FREQUENCY OF ABNORMAL WAIST CIRCUMFERENCE AND ASSOCIATED RISK FACTORS IN HEALTHY ADULTS

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ABSTRACT

Objective: *To find out the frequency of central obesity and risk factors for obesity based on waist circumference (WC) in healthy volunteers.*

Material and Methods: *This descriptive cross-sectional study in terms of data collection and analysis was conducted at Hayatabad Medical Complex (HMC) and Welfare Clinics in Peshawar City, from November 2005 till April 2006 (6 months). A convenient sample of 1031 healthy volunteers accompanying their patient to Out Patient Department (OPD), Ward at HMC and at welfare clinics in the city were included in the study. A structured interview questionnaire was administered to all participants and their anthropometric measurements taken in standardized way.*

Results: *Out of 1031 individuals (778 males, 253 females) with mean age of 35.75±13.45 years, the frequency of high waist circumference was 57%, significantly higher in females (89%) compared to males (47%). It increased with age peaking at 49-58 year age group and declining thereafter. Married subjects (67%), illiterates (69%), housewives (96%), car-owners (61%) and hypertensive subjects had significantly higher frequencies of increased waist circumference. Ethnicity (p=0.45), smoking (p=0.36) and awareness of risks (p=0.91) did not show significant association with frequency of increased waist.*

Conclusion: *There is a very high frequency of increased waist circumference particularly among females. There is progressive increase in waist with increasing age with a decline later in life. There is positive association of increased waist with occupation, educational status, use of cars and married marital status. There is no association of high waist with smoking, awareness or ethnicity.*

Keywords: *Obesity, Waist Circumference (WC), Risk Factors.*

INTRODUCTION

Obesity is one of the major public health problems and the most common nutritional disorders. [1-3] Both peripheral and abdominal obesity are associated with non-communicable chronic diseases such as type 2 diabetes mellitus, cardiovascular and cerebrovascular diseases, digestive disorders, and cancer. [4,5] In addition, obesity is also a major independent risk factor for the developmentof hypertension, type II diabetes mellitus, and dyslipidemia. A[6]ccordingto the World Health Organization (WHO) Consultation on Obesity, [7] the incidence of obesity has been increasing rapidly since 1990. The prevalence of obesity is also increasing in many developed countries [8] and developing countries. [9,10] The frequency of obesity in adults is 10% to 25% in most countries of Western Europe where obesity rates in the United States have risen sharply over the past 2 decades. [11,12] By 1999–2000, 64% of adults aged =20 years were classified as overweight and 30% wereclassified as obese. In Middle East countries like Bahrain, Kuwait, and Jordan, prevalence ofobesity is as high as 35% [13], 42% [14] and 49.7% [15], respectively. The prevalence varies not only among regions and countries but also among races and ethnic groups. [6] A commonly used surrogate assessment of obesity is the body mass index (BMI), which is weight in kilograms divided by height in meters squared. This was first described by Quetelet in 1869. [16] It has long been recognized that body mass index (BMI; in kg/m)is [2]

