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Prevalence and Risk factors, contributing to General , Central and Combined Obesity in women age 30-49 in Balochistan, Pakistan. A cross sectional study.

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ABSTRACT

INTRODUCTION

Globally, obesity is a major health concern. It is a chronic condition caused by excessive fat deposition in body parts(1,2). It is classified into general and central obesity on the basis of fat distribution(2). When body fat accumulates mainly in the buttocks and thigh region, it is called general obesity and when fat accumulates in the abdominal region, it is called central obesity(2). Worldwide, obesity prevalence has doubled since 1990(1). According to the World Health Organization (WHO) in 2022, the global prevalence of overweight and obesity in women aged 18 and older was 44% and 16%, respectively(1). In 2019, obesity caused an estimated five million deaths from non-communicable diseases (NCDs)(1). According to National Nutrition Survey (NNS) 2018, obesity prevalence rose to 37.8%, up from 28% in

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NNS 2011[1].Multiple factors have been described by various scholars, despite inconsistence among them. Obesity prevalence is higher in women who are older(3), married(3), have high parity(4,5), of low socioeconomic status(3), have low education(6), consume excessive calories and junk food(7,8), lead sedentary lifestyle(6), are physically inactive(5,6), and have disturbed sleep(8). Similarly, women in Balochistan, like those in many other regions of Pakistan, lack knowledge about the significance of physical activity and a healthy diet. Furthermore, due to poverty, they often rely on cheap sources of energy instead of consuming fruits and vegetables(10). Additionally, women in this region also tend to have high parity due to cultural and religious beliefs. The risk factors not only contribute to the development of obesity but also increase risk of various chronic conditions. Obesity is a known predisposing factor to various non-communicable diseases (NCDs)(11). General obesity can result in different chronic diseases like cancer, and type 2 diabetes(11,12). Central obesity is strongly associated with cardiovascular disorders, non-alcoholic fatty liver disease (NAFLD)(13,14), various type of cancers(11), and type 2 diabetes(11). When general and central obesity combine, they have synergestic effects on some diseases, such as type 2 diabetes(15). Additionally, in women the risk of stroke and cancer increases when general and central obesity are combined(16,17). Despite the rising burden and health consequences of obesity, studies evaluating the prevalence and risk factors of obesity among women aged 30–49 in Balochistan remain scarce. Therefore, this research specifically focuses on this underexplored age group within the Balochistan region.

AIMS AND OBJECTIVES

- To assess the prevalence of general, central, and combined obesity among women aged 30–49 years in Balochistan.

[1] National Nutrition Survey Pakistan 2018,
Report :(https://www.unicef.org/pakistan/media/1951/file/Final%20Key%20Findings%20Report%202019.pdf)

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- To determine the factors associated with general, central, and combined obesity in this population.

MATERIALS AND METHODS

Study Design

A cross-sectional design was used for evaluation of prevalence and risk factors contributing to general, central and combined obesity in women aged 30-49.

Study Setting

This study was conducted in Bolan Medical Complex Hospital and Civil Hospital, Quetta. These two tertiary care hospitals were the referral centers for patients from all over Balochistan, making them a suitable location for recruiting participants.

Study Population

Women aged 30-49 who visits for routine checkup in outpatient department of Bolan Medical Complex Hospital and civil hospital.

Study Duration

The duration of this study was from November 2024 to July 2025.

Inclusion Criteria

Women aged 30-49 years, residing in Balochistan were included in this study.

Exclusion Criteria

Those women who were pregnant, lactating, or had any eating disorders or chronic disease were excluded.

Sample Size and Technique

After taking 62.7% central obesity prevalence in women from reference study and using WHO-recommended sample size calculator (sample size determination in

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health studies(18)) for estimation a population proportion with specified absolute precision, a sample size of 360 with 5% precision and a 95% confidence interval was recruited through convenience sampling.

Data Collection Tool

Questionnaire: A structured questionnaire was adopted from the literature(19–22). It included questions related to socio-demographic characteristics, lifestyle factors and dietary habits(19–22). The questionnaire was also translated into Pashto and Urdu languages. General and central obesity: BMI (which is calculated as weight in kilograms divided by height in meters square, kg/m²) and waist circumference were used to assess general and central obesity, respectively, as recommended by WHO(23,24), through standardized tools. According to WHO-recommended Asian-Pacific cutoff values(24,25), general obesity was defined as BMI > 25 kg/m² and central obesity was defined as waist circumference > 80 cm.

