertensive patients by changing their life style with (or) without drug treatment.

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