

# PREVALENCE OF OBESITY AND ASSOCIATED RISK FACTORS IN A FEMALE POPULATION OF RURAL PESHAWAR-PAKISTAN

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## ABSTRACT

**OBJECTIVES:** This study was undertaken to find out the prevalence of overweight and obesity, its risk factors, and association with different diseases in the rural females of Peshawar.

**METHODOLOGY:** This cross-sectional survey was conducted in 2010 on 2296 non-pregnant women age 15-70 years. Overweight/obesity was defined as a BMI (body mass index) of > 23 kg/m<sup>2</sup> and obesity as BMI > 27 kg/m<sup>2</sup>. Results are presented as mean+ SD, %ages & odd ratio (OR) with 95% confidence interval (CI) by using EPI-Info 6.0.

**RESULTS:** The overall prevalence of overweight and obesity was 1226 (53.4%) and 619 (26.9%) respectively. Out of 2296 women, 2054 (89.5%) were married females. Obesity was increasing with age. Hypertension and diabetes was three times more prevalent in overweight and obese women as 3.67 (2.62-5.16)  $p < 0.0001$  and 3.77 (1.73-8.46)  $p < 0.0002$  respectively as compared to non obese female. Married women, parity > 5 and low income were significantly associated as 3.46 (2.52-4.77)  $p < 0.0001$ , 1.77 (1.42-2.20)  $p < 0.0001$  and 2.99 (2.22-4.03)  $p < 0.0001$  respectively with increased risk of obesity. More health problems were reported by the obese women

**CONCLUSION:** Obesity among women is a serious problem in this region. Marriage, parity, ageing are responsible for high prevalence of obesity that resulted in high frequency of diseases especially hypertension and diabetes in the female population.

**KEY WORDS:** Body mass index; Overweight / Obesity; Rural women; Peshawar-Pakistan.

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## INTRODUCTION

The prevalence of obesity and overweight has largely increased over the last decades and become a public health problem in both developed and developing countries.<sup>1-3</sup> Overweight, particularly obesity, is a major risk factor

for several important diseases, especially hypertension, coronary artery disease, ischemic stroke and diabetes mellitus.<sup>4,5</sup> An obesity epidemic is reported in the more industrialized and economically developed countries.<sup>6,7</sup> Due to globalization, increasing urbanization, changes in traditional family structures, changes

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in food habits and westernization of food processing,<sup>7-9</sup> developing countries are also increasingly vulnerable to the worldwide epidemic of obesity, which affects men, women including children.<sup>10</sup> Developing countries are increasingly faced with the double burden of hypertension and other cardiovascular diseases, along with infection and malnutrition.<sup>11</sup> Worldwide, about 58% of diabetes mellitus and 21% of ischemic heart disease are attributable<sup>12</sup> to body mass index (BMI) above 21 kg/m<sup>2</sup>. The World Health Organization produced a definition of obesity based on BMI, taking into particular consideration the association between BMI and mortality<sup>13</sup> and has updated recommendations for action to governments, international agencies and concerned partners in the public and private sector.<sup>14</sup>

The relationship between BMI and chronic disease may differ between Indo-Asian and European populations.<sup>1,4,15</sup> Indo-Asian populations are at highest risk for cardiovascular disease, worldwide.<sup>16</sup> The International Association for the Study of Obesity and the International Obesity Task Force have suggested lower BMI cutoff values for the definitions of overweight (23.0–24.9 kg/m<sup>2</sup>) and obesity (25.0 kg/m<sup>2</sup> or greater) in Asian populations.<sup>17,18</sup>

The present study was undertaken with an aim to find out distribution of overweight/ obesity, to determine risk factors and association of different diseases with excessive body weight using the recommended Asian-specific BMI definition (>23 kg/m<sup>2</sup>) for overweight and obesity in the adult rural women of Peshawar.

**METHODOLOGY**

Six villages in the surrounding of Peshawar University were randomly selected and included in the survey during the year 2010. Only those females age 15-70 years were interviewed in a house to house visit who have given the informed verbal consent. All relevant information viz. age, socioeconomic status, family size, marital status, age at marriage, number of children and history of diseases were recorded. Height, weight and blood pressure of respondents was measured using standard methods.

According to the revised criteria for Asian population overweight and obesity was defined as a BMI of 23 kg/m<sup>2</sup> or greater and obesity as a BMI of 27 kg/m<sup>2</sup> or greater<sup>18</sup>. Hypertension was defined as a systolic blood pressure of 140 mm Hg or greater or a diastolic blood pressure of 90 mm Hg or greater or current therapy with antihypertensive medication.

Data was analysed and presented in the form of mean±SD, percentage and crude odd ratios (OR) with 95% confidence interval (CI). For statistical analysis software package EPI-Info version 6.0 was used.

