

Research Article

Obesity Profile among Doctors in a Tertiary Care Hospital of Karachi, Pakistan

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Abstract: Background: Obesity increases the risk of non-communicable diseases worldwide. Obesity also affects populations in Pakistan, and South Asian populations can develop cardiometabolic risk at lower body mass index levels. Young doctors face several challenges which can lead to weight gain. However, local data on obesity among young doctors remain limited.

Objective: To determine the profile of obesity and explore associated factors among doctors in a tertiary care hospital of Karachi, Pakistan.

Materials and Methods: This cross-sectional study was conducted at National Medical Centre, Karachi, Pakistan, from 16th January 2026 to 31st March 2026. Ethical approval was obtained from the institutional ethical review committee (ERC Number: 005/2026 NMC, dated: 15th January, 2026) before commencement of the study. Doctors were recruited through non-probability consecutive sampling. Height and weight were measured and BMI was classified using Asian BMI criteria. Of 142 participants initially enrolled, 99 remained in the final cleaned analytic cohort after exclusion of incomplete records. Categorical comparisons, logistic regression, false discovery rate adjustment, and Firth penalized logistic regression were used as appropriate.

Results: Among 99 participants, 63 (63.6%) were females. The median BMI was 23.1 kg/m² (IQR 20.6-27.7), while 38 (38.4%) participants were obese and 54 (54.5%) were overweight or obese. In comparisons between normal-weight and obese participants, irregular eating was significantly more common among obese participants (50.0% vs. 25.0%, $p=0.039$), and immediate family history of obesity was also significantly more frequent (44.7% vs. 17.5%, $p=0.009$). Previous obesity diagnosis, self-perception of being overweight, current weight-loss attempts, and dietary modification were more frequent among obese participants. In univariable logistic regression, male sex, married status, and immediate family history of obesity showed nominal associations, although none remained significant after false discovery rate correction. In multivariable analysis, male sex remained independently associated with obesity (aOR 3.29, 95% CI 1.27-8.83, $p=0.015$).

Conclusion: Obesity and excess weight were common among young doctors in this hospital. Male sex was the only statistically significant independent factor associated with obesity in the final multivariable model, while family history showed a clinically important but borderline association. This stresses the importance of conducting larger studies to better understand the factors leading to obesity in this population.

Keywords: Body mass index, Obesity, Physicians, Lifestyle, Stress.

INTRODUCTION

Obesity is recognized as one of the leading modifiable risk factors for non-communicable diseases worldwide. WHO reports about 2.5 billion adults (43%) to be overweight, of whom, 890 million (16%) are estimated to have obesity, while adult obesity has more than doubled

since 1990 [1,2]. Obesity is strongly linked with hypertension, type 2 diabetes mellitus, dyslipidemia, ischemic heart disease, stroke, sleep-disordered breathing, musculoskeletal disorders, and several cancers, making it a major driver of morbidity, reduced quality of life, and premature mortality [3,4].

Low- and middle-income countries are also experiencing a substantial rise in overweight and obesity [5]. A national analysis of Pakistani adults reported a prev-

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alence of 22.8% for overweight and 5.1% for obesity with important sociodemographic variation across the population [6]. The burden may be underestimated when conventional cutoffs are applied particularly in South Asian populations that develop cardio metabolic risk at relatively lower body mass index (BMI) thresholds [7]. The growing burden of obesity is especially concerning in Pakistan because obesity contributes to the same chronic diseases that already place heavy pressure on the healthcare system, including diabetes, hypertension, and cardiovascular disease.

Healthcare professionals are expected to serve not only as providers of care but also as visible advocates of healthy behavior. However, doctors in training and early-career practice often work under conditions that promote unhealthy weight gain. Young doctors commonly face prolonged duty hours, night shifts, psychological stress, sleep deprivation, irregular meals, low physical activity, and frequent dependence on calorie-dense convenience foods [8]. These occupational and lifestyle pressures create an obesogenic environment during an important stage of professional development, when long-term health behaviors may become firmly established [9].