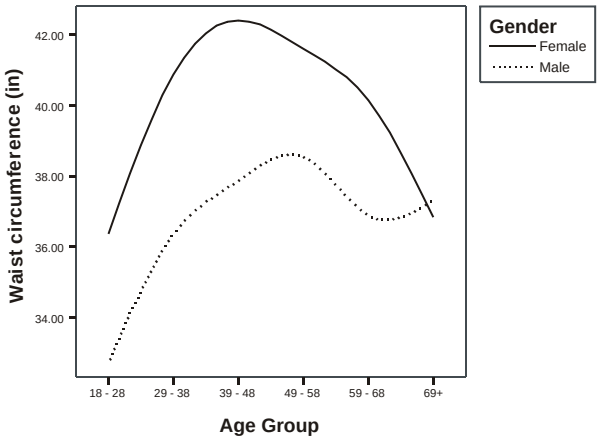

Figure 1

a predictor of the morbidity and mortality that are due tonumerous chronic diseases, including type 2 diabetes, cardiovascular disease (CVD), and stroke. [17,18] In addition, it has been establishedthat abdominal obesity, assessed by waist circumference (WC),predicts obesity-related health risk. [17-20] In fact, recent findingsindicate that WC is a stronger marker of health risk than BMI. [20] The utility of BMI and WC in predicting obesity-related health risk has been recognized by the National Heart, Lung,and Blood Institute (NIH). [18] The NIH guidelines indicate that the health risk increasesin a graded fashion when moving from the normal-weight throughobese BMI categories, and that within each BMI category men and women with high WC values are at a greater health risk thanare those with normal WC values. [18] Thus, it is assumed that BMI and WC have independent effects on obesity-related co morbidity. [21] The association of visceral obesity with diabetes etc is much stronger in Asians & therefore the cut off limit of waist for Asians is lower than the European counterpart. [22] For Asians the waist cut off is 32 and 36 inches in females and males respectively.The National Health Survey of Pakistan [23] represents one of the very few studies available on obesity amongst healthy population in Pakistan and none has been conducted so far in the North West Frontier Province. Therefore we lack adequate and up-to-date data on the demographic pattern and associated risk factors for adults in NWFP, without which a targeted policy for action against this issue is not feasible.

This study was conducted to determine the frequency of abnormal waist circumference and associated right factors in healthy adults.

MATERIAL AND METHODS

Study Area and Study Population

The study was conducted in the outpatient department (OPD) and wards of Hayatabad Medical Complex, Peshawar as well as Welfare Clinics in the city. The study population consisted of healthy adults (18 years & above) accompanying patients to these places, and comprised of individuals belonging to Peshawar district as well as rest of the province and therefore included both rural and urban.

Inclusion criteria: Everyone above 18 years & above who was willing to be assessed was included in the sample.

Exclusion criteria: Anyone less than 18 years old, pregnant ladies or patients having an apparent current medical (other than uncomplicated diabetes & hypertension) or surgical problem (other than hernias)

Instruments

The waist and BP were assessed as per protocol. The interview questionnaire included questions about demographics, educational status, ethnicity, occupation, smoking history, use of vehicle and awareness about being obese and its health risks. Those who did not know about association of obesity with heart disease, stroke, diabetes and hypertension were classified as having inadequate awareness.

FREQUENCY OF HIGH WC BY EDUCATIONAL STATUS (p<0.001

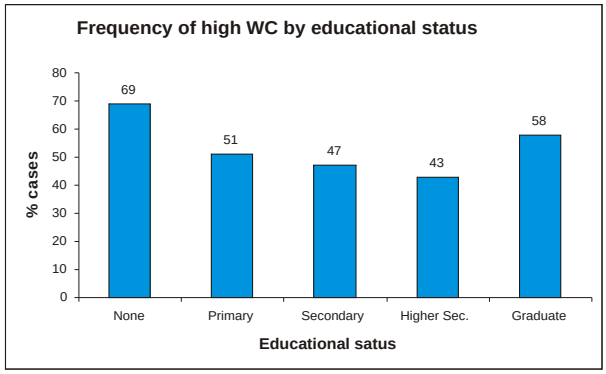

Figure 2

FREQUENCY OF HIGH WC BY OCCUPATION (p<0.001)