**Ethical approval:** The study did not involve invasive procedures, or personal identifying data. The women were interviewed only for getting information on their socio demographic characteristics/ history of diseases and recording height, weight/ blood pressure. Therefore, it was

not necessary to seek formal external ethical approval. Only verbal consent was taken from participating women. The project team committed to follow all local customs and traditions of the area.

**RESULTS**

A total of 2296 females (excluding pregnant women) were interviewed and investigated during this study. The mean ±SD of socio-demographic, anthro-

**TABLE I: COMPARISON OF POPULATION CHARACTERISTICS IN A FEMALE RURAL POPULATION OF PESHAWAR, PAKISTAN**

Characteristics	Number	Mean	±SD
Population	74918		
House Holds Visited	2008		
Female Interviewed	2296		
Mean Family Size		8.49	4.07
Montly Income (Rupees)			
< 5000	1682(73.3%)		
5000-10000	476(20.8%)		
> 10000	136(5.9%)		
Occupation of Household head			
Govt. servants	654(28.5%)		
Labor	638(27.8%)		
Farmers	1004(43.7%)		
Age (years)		31.8	10.86
Married	2054(89.5%)		
Un-married	242(10.5%)		
Age at marriage		17.00	3.20
Mean No. of Children	8701	5.0(1-13)	2.57
BMI (Kg/m <sup>2</sup> )	2296	24.2	5.2
Overweight/Obese ≥ 23)	1226(53.4%)	28.06	4.13
Overweight (23-26.9)	607(26.4%)	24.84	1.13
Obese (> 27)	619(26.9%)	31.22	3.52
Systolic B.P	2285	116.02	17.39
Diastolic B.P	22.85	74.91	14.47
Hypertensive	237(10.3%)	—	—

**TABLE II: AGE WISE PREVALENCE OF OVERWEIGHT AND OBESITY IN A FEMALE RURAL POPULATION OF PESHAWAR, PAKISTAN**

Age group	Overweight & Obese (n/N)	%	OR (95% CI)	P
15-24	180/598	30.1	3.73 (3.03-4.58)	P < 0.001
25-34	477/867	55.0	1.11 (0.93 -1.32)	P > 0.24
35-44	350/514	68.0	2.21 (1.78 - 2.74)	P < 0.001
45-54	166/220	75.5	2.95 (2.11 -4.12)	P < 0.001
55-64	44/68	64.7	1.62 (0.95 – 2.78)	P < 0.05
≥ 65	9/29	31.0	0.39 (0.16 -0.91)	P < 0.01

P < 0.05 = significant; P < 0.01= more significant; P < 0.001=highly significant

**TABLE III: DISTRIBUTION OF BODY MASS INDEX BY AGE IN A FEMALE RURAL POPULATION OF PESHAWAR, PAKISTAN**

Age groups (years)	Body Mass Index (kg/m <sup>2</sup> )										
	All BMI n	< 23.00		> 23		> 25		> 27		> 30	
		N	%	N	%	n	%	n	%	N	%
15-24	598	418	69.9	79	13.2	48	8.0	28	4.7	25	4.2
25-34	867	390	44.9	128	14.8	102	11.8	129	14.9	118	13.6
35-44	514	164	31.9	76	14.8	78	15.2	82	15.9	114	22.2
45-54	220	54	24.5	35	15.9	37	16.8	35	15.9	59	26.8
55-64	68	24	35.3	8	11.8	12	17.6	9	13.2	15	22.0
> 65	29	20	68.9	3	10.3	1	3.4	4	13.8	1	3.4
Total	2296	1070		329		278		287		332	
Meab		18.92		23.94		25.91		28.34		33.72	
±SD		±1.19		±0.56		±0.57		±0.81		±3.03	
Percentage (%)		46.6		14.3		12.1		12.5		14.5	

**TABLE IV: ASSOCIATION OF OVERWEIGHT AND OBESITY WITH SOCIAL AND CLINICAL CHARACTERISTICS IN A FEMALE RURAL POPULATION OF PESHAWAR, PAKISTAN**

