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ORIGINAL ARTICLE

ASSOCIATION OF WAIST CIRCUMFERENCE, WAIST TO HIP RATIO, WAIST TO HEIGHT RATIO IN DIABETIC AND NON-DIABETIC OBESE SUBJECTS

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ABSTRACT

Background of the Study: Obesity is known to the main risk factor for a number of non-communicable diseases like diabetes. As per WHO, over weight and obesity have 44% of the diabetic cases. Obesity has emerged as leading global health through recent environmental and society changes favoring a positive energy balance and weight gain. The aim of the study is to find the association of waist circumference, waist to hip ratio, waist to height ratio in diabetic and non-diabetic obese subjects. **Methodology:** This observational study was conducted in OPD, physiotherapy department ACS Medical College and Hospital. In which 50 subjects were selected based on inclusion and exclusion criteria of both male and female age group 25-50years. Subjects selected were obese patient with BMI above 30, diabetic and non-diabetic subjects and those excluded were lumbar Lordosis, history of pelvic fracture, inflammation of hip joint, gluteus medius, and with Trendlenburg gait. Selected subjects were selected and divided into two groups. Group A consisted of 25 subjects and Group B consisted of 25 subjects. Outcome measures include BMI, glucometer, Waist circumference, Waist to hip ratio, Weight to height ratio. **Results:** Comparative study between Group A and Group B showed significant difference in BMI,Glucose level, Waist to height Ratio and waist to hip ratio except Waist circumference, with P value <0.0001 among diabetics and non-diabetics. **Conclusion:** The study concludes that non diabetic subjects who are obese always show increase in waist to hip ratio whereas diabetic who are obese always shows increase in waist circumference.

Keywords: Obesity; Diabetics; BMI; Waist circumference; Waist to hip ratio.

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INTRODUCTION

The predominance of corpulence is expanding in numerous nations, and weight could be a major worldwide wellbeing issue In Australia, 19.3% of men and 22.2% of ladies are hefty, and the predominance of weight is 2.5 times higher than in 1980. Obesity could be a complex illness involving an excessive sum of body fat. Weight isn't fair a corrective concern[1]. It could be a restorative issue that increments your hazard of other infections and wellbeing issues, such as heart malady, diabetes, tall blood weightand certain cancers[2].

Later considers have detailed that all-inclusive, more than 1.9 billion grown-ups are overweight and 650 million are hefty[3]. Around 2.8 million passings are detailed as a result of being overweight or corpulent. Due to Due to the utilization of vitality thick nourishment (i.e., undesirable nourishment propensities), inactive life fashion, need of wellbeing care administrations and money related bolster, the creating nations are confronting tall chance of corpulence and their unfavorable results (i.e., diabetes, ischemic heart malady, etc.). In India, more than 135 million people were influenced by weight[4]. The predominance of corpulence in India changes due to age, sexual orientation[10]. There are numerous reasons why a few individuals have trouble dodging weight. As a rule, corpulence comes about from a combination of acquired variables, combined with the environment and individual count calories and work out choices[5].

Weight is at the foundation of extreme metabolic anomalies in India. About 30%–65% of grown-up urban Indians are either overweight, stout, or have stomach weight. Stomach weight plays a major part within the pathogenesis of Sort 2 diabetes, cardiovascular maladies, and hypertension. Central adiposity is more unequivocally related with these issues than add up to adiposity[6].

Diabetes mellitus, commonly known as diabetes, could be a metabolic infection that causes tall blood sugar. The hormone affront moves sugar from the blood into your cells to be put away or utilized for vitality. With diabetes, your body either doesn't make sufficient affront or can't viably use the insulin it does make[7, 8].

Diabetes could be an infection that happens when your blood glucose, too called blood sugar, is as well tall . Blood glucose is your primary source of vitality and comes from the nourishment you eat. Affront, a hormone made by the pancreas, makes a difference in glucose from nourishment get into your cells to be utilized for energy[11, 12].

India has an estimated 77 million individuals with diabetes, which makes it the second most influenced within the world, after China. One in six individuals (17%) within the world with diabetes is from India. India's population as calculated in October 2018 was approximately 17.5% of the worldwide add up[13].

The number is anticipated to develop by 2045 to end up 134 million per the Universal Diabetes Alliance. In India, sort 1 diabetes is more uncommon than in western nations [14]. As it were approximately one-third of sort 2 diabetics in India are overweight or hefty. A 2004 think about proposes that the predominance of sort 2 diabetes in Indians may be due to natural and way of life changes coming about from industrialization and movement to urban environment from rustic[15].

