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STUDY ON INDEX OF CENTRAL OBESITY AND GLYCEMIC CONTROL AMONG TYPE 2 DAIBETES MELLITUS PATEINTS

Clinical Science

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ABSTRACT

Study was aimed to assess index of central obesity (ICO) and glycemic control among type 2 diabetic patients. Glycemic control with respect to ICO in males ≥0.58 with HbA1c≥7.5% were observed 43.96 5 subjects followed by HbA1c≥ 6.5 -7.5% (22.41%) and HbA1c< 6.5% (7.55%) respectively. More subjects had poor glycemic control with ICO≥0.58. However ICO <0.58 in males had higher percentages of subjects (12.93%) in good glycemic control. Similar observation was not found in females subjects. In males 36.20% subjects had WC>102 cm with poor glycemic control and 4.31% subjects had <102 cm WC with poor glycemic control. In females 36.90% subjects showed WC ≥88 with HbA1c≥7.5% and 1.19% showed WC <88cm with HbA1c≥7.5%. Index of central obesity has a potential to be a better parameter of central obesity. In the present study we observed the relation between IOC and glycemic control and the difference between ICO and WC with glycemic control was not significant

KEYWORDS

ICO, WC, diabetes

SUMMARY

Waist circumference (WC) is globally used as a parameter to quantify central obesity, the key culprit in insulin resistance and related disorders. The global burden of disease is shifting from communicable diseases to non-communicable diseases. As the infections and nutritional deficiencies are receding as leading contributors to death and disability and cardiovascular diseases, cancers, diabetes, neuropsychiatric ailments, and other chronic diseases are becoming major contributors. To quantify proportion of visceral fat in the total body fat, WC alone is not sufficient. Authors hereby hypothesis that Index of central obesity defined by Rakesh et al, as a ratio of WC and height is a better parameter of central obesity. National Health and nutrition Examination Survey data base is replacing index of central obesity with waist circumference was found to enhance the specificity and sensitivity of definition of metabolic syndrome. Therefore, the present study was aimed to assess index of central obesity (ICO) and glycemic control among type 2 diabetic patients.

A total of 200 hundred known type 2 diabetes mellitus patients were included in the study. Type1 diabetes mellitus, peripheral vascular disease, acute or chronic infection, cancer, hepatic disease; myocardial infarction were excluded from the study. Written informed consent was obtained from all the subjects. Questionnaire consisted of age, gender, weight, height, body mass index, waist circumference, hip circumference, waist-hip ratio and blood pressure and biochemical investigations like fasting blood glucose, post prandial blood glucose and HbA1c, blood urea and serum creatinine and other bio-physiological parameters.

Data analysis was done using SPSS software. Mean and standard deviation was used for continuous variables. Analysis was done by using independent student's' test and Pearson Correlation co-efficient was calculated and P value was established as significant at 5 percent confidence level.

Glycemic control of studied subjects is presented in figure 2-5. Glycemic control with respect to ICO in males ≥0.58 with HbA1c≥7.5% were observed 43.96 5 subjects followed by HbA1c≥ 6.5 -7.5% (22.41%) and HbA1c< 6.5% (7.55%) respectively. More subjects had poor glycemic control with ICO≥0.58. However ICO <0.58 in males had higher percentages of subjects (12.93%) in good glycemic control. Similar observation was not found in females subjects. In males 36.20% subjects had WC>102 cm with poor glycemic control and 4.31% subjects had <102 cm WC with poor glycemic control. In females 36.90% subjects showed WC ≥88 with HbA1c≥7.5% and 1.19% showed WC <88cm with HbA1c≥7.5%.