Variables	Overweight (23-26.9 kg/m <sup>2</sup> )				Obesity (>27kg/m <sup>2</sup> )			
	(n/N)	%	OR (95% CI)	Student t' test	(n/N)	%	OR (95% CI)	Student t' test
Married	513/1840	27.9	1.49 (1.15-1.93)	P<0.001	567/1840	30.8	3.46 (2.52-4.77)	P<0.0001
Un married	94/456	20.6	0.67 (0.52-0.87)		52/456	11.4	0.29 (0.21-0.39)	
Low income	241/1682	14.3	0.98 (0.75-1.29)	P > 0.95	557/1815	29.9	2.99 (2.22-4.03)	P<0.0001
Medium	73/478	15.3	1.10 (0.82-1.47)	P > 0.57	609/2271	26.8	0.55 (0.23-1.33)	P > 0.2
High	16/136	11.8	0.79 (0.44-1.38)	P > 0.45	10/25	40	1.82 (0.75-4.35)	P > 0.2
Health Problem	221/329	67.2	0.96 (0.74-1.24)	P > 0.79	654/897	72.9	1.47 (1.21-1.77)	P<0.0005
Family size								
1-8	334/1281	26.0			349/1279	27.3		
> 8	272/1015	26.8	1.04 (0.86-1.26)	P > 0.7	269/1014	26.5	0.96 (0.79-1.17)	P > 0.7
Marriage Age								
< 17	304/1102	27.6			297/987	30.1		
> 17	269/952	28.3	0.96 (0.78-1.19)	P > 0.7	270/852	31.7	1.08 (0.88-1.32)	P > 0.5
Number of children								
< 5	217/767	28.3			187/767	24.4		
> 5	271/983	27.6	0.96 (0.78-1.20)	P > 0.7	357/983	36.3	1.77 (1.42-2.20)	P<0.0001

P < 0.05 = significant; P < 0.01= more significant; P < 0.001=highly significant

pometric and blood pressure variables of the studied population are shown in Table I. The mean age of the respondents was 31.8±10.86 years. The occupation

of majority of the household heads 654(28.5%) were government servants, while 638(27.8%) were labor and remaining were engaged in farming and

private business. The overall prevalence of overweight and obesity was 53.4% (28.06±4.13). The total number of hypertensive individuals was 237(10.3%).

**TABLE V: ASSOCIATION OF OVERWEIGHT AND OBESITY (BMI > 23 KG/M2) WITH CLINICAL CHARACTERISTICS IN THE RURAL WOMEN OF PESHAWAR, PAKISTAN**

Diseases	Total number	Number Overweight	(%)	Unadjusted OR (95% CI)	P
Hypertension	237	187	78.9	3.67 (2.62-5.16)	< 0.0001
No Hypertension	2059	1039	50.5	0.27 (0.19-0.38)	
Diabetes mellitus	47	38	80.9	3.77 (1.73-8.46)	< 0.0002
No Diabetes mellitus	2249	1188	52.8	0.27 (0.12-0.58)	
Cardiovascular diseases	35	26	74.3	2.55 (1.13- 5.94)	< 0.02
No Cardiovascular diseases	2261	1200	53.1	0.39 (0.17-0.88)	
Kidney disease	101	62	61.4	1.41 (0.91- 2.17)	> 0.12
No Kidney disease	2195	1164	53.0	0.71 (0.46-0.71)	
Gastroenteritis	390	260	66.7	1.95 (1.53-2.47)	< 0.0001
No Gastroenteritis	1906	961	50.7	0.51 (0.41-0.65)	
Joints pain	90	56	62.2	1.46 (0.92- 2.31)	> 0.1
No joints pain	2206	1170	53.0	0.69 (0.43-1.09)	
Eye Diseases	72	40	55.6	1.09 (0.66- 1.81)	> 0.8
No Eye diseases	2224	1186	53.3	0.91 (0.55-1.51)	

P < 0.05 = significant; P < 0.01= more significant; P < 0.001=highly significant

The mean BMI increased steadily with increasing age and then decreased gradually. The prevalence of overweight and obesity was highest, 75.5% (95% CI 2.11-4.12) among women aged 45–54 years (Table II).

The prevalence of overweight and obesity according to various BMI cutoff values is represented in Table III. The overall prevalence of obesity according to our study definition was 619 (26.9%) being 12.5% for BMI ≥27 and 14.5% for BMI ≥30 kg/m<sup>2</sup>. Most 59 (26.8%) of the obese women having BMI ≥30 kg/m<sup>2</sup> were lying in the age group of 45-54 years.

Table IV represents different variables tested for any association as a risk factor in the responded women of the region. Marriage, low income and parity ≥5 were significantly associated with increased risk of obesity (OR, 95% CI) calculated as 3.46 (2.52-4.77) p< 0.0001, 2.99 (2.22-4.03) p< 0.0001 and 1.77 (1.42–2.20) p< 0.0001 respectively. No relation was found between the risk of obesity with family size and marriage age

of the women under the study. Health problems were independently associated with overweight or obesity. More health problems were reported by the obese women (OR, 95% CI) as 1.47 (1.21-1.77) p< 0.0005 when compared with the non obese women.

Overweight and obesity was significantly associated with having hypertension, diabetes, cardiovascular diseases and gastroenteritis as 3.67(2.62-5.16) p< 0.0001, 3.77(1.73-8.46) p<0.0002, 2.55(1.13-5.94) p<0.02 and 1.95(1.53-2.47) p<0.0001 respectively in rural females of Peshawar (Table V).