Statistical Analysis

Data were first encoded into an MS Excel worksheet and then analyzed in SPSS version 31. Descriptive statistics were used to summarize the characteristics of the study population. Means and standard deviations (SD) were reported for continuous variables, while frequencies and percentages were reported for categorical variables. Chi-square and Fisher's exact tests were used to determine the association between categorical variables. Bivariate and multivariate logistic regression analyses were used to examine the association of each independent variable with the dependent variables (general, central, and combined obesity). Crude and adjusted odds ratios with 95% confidence intervals (CI) were reported for the regression analyses. A p-value < 0.05 was considered statistically significant.

Ethical Consideration

The research was conducted according to the guidelines provided by the National Bioethics Committee (NBC), Pakistan. Ethical approval was obtained from Bolan

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University of Health and sciences (BUMHS) ethical approval committee. Only women who were willing to provide information were considered as part of the study. Verbal consent was taken from each woman because majority of them were illiterate and they were assured of complete confidentiality of the information.

RESULT

The study was conducted among 360 women. The mean BMI and WC of the participants were 27.4 ± 6.1 kg/m² and 92.1 ± 16.2 cm, respectively. The prevalence of general obesity was 65.8%, central obesity was 80%, and combined obesity was 65% [Table 1]. Most participants were aged 45–49 years (44.2%). The majority were married (87.5%) and resided in Quetta (65.0%). Most were housewives (77.8%), reported having sufficient income (79.2%), and were uneducated (82.1%). A high proportion of participants had parity greater than three children (76.4%).

The majority were physically active (96.1%). Regarding dietary habits, most reported low intake of both sugar and fats (69.2%), and (82.2%) reported no fast-food consumption in the past week. Many participants had not experienced significant weight gain in recent years (70.8%). Most reported good sleep quality (63.6%) and no history of addiction (72.2%) [Table 2].

Table 1: Prevalence of General, Central, and Combined Obesity

Obesity types	Non-Obese (n, %)	Obese (n, %)
General Obesity	123 (34.2%)	237 (65.8%)
Central Obesity	72 (20%)	288 (80%)
Combined Obesity	126 (35%)	234 (65%)

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A variety of risk factors associated with obesity were studied in the population [Table 2***Table*** 3***Table*** 4]. General obesity was significantly associated with occupation ($p = 0.038$), parity ($p < 0.001$), fast food consumption ($p = 0.001$), self-reported weight gain in recent years ($p < 0.001$), and addiction ($p = 0.032$). No significant associations were found with age, residency, marital status, income level, education, physical activity, dietary intake of sugar and fats, or sleep pattern. Similarly, central obesity showed significant associations with age ($p = 0.007$), marital status ($p < 0.001$), parity ($p < 0.001$), fast food consumption ($p = 0.046$), recent weight gain ($p < 0.001$), and addiction ($p = 0.001$), while no associations were observed with residency, occupation, income, education, physical activity, dietary habits, or sleep. Combined obesity was significantly associated with parity ($p = 0.001$), dietary intake of sugar and fats ($p = 0.039$), fast food consumption ($p = 0.003$), weight gain in recent years ($p < 0.001$), and addiction ($p = 0.023$). No significant associations were found with age, residency, marital status, occupation, income level, education, physical activity, or sleep.

Table 5 presents the association between various risk factors and different types of obesity, using both bivariate and multivariate logistic regression analyses. In the bivariate analysis, general obesity was significantly associated with age 45–49 years (COR: 1.9; 95% CI: 1.07–3.38), being a housewife (COR: 1.7; 95% CI: 1.00–2.98) or unemployed (None) (COR: 5.0; 95% CI: 1.03–24.1), having parity greater than three (COR: 3.7; 95% CI: 1.46–9.45), high dietary intake of both sugar and fat (COR: 2.1; 95% CI: 1.01–4.48), fast food consumption (COR: 3.3; 95% CI: 1.63–6.81), experiencing significant weight gain in recent years (COR: 6.6; 95% CI: 3.41–13.1), and tobacco smoking (COR: 0.4; 95% CI: 0.27–0.83).