INTRODUCTION

Defining central obesity, which is a single entity numerous WC cutoffs have been suggested, separately for males and females and various races. We believe that this difference is amendable to differences in their average heights. To quantify proportion of visceral fat in the total body fat, WC alone is not sufficient. Authors hereby hypothesis that Index of central obesity defined by Rakesh et al[1], as a ratio of WC and height is a better parameter of central obesity. National Health and nutrition Examination Survey data base is replacing index of central obesity with waist circumference was found to enhance the specificity and sensitivity of definition of metabolic syndrome[2]. Therefore, the present study was aimed to assess index of central obesity (ICO) and glycemic control among type 2 diabetic patients.

Waist circumference (WC) is globally used as a parameter to quantify central obesity, the key culprit in insulin resistance and related disorders. For defining central obesity, which is a single entity numerous waist circumference cutoffs have been suggested separately for males and females and various races[3]. Authors believe that this difference is amendable to differences in their average heights. To quantify proportion of visceral fat in the total body fat, waist circumference alone is not sufficient. The Index of central obesity (ICO) defined by Parikh et al, as a ratio of waist circumference and height is a better parameter of central obesity[4].

AIMS AND OBJECTIVES

1. To determine the Index of central obesity among type $_2$ diabetes mellitus patients.
2. To correlate the index of central obesity and status of glycemic control among type $_2$ diabetes mellitus patients.

MATERIAL AND METHODS

Study design and setting

A case control cross sectional study was conducted in tertiary care center. Adult patients attending to medicine outpatient department, with the age group of 35-50 years were included in the study. A total of 200 hundred known type 2 diabetes mellitus patients were included in the study. Type1 diabetes mellitus, peripheral vascular disease, acute or chronic infection, cancer, hepatic disease; myocardial infarction were excluded from the study. Written informed consent was obtained from all the subjects.

Study questionnaire

Questionnaire consisted of age, gender, weight, height, body mass index, waist circumference, hip circumference, waist-hip ratio and blood pressure and biochemical investigations like fasting blood glucose, post prandial blood glucose and HbA1c, blood urea and serum creatinine and other bio-physiological parameters.

Demographic details

Demographic variables included in this study were age, gender, educational status, income, locality, marital status, religion and details of family members. Age was recorded by observing the patient identity card. Details of the family members were noted by interview.

Anthropometry measurements

The equipment's used for measuring anthropometric and clinical parameters- the weighing machine, the blood pressure machine and the tape measures was calibrated and certified for their accuracy by central work shop and also inter rater reliability was obtained for each of the parameters. Weight was measured (to the nearest 0.5 kg) with the participant standing motionless on a weighing scale without shoes or any heavy outer garments, and weight equally distributed over each leg. Height was measured(to the nearest 0.1cm) using a standards non-elastic tape measure with the participant standing erect against a wall, without shoes, and the head looking straight. Waist circumference will be measured using a standard non-elastic tape measure (to the nearest 0.1cm). The participant was asked to stand with the arms by the sides and to breathe out normally. Standing to the side of the participant, the inferior margin (lowest point) of the last rib and the crest of the ilium (top of the hip bone) was located and marked with a fine pen. The midpoint between the two was marked and measurement for waist circumference was taken at the level of this midpoint. The hip circumference was measured around the maximum circumference of the hips. Sitting blood pressure was measured using blood pressure machine (to the nearest 1mm Hg). Two readings were taken on left arm at an interval of 10 min. If difference between the two readings was more than10 mm Hg, a third reading of BP was recorded. The mean of 2 (or 3) readings was taken as the final measurement.

Behavioral details

Variables used to describe behavioral characteristics were cigarette smoking, alcohol use, chewing tobacco, diet and physical activity. “Cigarette Smoker” was defined as someone who self-reported smoking 100 or more cigarettes in their lifetime. “Alcohol Use” was defined as the average weekly alcohol consumption, derived from the subjects' responses to drinking questions. Average weekly alcohol consumption was calculated by multiplying the number of days a subject drinks (per week, month, or year), by the average number of drinks during those days, by the unit of time (52 weeks or 12 months or 1 year), and dividing by 52 weeks. Chewing tobacco was taken as duration of consumption. Diet whether the subject is vegetarian or non-vegetarian, if non vegetarian, frequency of consumption. “Physical Activity” was determined using the number of times subjects self-reported specific physical activities at a moderate or vigorous level in the past 30 days. Physical activities included: aerobics, baseball, basketball, bicycling, bowling, dance, fishing, football, gardening, running, sit-ups, skating, stair climbing, stretching, swimming, tennis, treadmill, volleyball, walking, weight lifting, yard work, boxing, yoga, cheerleading/gymnastics, rope jumping, jumping, and other.

