Original Research Article

Assessment of anthropometric parameters in metabolic syndrome: A descriptive study

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Abstract

Background: Greater industrialization worldwide is associated with rising rates of obesity which is anticipated to dramatically increase the prevalence of metabolic syndrome. As the population ages, prevalence and severity of obesity rises which is the initiative feature of metabolic syndrome. **Objective:** To assess parameters of obesity such as BMI, waist circumference and waist hip ratio in patients with central obesity with metabolic syndrome. **Methodology:** Study was conducted at Navodaya Medical College Hospital and Research Centre, Raichur from April 2013 to May 2014. Patients attending outpatient Department and those admitted were included in the study. The patients and controls had voluntarily participated in the study. Present study comprised of 100 patients which includes 50 cases of metabolic syndrome and 50 controls. **Results:** 48.27% of males and 47.62% of females of range 45 – 50yrs of age were taken in the study as cases. The difference mean±SD of age in cases and controls were 42.78±6.31 and 42.78±6.01 respectively. The mean ± SD of waist circumference in cases and controls were 107.25± 10.46 and 71.8± 8.5 respectively. The mean ± SD of waist hip ratio in cases and controls were 1.05 ± 0.12 and 0.75± 0.06 respectively. The mean ± SD of BMI in cases and controls were 31.77 ± 3.62 and 22.44± 1.83 respectively. Statistically there was highly significant increase ($p<0.001$) in waist circumference, WHR and BMI of cases as compared to controls. **Conclusion:** In our study, we observed that waist circumference, Waist Hip ration and BMI are significantly higher in cases of metabolic syndrome than normal subjects.
Key words: Metabolic syndrome, waist circumference, BMI, WHP

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INTRODUCTION

The Metabolic Syndrome (Syndrome X, Insulin Resistance Syndrome) consists of a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease (CVD) and diabetes mellitus (DM). The idea of metabolic syndrome has evolved since the original definition by World Health Organization in 1998 reflecting growing clinical evidence and analysis by a variety of consensus conferences and professional organizations.[1] Prevalence of metabolic syndrome varies across the globe, in part reflecting the age and ethnicity of the populations studied and the diagnostic criteria applied. In general the prevalence of metabolic syndrome increases with age. The highest recorded prevalence with nearly 60% of women and 40% of men aged 45-59 meeting National Cholesterol Education Program, Adult Treatment Panel III (NCEP: ATP III) [1] guidelines. Greater industrialization worldwide is associated with rising rates of obesity which is anticipated to dramatically increase the prevalence of metabolic syndrome. As the population ages, prevalence and severity of obesity rises which is the initiative feature of metabolic syndrome.[1] Visceral obesity is a key component in the development of the metabolic syndrome. Increased central adiposity, particularly in visceral region, leads to greater free fatty acid flux and inhibition of insulin action. Adipose tissue in obesity is

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resistant to insulin which is associated with disturbed glucose metabolism in the muscles and liver. Even mild or moderate degree of obesity with concomitant insulin resistance may be associated with metabolic syndrome. On the other hand, excessive accumulation of abdominal fat may lead to the development of metabolic syndrome independently of the degree of insulin resistance[2].

OBJECTIVE

To assess parameters of obesity such as BMI, waist circumference and waist hip ratio in patients with central obesity with metabolic syndrome.

METHODOLOGY

Study was conducted at Navodaya Medical College Hospital and Research Centre, Raichur from April 2013 to May 2014. Patients attending outpatient Department and those admitted were included in the study. The patients and controls had voluntarily participated in the study.Present study comprised of 100 patients which includes:-50 cases with Metabolic Syndrome [Clinically diagnosed/confirmed cases of HTN and/ or DM/ glucose intolerance with central obesity (waist circumference ≥ 90cm (males), ≥ 80cm (female)].50 were healthy controls. The patients were between the age group of 20–50 years.

Inclusion criteria:

- 50 cases of central obesity between age group 20-50 years with HTN and/ or DM/ glucose intolerance.
- 50 age and sex matched healthy individuals will be included for comparison.

Exclusion criteria:

- Juvenile and gestational diabetes.
- Smokers.
- Alcoholics.
- Patients with acute and chronic inflammatory and rheumatologic condition /infectious diseases
- Patients with other disorders like renal disease.

The duration of the study was from April 2013 to may 2014. Statistical analysis was carried out using student't' test (unpaired).

RESULTS

Table 1: Age and Sexwise wise distribution of cases

Age (yrs)	Males no (%)	Females no (%)	Total no (%)
20-24	00	00	00
25-29	00 (00)	02 (9.53)	02 (4.0)
30-34	03 (10.35)	00 (00)	03 (6.00)
35-39	08 (27.58)	04 (19.05)	12 (24.00)
40-44	04 (13.79)	05 (23.80)	09 (18.0)
45-50	14 (48.27)	10 (47.62)	24 (48.00)
Total	**29(100)**	**21 (100)**	**50 (100)**

The above table shows 0% of males and 9.53% of females ranging between 25- 29 yrs, 10.35 % of males and 0% of females ranging between 30 – 34 yrs, 27.58% of males and 19.05% of females of ranging between 35- 39yrs, 13.79% of males and 23.8% of females ranging between 40 – 44yrs, 48.27% of males and 47.62% of females of range 45 – 50yrs of age were taken in the study as cases.