In the multivariate analysis, after adjusting for confounding variables, parity greater than three (AOR: 6.7; 95% CI: 1.60–28.7), fast food consumption (AOR: 3.8; 95% CI: 1.64–8.82), experiencing significant weight gain in recent years (AOR: 8.7; 95% CI: 4.07–18.5), and tobacco smoking (AOR: 0.4; 95% CI: 0.20–0.88) remained statistically significant, while being physically active emerged as a protective factor (AOR: 0.1; 95% CI: 0.01–0.78).

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Table 2:Association of Population Characteristics with General Obesity

	General Obesity			
Factors	**Non-Obese (n, %)**	**Obese (n, %)**	**Total**	**p value**
Age				
30-34	33(9.2)	40(11.11)	73(20.3)	0.156
35-39	18(5)	35(9.7)	53(14.7)	
40-44	24(6.7)	51(14.2)	75(20.8)	
45-49	48(13.3)	111(30.8)	159(44.2)	
Total	123(34.2)	237(65.8)	360(100)	
Residency				
Quetta	83(23.1)	151(41.9)	234(65)	0.477
Outside Quetta	40(11.1)	86(23.90	126(35)	
Total	123(34.2)	237(65.8)	360(100)	
Marital Status				
Single	9(2.5)	10(2.8)	19(5.3)	0.167
Married	102(28.3)	213(59.2)	315(87.5)	
Widow/Divorced	12(3.3)	14(3.9)	26(7.2)	
Total	123(34.2)	237(65.8)	360(100)	
Occupation				
Housewife	91(25.3)	189(52.5)	280(77.8)	0.038*
Other	30(8.3)	36(10)	66(18.3)	
None	2(0.6)	12(3.3)	14(3.9)	
Total	123(34.2)	237(65.8)	360(100)	

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Income Level				
Insufficient	18(5)	29(8.1)	47(13.1)	0.408
Sufficient	99(27.5)	188(52.2)	287(79.9)	
>Sufficient	6(1.7)	20(5.6)	26(7.2)	
Total	123(34.2)	237(65.8)	360(100)	
Education Level				
Uneducated	101(28.1)	191(53.1)	292(81.1)	0.726
Educated	22(6.1)	46(12.8)	68(18.9)	
Total	123(34.2)	237(65.8)	360(100)	
Parity				
0	12(3.3)	8(2.2)	20(5.6)	0.000*
1	10(2.8)	6(1.7)	16(4.4)	
2	12(3.3)	8(2.2)	20(5.6)	
3	10(2.8)	19(5.3)	29(8.1)	
>3	79(21.9)	196(54.4)	275(76.4)	
Total	123(34.2)	237(65.8)	360(100)	

(continued)

Table 2:(continued)

	General Obesity			
Factors	**Non-Obese (n, %)**	**Obese (n, %)**	**Total**	**p value**
Physical activity level in daily routine				
Physically inactive (Rest or sit during day time/little physical movement)	2(0.6)	12(3.3)	14(3.9)	0.15
Physically active (Household chores/demanding tasks like farming, fetching water)	121(33.6)	225(62.5)	346(96.1)	
Total	123(34.2)	237(65.8)	360(100)	
Intake of sugar and fats				
High intake of both	10(2.8	379(10.3)	47(13.1)	0.067
High sugar intake	16(4.4)	21(5.8)	37(10.3)	
High fat intake	6(1.7)	21(5.8)	27(7.5)	
Low intake of both	91(25.3)	158(43.9)	249(69.2)	
Total	123(34.2)	237(65.8)	360(100)	
Fast food consumption				

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in past 7 days				
No	113(31.4)	183(50.8)	296(82.2)	0.001*
Yes	10(2.8)	54(15)	64(17.8)	
Total	123(34.2)	237(65.8)	360(100)	
Have you experienced significant				
Weight gain in past few years				
No	112(31.1)	143(39.7)	255(70.8)	0.000*
Yes	11(3.1)	94(26.1)	105(29.2)	
Total	123(34.2)	237(65.8)	360(100)	
Sleep pattern				
Good	82(22.8)	147(40.8)	229(63.6)	0.385
Poor	41(11.4)	90(25)	131(36.4)	
Total	123(34.2)	237(65.8)	360(100)	
Any Addiction				
Naswar	13(3.6)	25(6.9)	38(10.6)	0.032*
Tobacco smoke	30(8.3)	32(8.9)	62(17.2)	
None	80(22.2)	180(50)	260(72.2)	
Total	123(34.2)	237(65.8)	360(100)	