Medical history

Medical history included details of both individual and family history of diabetes, heart disease and stroke. Subjects who were previously diagnosed with diabetes or a stroke were coded as having a history of diabetes or history of stroke respectively. The presence of family history included an occurrence of diabetes or heart attack in a biological family member.

Biochemical investigations

Biochemical variables like serum triglyceride, HDL levels and fasting blood glucose and insulin and HbA1c. Fasting blood glucose and post prandial blood pressure was estimated by glucose/oxidase peroxidase-4-aminophenazonephenol; Randox method and HbA1c was analyzed by bio –red method. Serum Urea is estimated by Urease method[5]. Serum Creatinine is measured by enzymatic method using creatinine amid hydrolase[5]. Serum Triglyceride was measured by Glycerol oxidase and peroxidase[6]. Serum Total cholesterol measured by cholesterol oxidase and peroxidase[6].Serum direct HDL was measured by non HDL precipitation method[6].Serum LDL was calculated by using Fried weld's formula[6]. Regular internal quality control was run during the analysis.

STATISTICAL ANALYSIS

Data analysis was done using SPSS software. Mean and standard deviation was used for continuous variables. Analysis was done by using independent student's' test and Pearson Correlation co-efficient was calculated and P value was established as significant at 5 percent confidence level.

RESULTS

The basic demographic factors of males and females are shown in table 1. Total 200 type 2 diabetes mellitus were studied out of which 116 male and 84 female subjects. The mean age for male subjects were 44.65±4.81 and females were 43.80±4.71. 25% subjects had graduation and 3% subjects had education level up to professional course in male subjects. In female subjects high school (24.13%) was the highest education level observed. Most of the study subjects were from rural area in both male and female subjects. Female subjects showed low income (63.33%) levels than male subjects. More than 90% of male subjects had nuclear families than female (67%) subjects.

Behavioral factors of studied subjects were presented in table 2. 33.62% males were current smokers and 1.19% females were current smokers. Alcohol consumption was more in males (>85) and 50% males were on regular consumption of alcohol. Females (67.85%) subjects had higher tobacco chewing than males (26.72%). regular physical activity of study subjects was almost similar in both males (17.24%) and females (16.37%). Only 2.38% females were on vegetarian diet and others on mixed diet and there was no vegan found in males subjects.

Medical history of (Table 3) studied subjects was revealed, history of diabetes >4 years observed in males (54.31%) than females (17.85%). 63.09% of females had history of diabetes between 2-4 years, whereas 27.58% males had 2-4 years of diabetes. Hypertension duration, >4 years was in males (29.31%) compared to females (14.28%). History of heart diseases was more in females (15.47%) than (7.75%) in males. Less than 3% had stroke history in studied subjects. Females had high percentage (66.66%) of family history of diabetes than males (29.31%).

The anthropometric measurements of patients were shown in table 4. The mean weight varies from 65.95±10.92 to 70.72±11.92 and it was highly significant at P<0.05. There was significant difference (p<.001) observed with respect to BMI. The mean WC and HC were males and females 88.79±6.95, 91.47±7.95 and 88.52±8.55, 90.21±10.32 respectively. ICO of mean was more in males .66±.04 than females (.56±.05) and it was significant at p<0.05. There was no significate difference found for NC (P>.004) in males and females. Almost similar skinfold thickness measurements were observed in males and females and were not significant at P<0.05.