Fig: 1 Measurement of waist

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METHODOLOGY

Procedure: All the procedures were performed in accordance with the ethical standards of the responsible ethics committee both (Institutional and national) on human experimentation and the Helsinki Declaration of 1964 (as revised in 2008).

50 subjects based on the inclusion and exclusion criteria were selected. Subjects included were both diabetic and non-diabetic patients. Subjects excluded were those with Lumbar Lordosis, history of pelvic fracture, inflammation of hip joint, gluteus Medius lurch, Trendelenburg gait. An informed consent was obtained from the subjects after detailed explanation about the study procedure.

50 Subjects were selected using simple random sampling method and divided in to two groups. Group A (25 Subjects) diabetic and Group B (25 subjects) non-diabetic. They were assessed for with waist circumference, waist to hip ratio, waist to height ratio.

Measurement Procedure: BMI is calculated using formulaBMI = weight in kg/Height in m^2

Waist circumstance: Subject is asked to stand straight and by using tap measure just above the hip bone then bring the tape all the way around the body level and measure over the belly bottom. The tape should be at the same level, it should not be too high and it should be straight over at the back, and ask the patient not to hold the breath while measuring.

Waist to hip ratio: Subjects were asked to stand straight measurement was taken by using tape. Tape was wrapping around the waist at the smallest point usually around belly. This is waist circumference and it is recorded.

Hip measurements: Measurement was taken around the widest part of hip of the subject. This is the hip circumference and it is recorded. Divide: Waist size was divided by hip size and this is known as waist-to-hip ratio. And it's recorded.

Waist to height ratio: Subjects' waist circumference and height in inches was measured and then it is divided (waist circumference/height) and multiplied by 100.

All this measurement will be recorded. The recorded data will be analyzed and interrupted. The result will be revealed at the end of the study.

Fig: 2 Measurement of height

Data Analysis Descriptive Analysis of Group A – Obese with Diabetes

BMI	Frequency
25.6	2
25.8	3
26	2
26.2	1
26.4	2
26.6	3
26.8	2
27	2
27.2	0
27.4	2
27.6	1
27.8	2
28	0

Table 1. BMI and frequency among diabetics

Glucose level	Frequency
130	2
132	0
134	2
136	3
138	0
140	4
142	0
144	0
146	3
148	3
150	8

Table 2. Glucose level and frequency among diabetics

Waist circumference	Frequency
88	3
89	6
90	2
91	1
92	2
93	5
94	0
95	2
96	2
97	0
98	0
99	2

Table 3. Waist circumference level and frequency among diabetics

Waist to height	Frequency
0.59	7
0.595	0
0.6	3
0.605	0
0.61	6
0.615	0
0.62	3
0.625	0
0.63	2
0.635	0
0.64	2
0.645	0
0.65	2

Table 4. Waist to height and frequency among diabetics

Ratio waist to hip ratio	Frequency
0.9	2
0.905	0
0.91	5
0.915	0
0.92	1
0.925	0
0.93	5
0.935	0
0.94	0
0.945	0
0.95	5

Table 5. Ratio waist to hip ratio and frequency among diabetics

Group B – Obese With Non Diabetes

BMI	Frequency
25.4	2
25.6	2
25.8	3
26	0
26.2	5
26.4	5
26.6	2
26.8	3
27	0
27.2	2
27.4	0
27.6	0
27.8	1

Table 6. BMI and frequency among non diabetics

Glucose level	Frequency
130	2
132	0
134	2
136	3
138	0
140	4
142	0
144	0
146	3
148	3
150	8

Table 7. Glucose level and frequency among non diabetics

Waist circumference	Frequency
82	2
84	0
86	0
88	4
90	6
92	7
94	4
96	2
82	2
84	0
86	0
88	4

Table 8. Waist circumference level and frequency among non diabetics

Waist to height	Frequency
0.59	2
0.6	0
0.61	2
0.62	1
0.63	7
0.64	7
0.65	5
0.66	1
0.59	2
0.6	0
0.61	2
0.62	1
0.63	7

Table 9. Waist to height and frequency among non diabetics

Ratio waist to hip ratio	Frequency
0.91	1
0.92	0
0.93	5
0.94	3
0.95	2
0.96	3
0.97	4
0.98	3
0.99	4
0.91	1
0.92	0

Table 10. Ratio waist to hip ratio and frequency among non diabetics

Variables	Group A Mean	Group B Mean	Df	t Value	P value	Sig. different (P < 0.05)
BMI	26.76	26.34	48	2.076	0.0432	*
Glucose level	142.6	100.9	48	17.59	<0.0001	****
Waist circumference	91.92	90.28	48	1.662	0.1032	NS
Waist to height Ratio	0.6116	0.6328	48	4.026	0.0002	***
waist to hipratio	0.937	0.958	48	3.032	0.0039	**

Table 11: comparative unpaired t Test for BMI, Glucose level, Waist circumference,Waist to height Ratio and waist to hip ratio between the Group A and B

The above table 11 shows significant difference in BMI, Glucose level, Waist to height Ratio and waist to hip ratio except Waist circumference between the Groups A and B.