Table 3: Association of Population Characteristics with Central Obesity

	Central Obesity			
Factors	**Non-Obese (n, %)**	**Obese (n, %)**	**Total**	**p value**
Age				
30-34	25(6.9)	48(13.3)	73(20.3)	0.007*
35-39	9(2.5)	44(12.2)	53(14.7)	
40-44	14(3.9)	61(16.9)	75(20.8)	
45-49	24(6.7)	135(37.5)	159(44.2)	
Total	72(20)	288(80)	360(100)	
Residency				
Quetta	49(13.3)	185(51.4)	234(65.0)	0.543
Outside Quetta	23(6.4)	103(28.6)	126(35)	
Total	72(20)	288(80)	360(100)	

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Marital Status				
Single	8(2.2)	11(3.1)	19(5.1)	0.000*
Married	53(14.7)	262(72.8)	350(87.5)	
Widow/Divorced	11(3.1)	15(4.2)	26(7.2)	
Total	72(20)	288(80)	360(100)	
Occupation				
Housewife	54(15)	226(62.8)	280(77.8)	0.813
Other	15(4.2)	51(14.2)	66(18.3)	
None	3(0.8)	11(3.1)	14(3.9)	
Total	72(20)	288(80)	360(100)	
Income Level				
Insufficient	9(2.5)	38(10.6)	47(13.1)	0.514
Sufficient	60(16.7)	227(63.1)	287(79.7)	
>Sufficient	3(0.8)	23(6.4)	26(7.2)	
Total	72(20)	288(80)	360(100)	
Education Level				
Uneducated	61(16.9)	231(64.2)	292(81.1)	0.381
Educated	11(3.1)	57(15.8)	68(18.9)	
Total	72(20)	288(80)	360(100)	
Parity				
0	9(2.5)	11(3.1)	20(5.6)	0.000*
1	7(1.9)	9(2.5)	16(4.4)	
2	7(1.9)	13(3.6)	20(5.6)	
3	7(1.9)	22(6.1)	29(8.1)	
>3	42(11.7)	233(64.7)	275(76.4)	
Total	72(20)	288(80)	360(100)	

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Table 3: (continued)

Factors	Central Obesity: Non-Obese (n, %)	Obese (n, %)	Total	p value
Physical activity level in daily routine				
Physically inactive (Rest or sit during day time/little physical movement)	3(0.8)	11(3.1)	14(3.9)	1.00
Physically active (Household chores/demanding tasks like farming, fetching water)	69(19.2)	277(76.9)	346(96.1)	
Total	72(20)	288(80)	360(100)	
Intake of sugar and fats in food				
High intake of both	7(1.9)	40(11.1)	47(13.1)	0.070
High sugar intake	12(3.3)	25(6.9)	37(10.3)	
High fat intake	2(0.6)	25(6.9)	27(7.5)	
Low intake of both	51(14.2)	198(55)	249(69.2)	
Total	72(20)	288(80)	360(100)	
Fast food consumption in past 7 days				
No	65(18.1)	231(64.2)	296(82.2)	0.046*
Yes	7(1.9)	57(15.8)	64(17.8)	
Total	72(20)	288(80)	360(100)	
Have you experienced significant Weight gain in past few years				
No	65(18.1)	190(52.8)	255(70.8)	0.000*
Yes	7(1.9)	98(27.2)	105(29.2)	
Total	72(20)	288(80)	360(100)	
Sleep pattern				
Good	45(12.5)	184(51.1)	229(63.6)	0.827
Poor	27(7.5)	104(28.9)	131(36.4)	
Total	72(20)	288(80)	360(100)	
Any Addiction				
Naswar	8(2.2)	30(8.3)	38(10.6)	0.001*
Tobacco smoke	23(6.4)	39(10.8)	62(17.2)	
None	41(11.4)	219(60.8)	260(72.2)	

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Total	72(20)	288(80)	360(100)