Clinical measurements of selected subjects are in table 5. Slightly higher pulse rate was observed in females (80.26±8.02) than males (79.70±7.40), however the difference was not significant. There was not much difference found in blood pressure levels in both males (130.96±16.54/ 83.71±12.23) and females (130.52±16.11/83.05±13.45) in both SBP (Systolic blood pressure) and DBP (diastolic blood pressure). The mean FBS (Fasting Blood Sugar) level was higher in females (219.26±13.18) than males (192.53±100.05) and it was significant. Fasting insulin levels were slightly higher in females (30.34±7.55) than in males 26.94±4.73. The mean total cholesterol (TC) 177.93±63.35 and174.77±56.17, triglycerides172.57±94.42 and183.95±106.41, low density lipoprotein cholesterol (LDL-c) 89.66±25.69 and91.702±37.32, high density lipoprotein cholesterol (HDL-c) 38.77±14.81and43.65±35.60 in males and females respectively and were not significant at P<0.05. The mean renal parameters like uric acid and serum creatinine was observed and mean uric acid was more in males (8.27±10.14 and 1.15±.97) than in females (6.52±8.82 and.79±.33) and significant difference was found between males and females. The mean difference for HbA1c was found highly significant (P<0.000) in males and females.

Glycemic control of studied subjects is presented in figure 1-4. Glycemic control with respect to ICO in males ≥0.58 with HbA1c≥7.5% were observed 43.96 5 subjects followed by HbA1c≥ 6.5 -7.5% (22.41%) and HbA1c< 6.5% (7.55%) respectively. More subjects had poor glycemic control with ICO≥0.58. However ICO <0.58 in males had higher percentages of subjects (12.93%) in good glycemic control. Similar observation was not found in females subjects. In males 36.20% subjects had WC>102 cm with poor glycemic control and 4.31% subjects had <102 cm WC with poor glycemic control. In females 36.90% subjects showed WC ≥88 with HbA1c≥7.5% and 1.19% showed WC <88cm with HbA1c≥7.5%.

Table1. Demographic characteristics of male and female type 2 diabetes mellitus patients

Factors	Males(n=116) Mean ±SD	Females(n=84) Mean ±SD
Age(years)	44.65±4.81	43.80±4.71
Education		
Illiterate	22(18.96)	39(46.42)
Literate	94(81.03)	45(53.52)
Middle school	33(28.44)	29(34.52)
High school	28(24.13)	16(19.04)
Graduation	29(25.00)	-
Professional course	64(3.44)	-
Locality		
Urban	19(16.37)	7(8.33)
Rural	91(78.44)	56(66.66)
Slum	6(5.17)	21(25.00)
Marital status		
Married	105(90.51)	84(100)
Unmarried	2(1.72)	-
Widower	9(7.75)	-
Family income		
<5000	84(72.41)	70(63.33)
5000-10000	21(18.10)	14(16.66)
10000-20000	11(9.48)	-
>20000	3(2.58)	-
Religion		
Hindu	89(76.72)	58(69.04)
Islam	21(18.10)	15(17.85)
Christianity	6(5.17)	11(13.09)
Others	-	--
Type of family		
Nuclear	105(90.51)	57(67.13)
Joint	11(9.12)	27(37.14)

Values in parentheses are percentages.

Table 2 Behavioral factors of male and female type 2 diabetes mellitus patients

Factors	Males(n=116)	Females(n=84)
Smoking		
Never	26(22.41)	81(96.47)
Ex-smoker	51(43.96)	2(2.38)
Current smoker	39(33.62)	1(1.19)
Alcohol		
Never	16(13.79)	72(85.72)
Sporadic	41(35.34)	6(5.17)
Regular	59(50.86)	6(5.17)
Chewing tobacco		
Yes	31(26.72)	57(67.85)
No	85(73.22)	27(32.14)
Physical activity		
Never	31(26.72)	24(28.57)
Sporadic	65(56.03)	41(35.34)
regular	20(17.24)	19(16.37)
Diet		
Vegetarian	-	2(2.38)
Non-vegetarian	99(85.34)	7690.47)
Lactovegetarian	4(3.44)	4(4.76)
Lacto-ovovegetarian	13(11.20)	2(2.38)

