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RESEARCH ARTICLE

A study of waist circumference, hip-waist ratio as markers of Type 2 diabetes mellitus in male population of North Karnataka

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ABSTRACT

Background: Type 2 diabetes mellitus belongs to a group of diseases labeled as "lifestyle diseases" and is on the rise in Asians, especially Indians. It is estimated that by 2030, the number of people with diabetes will increase to more than 366 million. **Aims and Objectives:** This study was conducted to assess risk for Type 2 diabetes mellitus among study participants using waist circumference (WC) and waist-hip ratio (WHR). This study will also find out impact of WC and WHR as risk factor in recently diagnosed Type 2 diabetes mellitus patients. **Materials and Methods:** The clinical study includes subject population from and nearby areas of Raichur, Karnataka. A total of 150 patients who were diagnosed for first as Type 2 diabetes were included in this study. A total of 150 normal patients from the same area were chosen for comparison of data. **Results:** The mean WC for diabetics is 102.44 cm and for non-diabetics 96.60 cm. The mean hip circumference for diabetics is 107.15 cm and for non-diabetics 102.15 cm. The mean WHR for diabetics is 0.9527 and for non-diabetics 0.9368. We conclude that 36% population of North Karnataka region in of developing Type 2 diabetes mellitus using WC and WHR as indicator. **Conclusion:** WC provides unique indicator of body fat distribution, which can identify patients at the risk of diabetes mellitus. WHR more than 0.9 found in 98 (65.33%) freshly diagnosed diabetics and 69 (46%) non-diabetics.

KEY WORDS: Hip Circumference; Type 2 Diabetes Mellitus; Waist Circumference; Waist-hip Ratio

INTRODUCTION

Type 2 diabetes mellitus belongs to a group of diseases labeled as "lifestyle diseases" and is on the rise in Asians, especially Indians.[1] It is most challenging health problem of the 21st century. It is estimated that by 2030, the number of people with diabetes will increase to more than 366 million, more than twice the number in 2000.[2] Most these cases are from developing countries, and especially, South Asia including India.[3] Besides morbidity due to its complications, Type 2 diabetes mellitus carries a high risk of Myocardial infarction, stroke, and premature death. Thus, every effort should be made to prevent or postpone this disease by spreading awareness risk stratification, early diagnosis and regular treatment.[1] Besides morbidity due to its complications, Type 2 diabetes mellitus carries a high risk of Myocardial infarction, stroke, and premature death.[4,5]

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Obesity and particularly abdominal obesity are strongly associated with insulin resistance, which will result into Type 2 diabetes.[6] Diabetes results from the combination of genetic and environmental factors.[3] There is strong evidence to suggest that modifiable risk factors such as obesity and physical inactivity are non-genetic determinants of diabetes.[7]

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The occurrence of rapid and major lifestyles changes in the many countries has increased the prevalence of obesity and other non-communicable disease risk factors such as hypertension and dyslipidemia, which have been reported to be the major etiologic factors for the rising incidence of Type 2 diabetes worldwide.[8]

A simplified Indian Diabetes Risk Score (IDRS) for screening of undiagnosed diabetics was developed by Mohan Diabetes Foundation, Chennai. IDRS consists of variables such as age, abdominal obesity, physical activity, and family history. These variables predict diabetes mellitus with optimum sensitivity and specificity and have high positive and negative predictive value.[9,10] The waist circumference (WC), body mass index (BMI), and waist-hip ratio (WHR) are three parameters to evaluate body fat and fat repartition in adults. Some authors showed that BMI and WHR were predictor of Type 2 diabetes outcome. Whereas in other studies, WC was better predictor of Type 2 diabetes mellitus as more strongly correlated to the intra-abdominal body fat than WHR.[3] WC more than 90 cm and WHR more than 0.9 are considered at risk for male.

The prevalence of Type 2 diabetes mellitus is higher in South India, and particularly, North Karnataka, and the majority of patients remain undiagnosed for diabetes. This study was conducted to find out high-risk people for diabetes. This study was conducted to assess risk for Type 2 diabetes mellitus among study participants using WC and WHR. This study will also find out impact of WC and WHR as risk factor in recently diagnosed Type 2 diabetes mellitus patients. This study also estimates the prevalence of abdominal obesity among males of North Karnataka region.

MATERIALS AND METHODS

The clinical study includes subject population from and nearby areas of Raichur, Karnataka. A total of 150 patients who were diagnosed for first as type 2 diabetes were included in this study. A total of 150 normal patients from same area were chosen for comparison of data. Blood glucose level was routinely analyzed using glucometer. HbA1C level was done for diagnosis of Type 2 diabetes. Written consent taken from patient of both groups. Each patient's WC and hip circumference (HC) were measured according to WHO guidelines. WC was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch resistant tape that provided a constant 100 g tension. HC was measured around the widest portion of the buttocks, with the tape parallel to the floor. WHR was obtained by dividing WC by HC. Data tabulated and analysis were performed using SPSS software.

RESULTS

Table 1 shows the mean, maximum, minimum, standard deviation, standard error of age, WC, HC and WHR of diabetics, and non-diabetics. The mean WC for diabetics is 102.44 cm and for non-diabetics 96.60 cm. The difference between mean WC diabetics and non-diabetics was statistically significant ($P < 0.0001$). The mean HC for diabetics is 107.15 cm and for non-diabetics 102.15 cm. The difference between mean HC of diabetics and non-diabetics was statistically significant ($P < 0.0001$). The mean WHR for diabetics is 0.9527 and for non-diabetics 0.9368. The difference between mean HC of diabetics and non-diabetics was statistically significant ($P < 0.0001$). The mean age for diabetics is 48.87 years and for non-diabetics is 50.34 years. The difference between mean age of diabetics and non-diabetics was statistically non-significant ($P = 0.38$).