Table 4: Association of Population Characteristics with Combined Obesity

Factors	Combined Obesity			
	Non-Obese (n, %)	Obese (n, %)	Total	p value
Age				
30-34	34(9.4)	39(10.8)	73(20.3)	0.131
35-39	18(5)	35(9.7)	53(14.7)	
40-44	25(6.9)	50(13.9)	75(20.8)	
45-49	49(13.6)	110(30.6)	159(44.2)	
Total	126(35)	234(65)	360(100)	
Residency				
Quetta	86(23.9)	148(41.1)	234(65)	0.342
Outside Quetta	40(11.1)	86(23.9)	126(35)	
Total	126(35)	234(65)	360(100)	
Marital Status				
Single	9(2.5)	10(2.8)	19(5.3)	0.111
Married	104(28.9)	211(58.6)	315(87.5)	
Widow/Divorced	13(3.6)	13(3.6)	26(7.2)	
Total	126(35)	234(65)	360(100)	
Occupation				
Housewife	93(25.8)	187(51.9)	280(77.8)	0.096
Other	30(8.3)	36(10)	66(18.3)	
None	3(0.8)	11(3.1)	14(3.9)	
Total	126(35)	234(65)	360(100)	
Income Level				
Insufficient	18(5)	29(8.1)	47(13.1)	0.389
Sufficient	102(28.3)	185(51.4)	287(79.7)	
>Sufficient	6(1.7)	20(5.6)	26(7.2)	
Total	126(35)	234(65)	360(100)	
Education Level				
Uneducated	103(28.6)	189(52.5)	292(81.1)	0.821
Educated	23(6.4)	45(12.5)	68(18.9)	
Total	126(35)	234(65)	360(100)	

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Parity				
0	12(3.3)	8(2.2)	20(5.6)	0.001*
1	10(2.8)	6(1.7)	16(4.4)	
2	12(3.3)	8(2.2)	20(5.6)	
3	10(2.8)	19(5.3)	29(8.1)	
>3	82(22.8)	193(53.6)	275(76.4)	
Total	126(35)	234(65)	360(100)	

(continued)

Table 4: (continued)

	Combined Obesity			
Factors	**Non-Obese (n, %)**	**Obese (n, %)**	**Total**	**p value**
Physical activity				
Physically inactive (Rest or sit during day time/little physical movement)	3(0.8)	11(3.1)	14(3.9)	0.395
Physically active (Household chores/demanding tasks like farming, fetching water)	123(34.2)	223(61.9)	346(91.1)	
Total	126(35)	234(65)	360(100)	
Intake of sugar and fats in food				
High intake of both	10(2.84)	37(10.3)	47(13.1)	0.039*
High sugar intake	17(4.7)	20(5.6)	37(10.3)	
High fat intake	6(1.7)	21(5.8)	27(7.5)	
Low intake of both	93(25.8)	156(43.3)	249(69.2)	
Total	126(35)	234(65)	360(100)	
Fast food consumption in past 7 days				
No	114(31.7)	182(50.6)	296(82.2)	0.003*
Yes	12(3.3)	52(14.4)	64(17.8)	
Total	126(35)	234(65)	360(100)	
Have you experienced significant Weight gain in past few years				
No	114(31.7)	141(39.2)	252(70.8)	0.000*
Yes	12(3.3)	93(25.8)	105(29.2)	
Total	126(35)	234(65)	360(100)	
Sleep pattern				

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Good	83(23.1)	146(40.6)	229(63.6)	0.513
Poor	43(11.9)	88(24.4)	131(36.4)	
Total	126(35)	234(65)	360(100)	
Any Addiction				
Naswar	13(3.6)	25(6.9)	38(10.6)	0.023*
Tobacco smoke	31(8.6)	31(8.6)	62(17.2)	
None	82(22.8)	178(49.4)	260(72.2)	
Total	126(35)	234(65)	360(100)	

Similarly, central obesity was significantly associated in bivariate analysis with age groups 35–39 years (COR: 2.5; 95% CI: 1.07–6.04), 40–44 years (COR: 2.2; 95% CI: 1.06–4.83), and 45–49 years (COR: 4.7; 95% CI: 2.05–10.9), marital status (COR: 3.5; 95% CI: 1.38–9.36), parity greater than three (COR: 4.5; 95% CI: 1.77–11.6), self-reported significant weight gain in recent years (COR: 4.7; 95% CI: 2.11–10.8), and tobacco smoking (COR: 0.3; 95% CI: 0.17–0.58).