Values in parentheses are percentages

Table 3 Medical history of males and female 2 two diabetes mellitus patients

Medical history	Males	Females
History of diabetes		
< 2years	21(18.10)	16(19.04)
2-4	32(27.58)	53(63.09)
>4years	63(54.31)	15(17.85)
Hypertension		
<2years	29(25.00)	-
2-4	53(45.68)	72(85.71)
>4years	34(29.31)	12(14.28)
Heart diseases	9(7.75)	13(15.47)
Stroke	3(2.58)	2(2.38)
Family history of diabetes	34(29.31)	56(66.66)

Values in parenthesis indicate the percentages.

Table 4 Anthropometric measurements of males and female type 2 diabetes mellitus patients

Measurements	Males(n=116) Mean ±SD	Females(n=84) Mean ±SD	p-value
Weight	70.77±11.92	65.95±10.92	.000
Height	164.22±8.79	157.51±7.10	.000
BMI	26.22±3.41	26.67±2.70	.001
WC	88.79±6.95	88.52±8.55	.813
HC	91.47±7.95	90.21±10.32	.051
WHR	.93±.07	1.05±1.00	.004
NC	27.47±5.32	26.63±4.71	0.04
IOC	.66±.04	.56±.05	.001
SFT Biceps	9.30±2.29	9.22±1.09	.768
Triceps	9.48±2.19	9.47±1.39	.744
Suprailiac	9.42±1.53	9.19±.13	.265
Subscapular	9.50±1.83	9.14±1.40	.137

P is less than 0.05 is considered significant

Table 5 shows clinical measurements of males and female type 2 diabetes mellitus patients

Biochemical values	Males(n=116) Mean ±SD	Females(n=84) Mean ±SD	p-value
Pulse rate	79.70±7.40	80.26±8.02	.121
SBP	130.96±16.54	130.52±16.11	.619
DBP	83.71±12.23	83.05±13.45	.853
FBS	192.53±100.05	219.26±13.18	.009
Fasting insulin	26.94±4.73	30.34±7.55	.008
TC	177.93±63.35	174.77±56.17	.716
TG	172.57±94.42	183.95±106.41	.426
LDL-c	89.66±25.69	91.702±37.32	.648
HDL-c	38.77±14.81	43.65±35.60	.023
Uric acid	8.27±10.14	6.52±8.82	.004
Creatinine	1.15±.97	.79±.33	.001
HbA1c	9.79±2.62	9.48±2.70	.000