RESULT

Total 50 participants of diabetics and non diabetics were participated in this study based on specific selection criteria. Comparative study between Group A and Group B showed significant difference in BMI, Glucose level, Waist to height Ratio and waist to hip ratio except Waist circumference, with P value <0.0001 among diabetics and non diabetics. Table 11 shows that there is highly significance in waist circumference, waist to hip ratio, waist to height ratio in diabetic and non-diabetic obese subjects but it was intended and proved that Group A (diabetic with obese) shows highly significance with waist circumference and Group B (non-diabetic with obese) shows highly significance with waist to hip ratio.

DISCUSSION

The purpose of the study is to find out the association of waist circumference, waist to hip ratio waist to height ratio in diabetic and non diabetic obese subjects. Total 50 participants of diabetics and non diabetics were participated in this study based on specific selection criteria. Comparative study between Group A and Group B showed significant difference in BMI, Glucose level, Waist to height Ratio and waist to hip ratio except Waist circumference, with P value <0.0001 among diabetics and non diabetics.

A study in consistent with earlier studies indicate that WC with respective cut-off value of 98.5 cm and 89.5 cm in men and women, respectively, and WHtR at cut-off value of >0.51 of both sexes predicted diabetes better than BMI and discriminated have diabetic from nondiabetic with higher accuracy in both sexes. Regarding high prevalence has rated on obesity, metabolic syndrome, diabetes, and cardiovascular diseases in the general population of this geographic region. The results of this study emphasize application of WHtR and WC as appropriate discriminative tools for identification of diabetes [16].

Obesity is an undesirable outcome of changing of lifestyle and behaviours. It is also reversible predisposing factor for the development of several debilitating diseases. This study was aimed to determine the prevalence rate of obesity, overweight, central obesity and their associated factors in the north of Iran. We conducted a population-based cross- sectional study with a sample of 1800 women and 1800 men with respective mean ages of 37.5±13.0 and 38.5±14.2 years of urban population aged 20–70 years living in the north[17].

The Body Mass Index (BMI) is used as a measure of overweight and obesity. In epidemiological studies age, sex and ethnic background all have to be taken into consideration, particularly when determining the health risk caused by the amount of body fat.--Caution should be observed when using the BMI as a measure for interpreting overweight and obesity as body composition can be highly variable yet have the same BMI [18].

In normal weight individuals, WHHR and WHR were the best predictors in women, whereas SAD was the only independent predictor in men. Among overweight/obese individuals all measures failed to predict CVD in women, whereas WHHR was the strongest predictor after adjustments for CVD risk factors in men[19].

BMI and WC are more useful than WHR for predicting two or more non-adipose components of MetS. Cut off values for WC in males, and those of BMI and WHR in both sexes are lower than that in present MetS

criteria; WC in females is slightly higher. Cut off values of WC, BMI and WHR were increased with age in the Chinese[20].

Obesity has become a major worldwide epidemic affecting more than 300 million people. It is an important risk factor for diabetes mellitus. The standard epidemiologic translation of these clinical facts uses anthropometric measures waist circumference and waist/hip ratio have been used as measures of central obesity and body has been used as a measure of general obesity [21].

Studies have demonstrated that three obesity indicators are strong and consistent predictor of diabetes mellitus, type 2 epidemiological differences expected in relations of diabetes with BMI and waist circumference. Several studies have shown that waist circumference is a better predictor of diabetes mellitus type 2 [22].

In 2003 WHO laid down guidelines for screening of type 2 diabetes risk factor which include waist – hip ratio and waist circumference as important predictor of type 2 diabetes mellitus. This study as proved that waist circumference in obesity for diabetes and waist hip ratio in obesity is predictor for non diabetic [23].

Ethical Considerations: The manuscript is approved by the Institutional Review board of Faculty of Physiotherapy with reference number BPT IV C/PHYSIO/ IRB/2020-2021, dated 09/03/2021.

Conflicts of Interest: There is no conflict of interest to conduct this study.

Fund for the study: This is self-funded study.

CONCLUSION

The study concludes that non diabetic subjects who are obese always show increase in waist to hip ratio whereas diabetic who are obese always shows increase in waist circumference.

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