In the multivariate logistic regression model, after adjusting for confounding variables, age 35–39 years (AOR: 2.7; 95% CI: 1.04–7.26), 40–44 years (AOR: 2.6; 95% CI: 1.08–6.42), and 45–49 years (AOR: 4.7; 95% CI: 2.05–10.9), parity greater than three (AOR: 9.4; 95% CI: 2.20–40.1), self-reported weight gain in recent years (AOR: 5.9; 95% CI: 2.36–14.9), and tobacco smoking (AOR: 0.3; 95% CI: 0.14–0.64) remained statistically significant predictors of central obesity.

Combined obesity was significantly associated in bivariate analysis with age 45–49 years (COR: 1.9; 95% CI: 1.10–3.46), parity greater than three (COR: 3.5; 95% CI: 1.39–8.95), high dietary intake of both sugar and fat (COR: 2.2; 95% CI: 1.04–4.64), fast food consumption (COR: 2.7; 95% CI: 1.38–5.30), self-reported significant weight gain in recent years (COR: 6.2; 95% CI: 3.27–12.0), and tobacco smoking (COR: 0.4; 95% CI: 0.26–0.80).

In the multivariate logistic regression model, after adjusting for confounding variables, age 45–49 years (AOR: 2.1; 95% CI: 1.06–4.47), parity greater than

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three (AOR: 6.6; 95% CI: 1.56–27.8), fast food consumption (AOR: 2.9; 95% CI: 1.33–6.38), self-reported weight gain in recent years (AOR: 8.1; 95% CI: 3.89–17.1), and tobacco smoking (AOR: 0.4; 95% CI: 0.20–0.87) remained statistically significant predictors of combined obesity.

DISCUSSION

This study found a high prevalence of general (65.8%), central (80%), and combined obesity (65%) among women in Balochistan—substantially higher than previous figures from Pakistan, such as 5-22% general obesity reported in Lasbela(26) and 52% overweight/obesity among ever-married women aged 15-49 years in the national DHS 2017_18 data[i]. Similar upward trends in overweight/obesity have been noted across South Asia(27), reflecting a growing regional health concern.

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Table 5: Assessment of the Factors Associated with General, Central and Combined Obesity by Bivariate and Multivariate Logistic Regression Analysis

	General Obesity		Central Obesity		Combined Obesity	
Factors	**COR (95%CI)**	**AOR (95%CI)**	**COR (95%CI)**	**AOR (95%CI)**	**COR (95%CI)**	**AOR (95%CI)**
Age						
30-34	Ref	Ref	Ref	Ref	Ref	Ref
35-39	1.6 (0.77-3.33)	1.6 (0.70-3.87)	2.5 (1.07-6.04)*	2.7 (1.04-7.26)*	1.6 (0.81-3.52)	1.7 (0.75-4.06)
40-44	1.7 (0.89-3.42)	1.6 (0.73-3.64)	2.2 (1.06-4.83)*	2.6 (1.08-6.42)*	1.7 (0.89-3.39)	1.6 (0.75-3.62)
45-49	1.9 (1.07-3.38)*	2.0 (0.98-4.21)	2.9 (1.53-5.61)**	4.7 (2.05-10.9)***	1.9 (1.10-3.46)*	2.1 (1.06-4.47)*
Residency						
Quetta	Ref	Ref	Ref	Ref	Ref	Ref
Outside Quetta	1.1 (0.74-1.87)	1.1 (0.67-2.1)	1.1 (0.68-2.05)	1.0 (0.55-2.11)	1.2 (0.78-1.97)	1.2 (0.70-2.16)
Marital Status						
Single	Ref	Ref	Ref	Ref	Ref	Ref
Married	1.8 (0.74-4.76)	Not included	3.5 (1.38-9.36)**	Not included	1.8 (0.72-4.63)	Not included
Widow/Divorced	1.0 (0.32-3.43)		0.9 (0.29-3.28)		o.9 (0.27-2.94)	
Occupation						
Other	Ref	Ref	Ref	Ref	Ref	Ref
Housewife	1.7 (1.00-2.98)*	1.9 (1.00-3.86)	1.2 (0.64-2.35)	1.1 (0.54-2.55)	1.6 (0.97-2.88)	1.8 (0.95-3.62)