P is less than 0.05 is considered significant

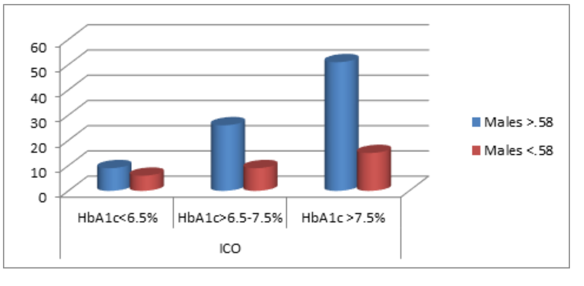

Fig. 1 ICO and glycemic control in selected male subjects

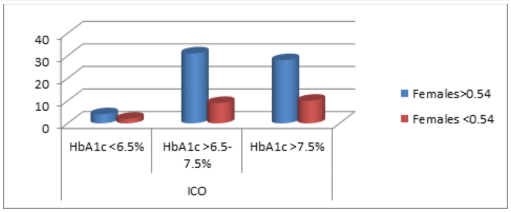

Fig. 2 ICO and glycemic control in selected female subjects

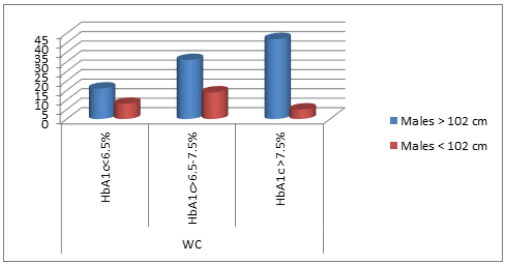

Fig.3 WC and glycemic control in selected male subjects

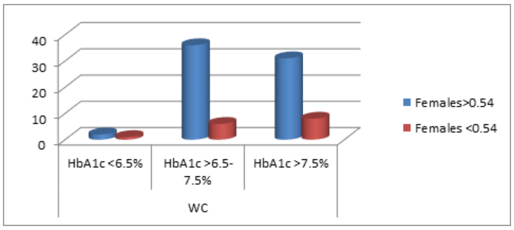

Fig. 4 WC and glycemic control in selected male subjects

DISCUSSION

There is conclusive evidence that obesity located in the central abdominal parts of the body is statistically associated with a number of metabolic derangements such as insulin resistance, hyperinsulinemia, hyperlipidemia and hypertension. Accelerated coronary and peripheral vascular atherosclerosis is one of the most common and serious complications of long term diabetes mellitus[7]. Along with other risk factors including hypertension, smoking and obesity and increasing importance has been given to secondary hyperlipidemia in the causation of accelerated atherosclerosis[8]. Based on results most of them are belong to low socioeconomic status with minimum educational level in both males and females and almost all study subjects belongs to rural areas. In the present study, the mean values for WC was significant (0.813) between males and females (table 4). 76.72% males had WC ≥102 cm and 82.14% females had WC≥88cm (figure 3 and 4) These results indicate that the risk of developing metabolic syndrome is certainly higher in females with the WC 102cm and above[9] .Studies conducted by Wannamethee et al[9] showed WC and BMI are equal predictors of diabetes in men . The mean BMI of males (26.22±3.41) was slightly lower than females (26.67±2.70); however this difference was significant. Significantly higher WHR was observed in females than in males. Similar findings were observed by Shah et al., [10] that the risk of developing diabetes is higher with WHR≥1.0 (Park et al., 2005 [11]) and the results were statistically significant ($p<0.05$). Obesity is a positive risk factor in the development of type 2 Diabetes mellitus, dyslipidemia, insulin resistance and hypertension. Obesity is often expressed in terms of body mass index (BMI) (flier et al., 2005 [12]).The distribution of adipose tissue in different anatomic depots also has substantial implications for morbidity. Specifically, intraabdominal and abdominal subcutaneous fat has more significance than subcutaneous fat present in the buttocks and lower extremities. Determining the waist-to-hip ratio (W/H ratio), most easily makes this distinction[13]. The risk of diabetes increases progressively with increasing body mass index and waist-hip ratio. Weight gain is associated with an increase in insulin resistance and deterioration in glucose tolerance. Mainly the centrally located adipocytes have specific metabolic roles in the pathogenesis of insulin resistance and type 2 diabetes mellitus[14]. Narasimha [14] et al found that, as Waist-Hip (W/H) ratio increases, serum cholesterol and triglyceride levels increases in male type 2 diabetes mellitus patients. In this study we also found highly significant TG and LDL-c values in males and females. Haffner SM[15] et al., in 1987 assessed diabetes and cardiovascular risk factors in Mexican-Americans and found that W/H ratio was associated with type 2 diabetes mellitus rates, low HDL-cholesterol levels and high triglyceride levels. Buynes C [16] et al., studied the sex differences in fat distribution, W/H ratio, serum lipids, and blood pressure, in male and female patients with type 2 diabetes mellitus, and found that men had higher W/H ratio and lower HDL-cholesterol. The SBP observed in our study was not significant, even though it was more in males compared to females. These results are similar to the observations by wei-lian Phan et al[17]. This showed that SBP helps to prevent several metabolic syndrome complications in males. BMI is one of the components which manifest the strongest independent contribution to elevated SBP (≥120mmhg) in males (Rosediani et al., 2006[18]). FI levels were elevated in both males and females, but the levels were found within physiological range. With reference to the mean HbA1c and FBS levels of males were more compared to females. A significant relation between HbA1c and FBS is in agreement with earlier reports (Bonora et al., 1996 [19]).Elevated uric acid is a consistent feature of the insulin resistance syndrome, which are characterized by high plasma insulin