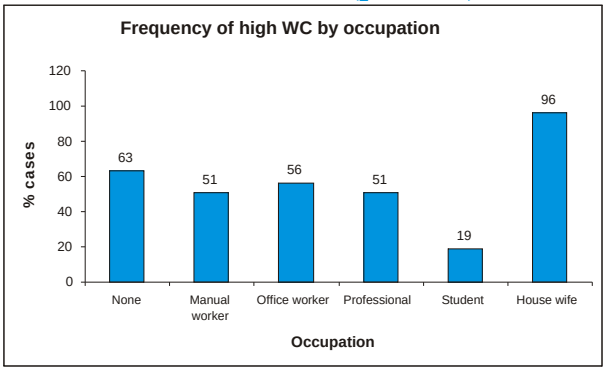

Figure 3

GENERAL CHARACTERISTICS OF THE SAMPLE

	Men (n=778)	Women (n=253)	Total (n=1031)
Age (years)	34.27±13.2	40.30±13.2	35.75±13.45
Height (m)	1.69±0.07	1.54±11.38	1.65±0.10
Weight (kg)	72.94±15.15	73.35±19.92	73.04±16.44
BMI (kg/m2)	25.41±5.19	31.34±10.39	26.87±7.29
WHR	0.91±0.08	0.94±0.09	0.92±0.08
WC (in)	35.25±5.33	40.25±9.90	36.47±7.07
Systolic BP (mmHg)	123.93±15.97	126.50±18.35	124.56±16.61
Diastolic BP (mmHg)	78.95±11.32	80.97±13.00	79.44±11.78
Ethnicity n (%)			
Pakistani	622 (79.9)	161 (63.6)	783 (75.9)
Afghan	156 (20.1)	92 (36.4)	248 (24.1)
Education n (%)			
None	200 (25.7)	170 (67.2)	370 (35.9)
Primary	113 (14.5)	21 (8.3)	134 (13.0)
Secondary	173 (22.2)	26 (10.3)	199 (19.3)
H. Secondary	90 (11.6)	9 (3.6)	99 (9.6)
Graduate	202 (26.0)	27(10.7)	229 (22.2)
Occupation n (%)			
None	112 (14.4)	96 (37.9)	208 (20.2)
Manual worker	201 (25.8)	5 (2.0)	206 (20.0)
Office worker	135 (17.4)	7 (2.8)	142 (13.8)
Professional	261 (33.5)	7 (2.8)	268 (26.0)
Student	69 (8.9)	9 (3.6)	78 (7.6)
House wife	-	129 (51.0)	129 (12.5)
Smoking Hx n (%)			
Active smokers	641 (17.6)	-	137 (13.3)
Non-smokers	137 (82.4)	100 (100)	894 (86.7)
Vehicle usage n (%)			
None	379 (48.7)	187 (73.9)	566 (54.9)
Cycle	103 (13.2)	2 (0.8)	105 (10.2)
Motorcycle	90 (11.6)	5 (2.0)	95 (9.2)
Car	206 (26.5)	59 (23.3)	265 (25.7)
Awareness n (%)			
Inadequate	585 (75.2)	207 (81.8)	792 (76.8)
Good	193 (24.8)	46 (18.2)	239 (23.2)

*Data are means ± SD unless noted otherwise

Table 1

Waist was measured to the nearest 0.5 cm, in light garments at mid point between the last rib & the highest point on the iliac crest at the end of normal inspiration. The arterial blood pressure (BP) was measured at the end of interview by the help of a standard mercury sphygmomanometer with the subject in sitting position. Individuals having a systolic BP of 140 mmHg or more and/or diastolic BP of 90 mmHg or higher, were defined as hypertensive.

Data Management / Validation

Inter-observer studies were carried out. A pilot study on 50 subjects was carried out before the actual study and adjustments in physical arrangements were made. Some changes were also made in the interview questionnaire. Interview forms were coded and double-entered into SPSS/PC version 12.0 (SPSS Inc., Chicago, IL). The files were merged and corrected for errors. All associations were tested for statistical significance

WC VERSUS AGE GROUP (p<0.001)

Waist Group	Age Group (Years) and above						
	18 - 29 (n=395)	30 - 39 (n=241)	40 - 49 (n=190)	50 - 59 (n=122)	60 - 69 (n=60)	70 + (n=23)	Total (n=1031)
Normal	280 (71)	79 (33)	36 (19)	18 (15)	18 (30)	6 (26)	594 (57.6)
High WC	115 (29)	162 (67)	154 (81)	104 (85)	42 (70)	17 (74)	437 (42.4)

Table 2

using Chi-Square test.

Ethical Consideration

Formal ethical approval was obtained from the hospital's Ethical Committee. Verbal consent was obtained from the individuals after giving them all the explanation regarding what was involved in the study. All participants were educated about diseases associated with obesity and were offered written advice on weight management when necessary. They were given a written record of their current waist & ideal waist for the South East Asians. Overweight and obese participants were given detailed advice on exercise and dietary adjustments required for reducing weight and blood glucose testing was advised to screen for the unknown diabetics.

Limitations of the study

Because of the random convenience sampling technique, the findings of this study cannot be generalized to all the population of NWFP. The female sample was considerably small (25%), explaining a low uptake of health care services by females because of the male dominated culture of our society.

Practical Arrangements

All participants were interviewed by doctors. Two separate well-lit rooms, for male and female subjects, were allotted for the purpose of the study at the hospital outpatient department and similar arrangements were made at the welfare clinics in the city. Arrangements for waist measurements were made (as mentioned above). One subject was interviewed in each room at any single time to ensure privacy.