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None	5.0 (1.03-24.1)*		1.0 (0.26-4.37)		3.0 (0.78-11.9)	
Income Level						
Insufficient	Ref	Ref	Ref	Ref	Ref	Ref
Sufficient	1.1 (0.62-2.22)	1.0 (0.51-2.31)	0.8 (0.41-1.95)	0.6 (0.27-1.66)	1.1 (0.59-2.12)	1.0 (0.49-2.16)
>Sufficient	2.0 (0.69-6.12)	2.9 (0.72-11.9)	1.8 (0.44-7.40)	1.1 (0.20-6.59)	2.0 (0.69-6.12)	2.7 (0.69-10.9)
Education Level						
Uneducated	Ref	Ref	Ref	Ref	Ref	Ref
Educated	1.1 (0.63-1.94)	0.7 (0.35-1.68)	1.3 (0.67-2.76)	1.3 (0.54-3.44)	1.0 (0.61-1.86)	0.7 (0.34-1.56)

(continued)

Table 5: (Continued**)**

	General Obesity		Central Obesity		Combined Obesity	
Factors	**COR (95%CI)**	**AOR (95%CI)**	**COR (95%CI)**	**AOR (95%CI)**	**COR (95%CI)**	**AOR (95%CI)**
Parity						
0	Ref	Ref	Ref	Ref	Ref	Ref
1-3	1.5 (0.55-4.28)	2.3 (0.52-10.9)	1.7 (0.61-4.76)	3.8 (0.81-18.2)	1.5 (0.55-4.28)	2.7 (0.59-12.4)
>3	3.7 (1.46-9.45)**	6.7 (1.60-28.7)**	4.5 (1.77-11.6)**	9.4 (2.20-40.1)**	3.5 (1.39-8.95)**	6.6 (1.56-27.8)*
Physical activity level in daily routine						
Physically inactive	Ref	Ref	Ref	Ref	Ref	Ref
Physically active	0.3 (0.06-1.40)	0.1 (0.01-0.78)*	1.0 (0.29-4.03)	0.9 (0.16-5.20)	0.4 (0.13-1.80)	0.2 (0.04-1.20)
Intake of sugar and fats						
Low intake of both	Ref	Ref	Ref	Ref	Ref	Ref
High intake of both	2.1 (1.01-4.48)*	1.4 (0.62-3.52)	1.4 (0.62-3.47)	1.0 (0.37-2.73)	2.2 (1.04-4.64)*	1.5 (0.67-3.78)

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High sugar intake	0.7 (0.37-1.52)	0.7 (0.30-1.63)	0.5 (0.25-1.14)	0.4 (0.20-1.24)	0.7 (0.35-1.40)	0.6 (0.28-1.49)
High fat intake	2.0 (0.78-5.17)	1.8 (0.64-5.61)	3.2 (0.73-14.0)	3.1 (0.59-16.2)	2.0 (0.81-5.35)	2.0 (0.68-5.90)
Fast food consumption in past 7 days						
No	Ref	Ref	Ref	Ref	Ref	Ref
Yes	3.3 (1.63-6.81)**	3.8 (1.64-8.82)**	2.2 (0.99-5.26)	2.5 (0.98-6.66)	2.7 (1.38-5.30)**	2.9 (1.33-6.38)**
Experiencing significant weight gain in past years						
No	Ref	Ref	Ref	Ref	Ref	Ref
Yes	6.6 (3.41-13.1)***	8.7 (4.07-18.5)***	4.7 (2.11-10.8)***	5.9 (2.36-14.9)***	6.2 (3.27-12.0)***	8.1 (3.89-17.1)***
Sleep pattern						
Good	Ref	Ref	Ref	Ref	Ref	Ref
Poor	1.2 (0.77-1.93)	1.0 (0.63-1.88)	0.9 (0.55-1.60)	0.7 (0.39-1.42)	1.1 (0.73-1.83)	1.0 (0.59-1.76)

(continued)