Table 2 shows details distribution of WC and WHR of diabetic and non-diabetic.

Table 1: WC, HC, and WHR in both groups

Variables	*n*	Minimum	Maximum	Mean±SD	SE	*P* value
Age (years)						
Diabetics	150	36	60	48.873±6.4510	0.5267	0.38
Non-diabetics	150	39	59	50.347±5.7894	0.4727	0.38
WC (cm)						
Diabetics	150	74	125	102.44±10.0607	0.8214	<0.0001
Non-diabetics	150	77	143	96.60±10.1405	0.8280	<0.0001
HC (cm)						
Diabetics	150	77	130	107.15±8.5796	0.7005	<0.0001
Non-diabetics	150	83.5	125	102.15±9.3483	0.7633	<0.0001
WHR						
Diabetics	150	0.83	1.04	0.9527±0.4689	0.0383	<0.001
Non-diabetics	150	0.86	1.14	0.9368±0.3807	0.0311	<0.001

SD: Standard deviation, SE: Standard error, WC: Waist circumference, HC: Hip circumference, WHR: Waist-hip ratio

Table 2: Detail distribution of WC, WHR in both groups

Variables	*n* (%)
WC (cm)	
>90	
Diabetics	106 (70.66)
Non-diabetics	61 (40.66)
≤90	
Diabetics	44 (29.33)
Non-diabetics	89 (59.33)
WHR	
>0.9	
Diabetics	98 (65.33)
Non-diabetics	69 (46.00)
≤0.9	
Diabetics	52 (34.66)
Non-diabetics	81 (54.00)
WC>90 cm+WHR>0.9	
Diabetics	89 (59.33)
Non-diabetics	54 (36.00)
WC≤90 cm+WHR≤0.9	
Diabetics	61 (40.66)
Non-diabetics	96 (54.00)

WC: Waist circumference, WHR: Waist-hip ratio

DISCUSSION

In the present study, 150 freshly diagnosed diabetics attending medicine outpatient department (OPD) of Navodaya Medical College were taken to assess role of WC, HC, and WHR in diabetes. Even these values are compared with 150 normal non-diabetics from the same area. In our study, WC and WHR of diabetics and non-diabetics are above cutoff points according to WHO guidelines. Even WC values of diabetics are in substantially increased group for metabolic disorders according to WHO guidelines. WC values of non-diabetics are in increased group for metabolic disorders according to WHO guidelines. WC more than 90 cm found in 106 (70.66%) freshly diagnosed diabetics and 61 (40.66%) non-diabetics. WHR more than 0.9 found in 98 (65.33%) freshly diagnosed diabetics and 69 (46%) non-diabetics. WC more than 90 cm and WHR more than 0.9 found in 89 (59.33%) freshly diagnosed diabetics and 54 (36%) non-diabetics. Thus, WC and WHR were major risk factors in 89 (59.33%) freshly diagnosed diabetics of North Karnataka region. According to these factors (WC, WHR), 36% normal population of North Karnataka region have values of WC AND WHR more than guidelines of WHO. Thus this 36% population is in danger of developing type 2 diabetes mellitus in future if enough care not taken.

Brahmbhatt et al. studied 145 diabetic patients from OPD of A J Institute of Medical Science and Research Center, Mangalore. In their study 34 % population have WC and WHR values more than WHO guidelines and thus at high risk of developing type 2 diabetes mellitus in future. The prevalence of abdominal obesity was 44% in male. Result of this study is similar to the present study.[9] Gokhale et al. studied 184 patients attending diabetic OPD of Dr. D. Y. Patil Medical College, Pimpri, Pune. The mean WC of this study is 94.76 cm which is more than our study. The mean WHR of this study is 0.97409 cm which is more than our study. This difference in WC and WHR values are may be due to geographical differences of population.[1] Rajappa T and Karunanandham S studied 800 patients not known for Type 2 diabetes mellitus and screen them using IDRS. Among male patients of this study, 30.7% have more than 90 cm WC. On computing the IDRS, 52% of patients showed moderate-risk score and 19% high-risk score.[11] Rane et al. found that young Asian adults (18-25) years with a positive family history of Type 2 diabetes had higher WC and WHR and hence could be warned of early onset of diabetes.[12]

WC provides unique indicator of body fat distribution, which can identify patients at the risk of diabetes mellitus. It also provides additional information to help the clinicians to determine which patient should be evaluated for the presence of diabetic factor without change of BMI. Diet plan and exercise can change WC, which can help to control diabetes.

CONCLUSION

The present study did show majority of our Type 2 diabetes patient having WC and WHR above cutoff values for Asians. We conclude that 36% population of North Karnataka region in of developing Type 2 diabetes mellitus using WC and WHR as indicator. WC and WHR were major risk factors in 59.33% (89 out of 150) freshly diagnosed diabetic patients of North Karnataka region. In diabetic clinics across India, besides weight and height, measurement of WC, HC, and WHR would be a very valuable and cost-effective measurement for preventing diabetes and monitoring established diabetes.

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