Generating evidence about the burden of obesity among doctors is important for identifying its magnitude, recognizing vulnerable subgroups and informing hospital-based wellness initiatives including nutrition awareness, opportunities for physical activity, screening for obesity-related risk factors, and workplace health promotion strategies. These doctors are frontline healthcare providers whose own health practices may influence patient counseling and professional performance. Local data from comparing obesity prevalence among doctors are limited. This study was planned to generate context-specific evidence that may support hospital-based preventive interventions and staff wellness policies. The objective of this study was to determine the overall profile of obesity and explore associated factors amongst doctors in a tertiary care hospital of Karachi, Pakistan.

MATERIALS AND METHODS

This hospital-based, analytical, cross-sectional study was conducted at National Medical Centre Karachi, Pakistan, during 16th January 2026 to 31st March 2026. Ethical approval was obtained from the institutional ethical review committee (ERC Number: 005/2026 NMC, dated: 15th January 2026.) before commencement of the study. The study population consisted of doctors aged 18-40 years who were available and working during

the data collection period and consented to participate. Those who were pregnant, on prolonged leave, or unable to undergo anthropometric assessment were excluded. Written informed consent was obtained from all participants. Participation was voluntary, and confidentiality of the collected data was maintained throughout the study. Participants were recruited through non-probability consecutive sampling. A sample size of 142 was calculated using OpenEpi sample size calculator, considering the proportion of obesity as 15.7% [10], with 95% confidence level and 6% margin of error, without taking into account an additional 10% for incomplete records. A total of 142 participants were initially enrolled. Before final analysis, records were screened for completeness, internal consistency, and plausibility of anthropometric data. Forty-three records with incomplete key analytical variables were excluded, leaving a final cleaned cohort of 99 participants.

Information about age, gender, marital status, department, designation, and training status was noted. Height was measured in meters using a stadiometer with participants standing barefoot in an erect position, while weight was measured in kilograms using a calibrated digital scale with light clothing and no shoes. BMI was calculated as weight in kilograms divided by height in meters squared. BMI was evaluated using Asian criteria as underweight if BMI <18.5 kg/m², normal weight if 18.5-22.9 kg/m², overweight if 23.0-24.9 kg/m², and obese if ≥25.0 kg/m² [11]. Data were also collected on lifestyle, occupational, sleep-related, stress-related, medical, and behavioral variables relevant to obesity. These included awareness of BMI, dietary habits, physical activity, sedentary behavior, transport patterns, work schedule, on-call burden, sleep profile, perceived job stress, access to wellness support, comorbidities, medications affecting weight, family history, substance use, self-perceived health and weight status, current weight-reduction efforts, and perceived barriers to healthy weight maintenance.

The questionnaire was pilot tested on a small group of doctors not included in the final analysis to assess clarity and sequence, after which minor revisions were made. All collected information was anonymized using study codes to maintain confidentiality.

STATISTICAL ANALYSIS

Data were analyzed using R statistical software. Continuous variables were summarized as mean ± standard deviation (SD) and median with interquartile range (IQR), while categorical variables were expressed as frequen-

cies and percentages. For descriptive comparisons of lifestyle, occupational, sleep, medical, and weight-management characteristics, normal-weight participants (n=40) were compared with obese participants (n=38); underweight and overweight participants were excluded from these pairwise comparisons. Chi-square or Fisher exact tests were used as appropriate. For logistic regression, obesity was modeled as a binary outcome in the full cleaned cohort, against all non-obese participants. Crude odds ratios (OR) with 95% confidence intervals (CI) were calculated, and p-values from the univariable models were adjusted for multiple testing using the Benjamini-Hochberg false discovery rate (FDR) procedure. A multivariable logistic regression model included male sex, exercise <3 times/week, sleep disturbance, and immediate family history of obesity. Firth penalized logistic regression was performed as a sensitivity analysis. Adjusted odds ratios (aOR) with 95% CI were reported, and $p < 0.05$ was considered statistically signif-

icant. Variable-specific denominators were used where data were missing.

RESULTS

Of the 142 participants initially enrolled, 43 were excluded during data quality assessment because of incomplete key analytical variables or inconsistent anthropometric data, leaving 99 participants in the final cohort. Departmental data were only available for 98 participants, as one medical officer was rotating between departments. There were 63 (63.6%) females and 36 (36.4%) males. The median BMI was 23.1 kg/m² (IQR 20.6-27.7), with a mean BMI of 24.65±6.66 kg/m². Five (5.1%) participants were underweight, 40 (40.4%) had normal weight, 16 (16.2%) were overweight, and 38 (38.4%) were obese. Overall, 54 (54.5%) participants were either overweight or obese (Table 1).