Table 5: (Continued**)**

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	General Obesity		Central Obesity		Combined Obesity	
	COR (95%CI)	**AOR (95%CI)**	**COR (95%CI)**	**AOR (95%CI)**	**COR (95%CI)**	**AOR (95%CI)**
Any Addiction						
None	Ref	Ref	Ref	Ref	Ref	Ref
Naswar	0.8 (0.41-1.75)	0.8 (0.35-1.87)	0.7 (0.30-1.64)	0.6 (0.26-1.82)	0.8 (0.43-1.81)	0.8 (0.38-2.00)
Tobacco smoke	0.4 (0.27-0.83)**	0.4 (0.20-0.88)*	0.3 (0.17-0.58)***	0.3 (0.14-0.64)**	0.4 (0.26-0.80)**	0.4 (0.20-0.87)*

NOTE: COR (crude odd ratio), AOR (adjusted odd ratio), CI (confidence interval), Ref (reference), *p-value<0.05, **p-value<0.01, ***p-value<0.001

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Age was significantly associated with all obesity types, especially among women aged 45–49 years. This supports findings from other Pakistani and low- and middle-income countries (LMIC) studies that observed positive association between age and obesity(6,9,28). This trend is often explained by physiological changes associated with aging, such as reduced basal metabolic rate, decreased physical activity, and hormonal shifts(29,30). The notable association between central obesity and younger women (35–44 years) may reflect early abdominal fat accumulation that could increase future cardiometabolic risk in this age group.

Parity greater than three was also strongly associated with all three types of obesity, with adjusted odds ratios ranging from 6.6 to 9.4. This finding may be explained by the hypothesis that repeated pregnancies may contribute to long-term weight retention and altered fat distribution, particularly in the abdominal region. Similar associations have been reported in regional studies from South Asia(4,22,31).

Dietary patterns played an important role in obesity risk. High intake of fast food was a strong and significant predictor of both general and combined obesity, while high intake of both sugar and fat was associated with obesity in bivariate analysis but lost significance after adjustment. These findings suggest that frequent consumption of calorie-dense, processed foods may be key contributors to weight gain. Similar findings have been reported in other studies, particularly in South Asian populations, where unhealthy dietary habits have been linked to increased obesity risk(8,32,33). Public health strategies that promote healthy eating habits and reduce the consumption of processed foods could therefore be effective in preventing obesity-related complications.

Recent self-reported weight gain emerged as one of the strongest predictors of obesity, particularly general and combined types, with adjusted odds ratios exceeding 8. This finding is consistent with previous studies that have shown self-

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perceived or recent weight gain to be indicator of obesity risk(34). This emphasizes the importance of weight monitoring and early intervention in women experiencing noticeable weight gain.

Interestingly, tobacco smoking was found to be negatively associated with all forms of obesity. This inverse association has also been reported in several other studies(8,9). One possible explanation is that nicotine, a major component of tobacco, may suppress appetite and increase metabolic rate, leading to reduced caloric intake and body weight(35).

An important finding was that being physically active (defined as engaging in household chores or demanding activities such as farming or fetching water etc.) was protective against general obesity. This is in consistent with global evidence that even non-leisure forms of physical activity, such as domestic work, can contribute significantly to energy expenditure in low-resource settings(21).

Some variables such as education level, household income, and sleep quality were not significantly associated with general, central, or combined obesity at any stage of analysis which is in contrast with many other studies. This may be due to the relatively homogenous nature of the study population in terms of these characteristics or due to their indirect influence through other factors. Although marital status showed a significant association with obesity in the chi-square test and bivariate logistic regression, it was not included in the final multivariate model, due to multicollinearity with other demographic variables such as parity. As a result, its independent effect could not be assessed in the adjusted analysis.

Conclusion

This study provides important insight into the prevalence and risk factors of general, central, and combined obesity among women in Balochistan. The key factors implicated in obesity include age, parity, unhealthy dietary habits, physical inactivity, and recent weight gain. This study will be valuable for health educators to raise awareness about contributing factors. Additionally, health policymakers

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can utilize this region-specific data to modify their policies, ultimately contributing to the prevention and control of obesity in Balochistan.

Limitations

The use of convenience sampling may restrict the generalizability of the findings, and the cross-sectional study design prevents conclusions about causality. To strengthen the evidence, future studies should use probability-based sampling and a cohort study design to establish temporal and causal relationships between risk factors and obesity.

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[i] Pakistan Demographic and Health Survey 2017-18 [FR354]
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