RESULTS

The general characteristics of the sample are described in Table 1. The frequency of high WC in our sample was 594/1031 (57%); it was 225/253 (88.9%) and 396/778 (47%) in females and males respectively (p<0.001). The frequency of high WC also varied significantly with age peaking at 85% in 49-58 years age group (p<0.001) (Table 2). Further examination showed similar trends in both genders with the peak occurring earlier in females (Figure 1). The frequency of central obesity was 518/776 (66.8%) and 76/255 (29.9%) amongst married and unmarried subjects respectively (p<0.001). Ethnically, the frequency did not vary much, being 446/783 (57%) in Pakistani and 148/248 (59.7%) in Afghan individuals (p=0.45). Frequency of high WC was seen to vary significantly with educational status (p<0.001) with 255/370 (68.9%) in illiterates and 132/229 (57.6%) in graduates (Figure 2). It also varied significantly with occupation (p<0.001), with highest frequency in house wives, 124/129 (96.1%), and lowest in students 15/78 (19.2%), (Figure 3). High WC had a frequency of 520/894 (58.2%) and 74/137 (54%) in non-smokers and active smokers respectively (p=0.36). It showed a significant variation in relation to use of vehicle (p<0.001) with high frequencies in car owners and those with no vehicles (Table 3).

Our study did not reveal a significant association between high WC and awareness about obesity and its risk factors (p=0.91), the frequency being 137/239 (57.3%) in those with good awareness and 457/792 (57.7%) in those with inadequate awareness. Frequency of high WC was 229/293 (78.2%) in hypertensive compared to 365/738 (49.5%) in normotensive subjects (p<0.001).

DISCUSSION

Obesity is a common concern in the western world. In Europe, it has been estimated that 10-20% of all men and 15-25% of women are obese.[24] The prevalence of obesity has more than doubled in the UK between 1980 and 1993 and this trend has been uniform for both men and women of all age groups.[25] In United States, the prevalence of high risk waist circumference was found to be approximately 46% in (NHANES 1999 to 2000).[21] In India, the prevalence of obesity has been reported to be 21.5%.[26] In South Korea, the prevalence of overweight has steadily increased (1.3% annually), where obesity has shown a lower prevalence and only a slight increase (0.1%-0.2%) annually.[27] In Turkey, the prevalence of obesity been reported to be 23.5%: 29.4% in women and 16.5% in men. The combined prevalence of both overweight and obesity was 60.3 %.[28] In our study the frequency of central obesity (high WC) was 57%; it was 89% and 47% in females and males respectively (p<0.001), suggesting that obesity is a

WC VERSUS VEHICLE AT HOME (p<0.001)

	Vehicle at home n (%)			
	None (n=566)	Cycle (n=105)	Motorcycle (n=95)	Car (n=265)
Normal	225 (39.8)	65 (61.9)	43 (45.3)	104 (39.2)
High WC	341 (60.2)	40 (38.1)	52 (54.7)	161 (60.8)

Table 3

growing health problem in the developing countries.

Females (89%, mean WC 40.2 inches +SD 9.9) were more likely to have higher WC as compared to males (47%, mean WC 35.2 inches +SD 5.3) with p<0.001. A large Turkish study revealed a similarly high prevalence of central obesity in females compared to males (38.9% versus 18.1%).[28] The high frequency of central obesity in female is probably due to more sedentary life, less likely to do heavy manual work, lack of employment outside the house, less sporting activities and mostly being at home as compared to males. Electricity, tap water and modern transportation (buses and cars) have become available on a large scale, and agriculture is becoming highly mechanized. These changes have been accompanied by an abundance of food. Many women in NWFP observe Purda and stay at home. Traditionally, the locals of this province consider obesity to be a sign of good health and beauty, an attitude that may contribute to the current situation.

There is tendency to become obese with increasing age. In India, there has been continuous increase in the prevalence of obesity with age.[26] In Turkey, age was strongly associated with obesity.[28] Same has been reported by several other studies.[21,29,30] In our study, the frequency of high WC also varied significantly with age peaking at 85% in 49-58 years age-group (p<0.001). Further examination showed similar trends in both genders with the peak occurring earlier in females. The association between obesity and age can be explained, in part, by a decrease in the degree of physical activity with age in men and women.[29,30] In women, pregnancy-related circumstances must be considered as obesity has been shown to increase with the number of pregnancies.[31] Women are also prone to weight gain during menopause. The loss of the menstrual cycle affects calorie intake and slightly lowers metabolic consumption, although most gain weight has been attributed to a reduction in physical activity. Our sample showed a decline in frequency of high WC in later age groups. This decline may be related to different diseases in the elderly and malnutrition. Studies have also shown that the obese have greater mortality in older age and this may also explain the apparent decline in frequency of high WC in later age-groups.[32]