Table 1. Demographic Characteristics and BMI Profile of the Final Analytic Cohort (n=99).

Characteristic	Category	Overall
Age group	20-25 years	15 (15.2%)
	26-30 years	60 (60.6%)
	31-35 years	20 (20.2%)
	36-40 years	4 (4.0%)
Sex	Female	63 (63.6%)
	Male	36 (36.4%)
Marital status	Single	63 (63.6%)
	Married	36 (36.4%)
Professional status	Medical Officer	6 (6.0%)
	Postgraduate trainee	93 (93.9%)
Department*	Medicine	67 (68.4%)
	Surgery	9 (9.2%)
	Nephrology	5 (5.1%)
	Emergency	4 (4.1%)
	Other departments	13 (13.3%)
BMI, kg/m ²	Median (IQR)	23.1 (20.6-27.7)
	Mean ± SD	24.65 ± 6.66
	Underweight	5 (5.1%)
BMI category	Normal	40 (40.4%)
	Overweight	16 (16.2%)
	Obese	38 (38.4%)
Overweight or obese	Yes	54 (54.5%)

*Complete department data were available for 98 participants. Other departments included anesthesiology, cardiology, dental operative/endodontics, gastroenterology, gynecology and obstetrics, neurology, paediatrics, psychiatry, pulmonology, radiology, and mixed/other entries. Values are n (%) unless otherwise stated.

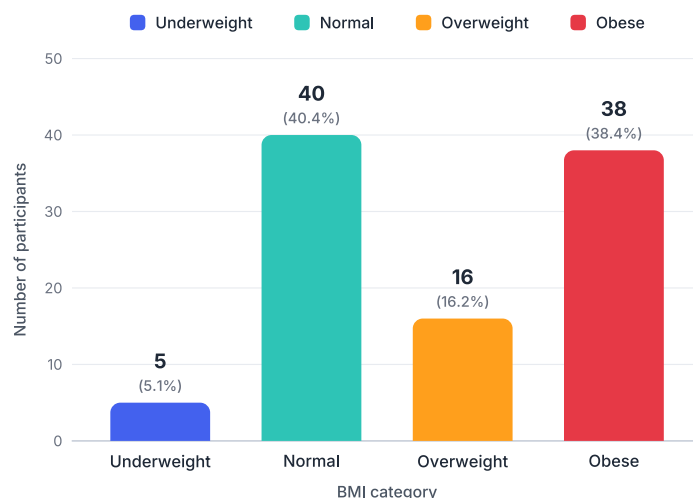


Fig. (1). Distribution of Participants according to BMI Category.

Dietary and physical-activity characteristics were compared between 40 normal-weight and 38 obese participants. Eating habits differed significantly between the

groups ($p=0.039$). Other dietary and physical-activity characteristics did not differ significantly between the groups Table 2, Fig (1).

Table 2. Dietary and Physical-Activity Characteristics by Weight Status.

Characteristic	Category	Normal weight, n (%)	Obese, n (%)	p-value
Eating habits	Regular eating habits	19 (47.5%)	15 (39.5%)	0.039
	Irregular eating	10 (25.0%)	19 (50.0%)	
	Frequently skips meals	11 (27.5%)	4 (10.5%)	
Fast-food consumption	Never	0 (0%)	2 (5.3%)	0.233
	Once a week or less	18 (45.0%)	12 (31.6%)	
	2-3 times/week	19 (47.5%)	19 (50.0%)	
	4-5 times/week	3 (7.5%)	5 (13.2%)	
Sugary-drink consumption	Never	8 (20.0%)	10 (26.3%)	0.422
	1-2 times/week	25 (62.5%)	19 (50.0%)	
	3-5 times/week	6 (15.0%)	5 (13.2%)	
	Daily	1 (2.5%)	4 (10.5%)	
Fruit/vegetable consumption	Rarely or never	1 (2.5%)	6 (15.8%)	0.070
	1-2 times/week	14 (35.0%)	18 (47.4%)	
	3-5 times/week	14 (35.0%)	8 (21.1%)	
	Daily	11 (27.5%)	6 (15.8%)	
Specific diet plan	No	39 (97.5%)	35 (92.1%)	0.352
	Yes	1 (2.5%)	3 (7.9%)	
Exercise frequency	Never	30 (75.0%)	22 (57.9%)	0.355
	1-2 times/week	6 (15.0%)	12 (31.6%)	
	3-5 times/week	2 (5.0%)	2 (5.3%)	
	Daily	2 (5.0%)	2 (5.3%)	