## DISCUSSION

Obesity is globally recognized as a major public health problem.<sup>19</sup> It is a well-known risk factor for hypertension, coronary heart disease, type 2 diabetes mellitus and renal disease.<sup>20-22</sup> In developing countries, due to the change in the lifestyles by people, a sharp rise in morbidity and mortality from cardiovascular diseases, particularly those related to hypertension, have been noted.<sup>23</sup>

The results of this study reveals the magnitude of the problem of obesity in the women of rural area, in which 53.4% (28.06 ± 4.13) of the population aged 15-70 years shows overweight and obesity based on BMI ≥23 kg/m<sup>2</sup>, which is to the study reported from Pakistan<sup>24</sup> and south-east Spain.<sup>25</sup> Majority of females in the study population were housewives and as they have constant access to food, which may contribute to the appearance of overweight and obesity in these women.

The statistical analysis reveals a strong association between age and obesity. Obesity is more prevalent in the women age greater than 35 years, which may be due to a decrease of physical activity with age<sup>26</sup> and with increase in the number of pregnancies<sup>7,27</sup>. Therefore for the same reason married women were found more obese than unmarried women. During the period of menopause women are more vulnerable to weight gain. The loss of the menstrual cycle affects calorie intake and considerably lowers metabolic consumption, although most weight gain has been documented to a

reduction in physical activity.<sup>7</sup> In our study an alarming number (30.1%) of females of the younger age group 15-24 years were overweight that may be attributed to the social restriction of *parda* system in Pathans, which bound the women to go outside for walk, shopping etc and thereof to keep them physically fit. According to National Health Survey of Pakistan (1990-1994) the overall prevalence of overweight and obesity in the general Pakistani population<sup>27</sup>, was 25.0% (95% CI 21.8–28.2%) which has become more than double in the last ten years. This sharp increase in the weight gain may be attributed to, industrialization affecting changes in traditional family structures, lifestyles, physical activity patterns and food habits.

We observed a three times greater prevalence of hypertension and diabetes among overweight/obese women as compared to non obese women, while prevalence of cardiovascular diseases was two times more prevalent in rural women under study, which is comparable to the findings of Shah et al<sup>2</sup> & Jafar et al<sup>4</sup>.

Women in the upper strata of income distribution were not more likely to be overweight. In the low income group women was three time more obese as compared to the women in the medium and high income group. High prevalence of obesity in low income group may be due to the reason of eating more carbohydrates and fats rich diet like bread and rice as compared to the other groups, which seems to be consuming more protein diet and fresh fruits. Usually people living in the rural areas have a piece of land where they mostly grow wheat and rice for their own domestic needs. According to the findings of Drewnowski & Popkin,<sup>28</sup> in low-income countries, increase in prevalence of overweight and obesity has been linked to wider availability of cheap vegetable oils and fats, resultant in higher fat utilization. This finding is in accordance with a study conducted in

high mountain areas of Pakistan<sup>2</sup>, and is in contrast to positive association of income and higher BMI as shown previously for developing countries.<sup>7,29</sup>

Martorell et al<sup>30</sup> reviewed 39 nationally representative surveys data from 38 developing countries and the USA conducted in 1990's, to estimate obesity ( $\geq 30$  kg/m<sup>2</sup>) on 147,938 non-pregnant women age 15-49 years. The percentage of obese women found was 0.1% in South Asia, 2.5% in Sub-Saharan Africa, 9.6% in Latin America and the Caribbean, 15.4% in Central Eastern Europe/Commonwealth of Independent States (CEE/CIS), 17.2% in the Middle East and North Africa, and 20.7% in the USA. In our study obesity  $\geq 30$  kg/m<sup>2</sup> was found in 14.5% rural women as compared to 7.3% reported by Jafar et al,<sup>4</sup> based on National Health Survey of Pakistan (1990-1994).

## CONCLUSION

From present study, it can be concluded that obesity among women is a serious problem in this region and its levels increased over time in the country at varying rates. Marriage, parity and ageing are responsible for high prevalence of obesity that resulted in high frequency of diseases especially hypertension and diabetes in the female population. Changes in traditional family structure, dietary habits, sedentary life styles, may lead to increased levels of obesity in the future.

## RECOMMENDATION

A community-based strategy is required to combat with increasing rate of obesity and its subsequent complications such as diabetes, coronary artery disease, hypertension and osteoarthritis.

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### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

- RN:** Study design, acquisition of data, drafting the manuscript, final approval of the version to be published
- TA:** Concept, drafting the manuscript, final approval of the version to be published
- GL:** Drafting the manuscript, critical revision, final approval of the version to be published
- MAK:** Analysis and interpretation of data, final approval of the version to be published
- JH & HA:** Acquisition of data, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

#### CONFLICT OF INTEREST

Authors declare no conflict of interest

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