A positive association has been noted between obesity and marital status. Laurier et al., in a comparative survey in France, the United Kingdom, and the United States, have reported that married men or those living as part of a couple are twice as likely to be obese than those living alone.[33] Other researchers using multivariate analysis have reported that the prevalence of obesity in widowed persons is higher than that in single and married ones.[34] Our results were similar to previous results, high WC was found in married (67%) compared to single (30%) (p< 0.001). However, the results may be affected by the younger age group of unmarried sample.

Studies have shown that the prevalence of increased WC varies not only among regions and countries but also among races and ethnic groups.[35] There was statistically insignificant difference in central obesity among Pakistani (57%) and Afghani (60%) ethnic population (P=0.45). Our results are in contrast to a study conducted on children in United States of America[21] & UK[35], where significant differences were evident in body fatness according to gender (p<0.01) and ethnicity (p<0.01). Boys were leaner than girls and black children were leaner than white and Asian children (both p<0.01).[35] The causes for the weak association may be due to similar environmental factors, the same Pushtoon tribes living across the Durand Line (border between Pakistan & Afghanistan) and a small Afghan sample. Perhaps ethnicity plays a little role as compared to environmental factors in the causation of obesity.

Occupation had a strong association with increased WC (p<0.001). The highest WC was among housewives (96%) & those who had no job (63%). Only (19%) students (may be they were young), 51% manual workers & 51% professional had larger waist. In Turkey, women engaged in domestic duties were more often obese than employed women.[28] Performing domestic duties without fixed hours or remuneration, and having a constant access to food, may have contributed to obesity in these women. Our results are similar to other previous studies.[21,29,30]

There was no difference in the WC among

smokers (54%) and non-smokers (58%) (p=0.36) in our study. In Turkey, smokers were thinner than nonsmokers. [28] Similar findings have been seen in other studies, [36,37] although smokers in India constitute a greater percentage of the obese. [38] Smoking cessation usually leads to weight gain and changes in adipose cell metabolism, in particular increases in adipose tissue lipoprotein lipase activity. [39] Also, this trend might be due to the effect of cigarettes on suppressing the appetite.

There was statistically significant association of increase in WC with the presence of vehicle at home. The frequency was high among those who had a car (61%) or a motor cycle (55%) at home as compared to those who had a cycle (38%) or no vehicle (p<0.001). However there was also an unexplained high frequency of central obesity in those with no vehicles (60%). In China, the odds of being obese were 80% higher (p<0.05) for men and women in households who owned a motorized vehicle compared with those who did not own a vehicle. [40]

Majority (76.8%) of our sample cohort was unaware of being obese and the hazards of obesity. In Karachi, awareness was 90%. [37] There was no statistically significant difference of increased WC among those who were aware (57%) of being obese and aware of the hazards of obesity and those who were unaware (58%) in our study (p=0.91).

An inverse association of obesity has been reported with education by others. [29,30] Similar trend was noted in our study, higher waist among illiterate (69%) compared to those who had education up to primary (51%), Secondary (47%), high secondary (43%) & graduation (58%) (p<0.001). This may be due to increase in the household income among the graduates which has shown to be associated with obesity in the developing countries. [41] This is in sharp contrast to the developed countries where there is decrease in the prevalence of obesity with an increase in household income. [33] In the presence of limited awareness increase in income will lead to over expenditure on high caloric foods, this might be cause in our setting. [28]

Our study also showed a significant association of central obesity with hypertensive compared to normotensive subjects (p<0.001). The results are similar to a study conducted in Turkey. [28] Our results are perhaps a confirmation of the well-established relationship between obesity and hypertension.

CONCLUSION

There is a very high frequency of increased waist (central obesity) in our community particularly among females as compared to males. There is progressive increase in waist with increasing age (20-55 years). There is positive association of increased waist with occupation, educational status, presence of vehicles at home and married marital status. There is no association of high waist with smoking, awareness or ethnicity in our study. A much larger community based survey is needed to assess the prevalence and risk factors of obesity.

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