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Daily sitting time	<4 hours/day	11 (27.5%)	10 (26.3%)	0.781
	4-6 hours/day	17 (42.5%)	13 (34.2%)	
	7-8 hours/day	9 (22.5%)	10 (26.3%)	
	>9 hours/day	3 (7.5%)	5 (13.2%)	
Stairs or elevator use	Both equally	7 (17.5%)	9 (23.7%)	0.283
	Mostly elevator	9 (22.5%)	13 (34.2%)	
	Mostly stairs	24 (60.0%)	16 (42.1%)	
Transport to work	Walk	2 (5.0%)	3 (7.9%)	0.894
	Public transportation	7 (17.5%)	5 (13.2%)	
	Car app service	6 (15.0%)	7 (18.4%)	
	Private vehicle	25 (62.5%)	23 (60.5%)	

Comparative tables include normal-weight (n=40) and obese (n=38) participants: underweight and overweight participants were excluded. Percentages are based on available data, so denominators may vary because of missing responses.

Occupational workload, perceived stress, and sleep characteristics did not differ significantly between normal-weight and obese participants. Daily work hours ($p=0.638$), on-call shifts per week ($p=0.939$), daily standing time ($p=0.699$), weekly work hours ($p=0.512$), stress affecting eating or activity ($p=0.953$), and job stress level ($p=0.802$) were comparable between the groups. Short

on-call sleep was common in both groups: sleep of less than 4 hours while on call was reported by 32 (84.2%) obese participants and 29 (72.5%) normal-weight participants, however this did not reach statistical significance ($p=0.088$). Sleep disturbance and the belief that lack of sleep affects health also did not reach significance (Table 3).

Table 3. Occupational Workload, Stress, and Sleep Characteristics by Weight Status.

Characteristic	Category	Normal weight, n (%)	Obese, n (%)	p-value
Daily work hours	<8 hours	8 (20.0%)	4 (10.5%)	0.638
	8-10 hours	25 (62.5%)	25 (65.8%)	
	11-14 hours	3 (7.5%)	5 (13.2%)	
	>14 hours	4 (10.0%)	4 (10.5%)	
On-call shifts per week	None	5 (12.5%)	5 (13.2%)	0.939
	1-2 shifts/week	27 (67.5%)	26 (68.4%)	
	3-4 shifts/week	8 (20.0%)	6 (15.8%)	
	5 or more shifts/week	0 (0.0%)	1 (2.6%)	
Daily standing time	<4 hours/day	10 (25.0%)	10 (26.3%)	0.699
	4-6 hours/day	14 (35.0%)	16 (42.1%)	
	6-12 hours/day	15 (37.5%)	10 (26.3%)	
	>12 hours/day	1 (2.5%)	2 (5.3%)	
Weekly work hours	<40 hours	1 (2.5%)	4 (10.5%)	0.512
	40-60 hours	13 (32.5%)	9 (23.7%)	
	60-80 hours	13 (32.5%)	13 (34.2%)	
	>80 hours	13 (32.5%)	12 (31.6%)	
Stress affects eating/activity	No	8 (20.5%)	8 (21.1%)	0.953
	Yes	31 (79.5%)	30 (78.9%)	
Job stress level	Low	2 (5.0%)	1 (2.6%)	0.802
	Moderate	18 (45.0%)	21 (55.3%)	
	High	16 (40.0%)	13 (34.2%)	
	Very high	4 (10.0%)	3 (7.9%)	

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Access to wellness program	No	29 (78.4%)	22 (75.9%)	0.809
	Yes	8 (21.6%)	7 (24.1%)	
Sleep on non-call days	<4 hours	1 (2.5%)	2 (5.3%)	0.895
	4-6 hours	19 (47.5%)	17 (44.7%)	
	6-8 hours	19 (47.5%)	19 (50.0%)	
	>8 hours	1 (2.5%)	0 (0.0%)	
Sleep while on-call	<4 hours	29 (72.5%)	32 (84.2%)	0.088
	4-6 hours	10 (25.0%)	3 (7.9%)	
	6-8 hours	1 (2.5%)	3 (7.9%)	
Sleep disturbance	No	23 (63.9%)	18 (56.2%)	0.520
	Yes	13 (36.1%)	14 (43.8%)	
Believes sleep affects health	No	14 (35.0%)	10 (26.3%)	0.406
	Yes	26 (65.0%)	28 (73.7%)	

Comparative tables include normal-weight (n=40) and obese (n=38) participants; underweight and overweight participants were excluded.