Table 2: Comparison of Age and BP between Cases and Controls (Unpaired "t" test)

VARIABLE	CASES (N=50)		CONTROLS (N=50)		t	p	Inference
	MEAN	SD	MEAN	SD			
Age (yrs)	42.78	6.31	42.78	6.01	0.0001	1.0 (P>0.05)	N.S
SBP (mmHg)	144.04	23.06	118.12	9.25	7.37	0.0001 (p<0.001)	H.S
DBP(mmHg)	88.62	12.67	77.74	6.37	5.42	0.0001 (P<0.001)	H.S

The difference mean±SD of age in cases and controls were 42.78±6.31 and 42.78±6.01 respectively. The difference of mean± SD of systolic BP in cases and controls were 144.04 ± 23.06 and 118.12±9.25 respectively, the difference of mean ± SD of diastolic BP in cases and controls were 88.6±12.67 and 77.74±6.37 respectively. The difference of systolic BP and diastolic BP of cases were statistically highly significant ($p < 0.001$) as compared to controls. But difference in mean± SD of age of cases was not significant ($p>0.05$) as compared to controls.

Table 3: Comparison of Anthropometric Measurements between Cases and Controls (Unpaired "t" test)

VARIABLE	CASES (N=50)		CONTROLS (N=50)		t	p	Inference
	MEAN	SD	MEAN	SD			
WC (cm)	107.25	10.46	71.8	8.5	18.58	0.0001 (P<0.001)	H.S
WHR	1.05	0.12	0.75	0.06	15.59	0.0001 (P<0.001)	H.S
BMI	31.77	3.62	22.44	1.83	16.22	0.0001 (P<0.001)	H.S

The mean ± SD of waist circumference in cases and controls were 107.25± 10.46 and 71.8± 8.5 respectively. The mean ± SD of waist hip ratio in cases and controls were 1.05 ± 0.12 and 0.75± 0.06 respectively. The mean ± SD of BMI in cases and controls were 31.77 ± 3.62 and 22.44± 1.83 respectively. Statistically there was highly significant increase (p<0.001) in waist circumference, WHR and BMI of cases as compared to controls.

Table 4: Mean age in various studies

Various studies	Mean age	
	Males	Females
G. P. Parale *et al*[3]	42.96± 7.91yrs	44.28±7.918yrs
Ramachandran *et al*[4]	47.8± 8.9yrs	50.9±8.3yrs
Dong Feng Gu *et al*[5]	50.1±0.2yrs	50.2 ±0.2yrs
Present study	42.86± 6.31	52.12±14.99yrs

Table 5: Waist circumference in various studies

Various studies	Mean	
	Male	Female
Rajeev Gupta *et al*[7]	102 cm	88cm
Ramachandran *et al*[4]	90cm	85cm
Dong Feg Gu *et al*[5]	90cm	80cm
Present study	90cm	80cm

DISCUSSION

The mean age of males in our study is 42.86±6.31 and females are 52.12±14.99 yrs and this is comparable with other studies. Age is an important factor as more than 45yrs of age are at greater the risk of MS. Our findings of age adjusted prevalence are similar to studies conducted by Ramachandran *et al.*[4] and G. P. Parale *et al.*[3,] where increasing age had a linear association with MS and its risk factors.Our study showed the there was statistically significant increase in waist circumference of cases as compared to healthy controls. Waist circumference is a good index in assessing of central obesity and also a good predictor tool of insulin resistance.In 2003, Ramachandran *et al.*[4] conducted a study among urban Asian Indian adults to determine the prevalence of metabolic syndrome and in 2005 Dong Feg Gu *et al.*[6] conducted a study to know the prevalence of metabolic syndrome among overweight adults in China. These studies show similar values of waist circumference as compared to our study.Different studies use different criteria and our study has used IDF criteria for waist circumference that is more applicable to Asian Indian population. The waist circumference criteria followed in the study is comparable with Rajeev Gupta *et al*, Ramachandran *et al* and Dong Feg Gu *et al.* Waist circumference when assessed independently is more predictive of metabolic syndrome compared to other anthropometric measures like BMI. Although neither BMI nor waist circumference provides a complete picture of overall risk. Waist circumference of the subjects from present study revealed stronger association with other multiple components of metabolic syndrome.In 2010 Shahid Ahmed *et al.*[8] conducted a study to observe the frequency of metabolic syndrome in patients with type 2 diabetes which has shown significant increase in BMI in metabolic syndrome with type 2 diabetes as compared to healthy controls.

CONCLUSION

In our study, we observed that waist circumference, Waist Hip ration and BMI are significantly higher in cases of metabolic syndrome than normal subjects. Abdominal fat is the major risk factor for CVD (cardiovascular disease) and type 2 diabetes and WHR can be used to estimate the proportions of fat distribution. Measuring waist circumference of patients could help in identifying abdominal adiposity which is being recognized as a useful measure for insulin resistance and CVD risk. BMI

measures the overall obesity and cannot provide useful information compared to WC in predicting insulin resistance.

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