levels, blood glucose concentrations and serum triglyceride concentrations and raised BMI and WHR (Johnson et al., 2005[20]). In our study we have observed slightly higher levels of uric acid in males than in females, which may suggest the presence of insulin resistance. The higher values of micro albuminuria were observed in males than in females. Studies conducted by Broch. K et al., have reported an increased prevalence of micro albuminuria in men compared with women(Deckert et al., 1989[21]).The casual risk factors for micro albuminuria are raised blood pressure, and older age, male sex and preexisting retinopathy. Micro albuminuria has also been reported to be associated with generalized vascular disease (Dunn et al., 1988[22]). AER (urinary Albumin Excretion Rate) is most important and should be done frequently but there are gains to be made in predictive precision by considering family history, smoking habits, glycemia, B.P.,BMI and lipid levels. Early screening for insulin resistance and aggressive management of these risk factors is important in optimizing the risk for insulin resistance. We observed significant relation between BMI and WC in males and significantly positive correlation in females (figure 1-4). Several investigators have reported significant correlations between BMI and lipid profiles and suggested the importance for insulin resistance .Along with other risk factors including hypertension, smoking and obesity, the other factors like physical activity, type of diet and alcohol consumption is also increasing importance has been given to secondary hyperlipidemia in the causation of accelerated atherosclerosis. Based on our results, we were unable to support ICO as a better parameter for glycemic control diagnosis compared to WC among studied subjects. Our findings included subjects with ICO or obese WC had elevated risks of raised blood pressure, raised blood glucose, raised triglycerides, and reduced HDL, the association between ICO and glycemic control was not significantly different from WC. The raised blood pressure, raised blood glucose, raised triglycerides, or reduced HDL was not consistently higher in either ICO or WC. Prevalence of ICO increased as age increased, but age did not influence the correlation and association of ICO with glycemic control. Differences of demographic factors, behavioral factors, and medical history were observed in the study subpopulations and gender disparities regarding anthropometric measurements and risk for glycemic control. Prevalence of obesity among the genders on the anthropometric parameter used. Our analysis indicated 33% of men and 37 % of women from our study population were considered obese with a BMI ≥30. Disparities in the prevalence of obese BMI measurements were found in the females but not in the males.

CONCLUSION

Comparing genders, women had higher rates of obesity based on all anthropometric measurements: BMI, WC, and ICO. However, the females had lower rates of metabolic syndrome components (hypertension, elevated triglycerides, and elevated fasting blood glucose), with exception to the higher rates of reduced HDL levels. The lower rates may be contributable to the protective influence of gynoid adiposity on insulin resistance, which is common in the female phenotype. When stratified by ICO status, obese females and obese males had very similar WHtR averages ranging from 0.64 to 0.66. This may indicated that a WHtR is a closer agreement of parameters between genders and may adjust for sexual dimorphism. Having a single WHtR value to measure central obesity in either gender is a plausible concept. The ICO appears to be encompassing the adjustment for the smaller stature. Subjects (particularly males) with an ICO presented higher risks for metabolic syndrome components compared to WC. When age, education, income, smoking status, alcohol use, physical activity, and family history were controlled for, ICO and WC remained a statistical significant indicator in the subjects. These results may be a reflection of the ICO parameters derived from previous studies and national averages. Index of central obesity has a potential to be a better parameter of central obesity. In the present study was observed the relation between IOC and glycemic control and the difference between ICO and WC with glycemic control was not significant. However for better conclusion study should be carried out on large sample size.

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