Medical history and self-perception findings are shown in Table 4. Previous diagnosis of obesity by a health-care professional was reported by 9 (23.7%) obese participants and none of the normal-weight participants ($p<0.001$). An immediate family history of obesity was more common among obese than normal-weight participants (44.7% vs. 17.5%, $p=0.009$). Self-perception

of being overweight was also strongly related to measured weight status, being reported by 36 (94.7%) obese participants compared with 2 (5.0%) normal-weight participants ($p<0.001$). Other family-history variables, comorbidity, medication affecting weight, smoking, other substance use, and self-assessed health were not significantly different between the groups.

Table 4. Medical History, Family History, Substance Use, and Self-Perception by Weight Status.

Characteristic	Category	Normal Weight, n (%)	Obese, n (%)	p-value
Knows own BMI	No	7 (17.5%)	9 (23.7%)	0.499
	Yes	33 (82.5%)	29 (76.3%)	
Any comorbidity	No	35 (87.5%)	34 (89.5%)	1.000
	Yes	5 (12.5%)	4 (10.5%)	
Medication affecting weight	No	40 (100.0%)	37 (97.4%)	0.487
	Yes	0 (0.0%)	1 (2.6%)	
Previous obesity diagnosis	No	40 (100.0%)	29 (76.3%)	<0.001
	Yes	0 (0.0%)	9 (23.7%)	
Immediate family history of obesity	No	33 (82.5%)	21 (55.3%)	0.009
	Yes	7 (17.5%)	17 (44.7%)	
Family history of hypertension	No	9 (22.5%)	8 (21.1%)	0.877
	Yes	31 (77.5%)	30 (78.9%)	
Family history of type 2 diabetes	No	14 (35.0%)	12 (31.6%)	0.749
	Yes	26 (65.0%)	26 (68.4%)	
Family history of cardiovascular disease	No	27 (67.5%)	26 (68.4%)	0.931
	Yes	13 (32.5%)	12 (31.6%)	
Family history of hyperlipidemia	No	30 (75.0%)	29 (76.3%)	0.892
	Yes	10 (25.0%)	9 (23.7%)	
Family history of thyroid disease	No	35 (87.5%)	36 (94.7%)	0.432
	Yes	5 (12.5%)	2 (5.3%)	

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Smoking status	Never	38 (95.0%)	31 (81.6%)	0.194
	Former	1 (2.5%)	4 (10.5%)	
	Current	1 (2.5%)	3 (7.9%)	
Alcohol use	No	40 (100.0%)	38 (100.0%)	1.000
	Yes	0 (0.0%)	0 (0.0%)	
Other substance use	No	25 (62.5%)	27 (71.1%)	0.423
	Yes	15 (37.5%)	11 (28.9%)	
Self-rated health	Poor	3 (7.5%)	8 (21.1%)	0.363
	Fair	18 (45.0%)	17 (44.7%)	
	Good	17 (42.5%)	12 (31.6%)	
	Excellent	2 (5.0%)	1 (2.6%)	
Self-perceived overweight	No	38 (95.0%)	2 (5.3%)	<0.001
	Yes	2 (5.0%)	36 (94.7%)	

Comparative tables include normal-weight (n=40) and obese (n=38) participants: underweight and overweight participants were excluded.

Weight-management practices also differed according to weight status (Table 5). Ongoing attempts to lose weight were reported by 19 (50.0%) obese participants compared with 6 (15.0%) normal-weight participants ($p<0.001$). Dietary modification for weight management was reported by 25 (65.8%) obese participants and 6 (15.0%) normal-weight participants ($p<0.001$). Lack

of time for exercise was more commonly identified as a barrier among obese participants (86.8% vs. 67.5%, $p=0.043$). Weight-monitoring frequency, weight-management motivation, use of exercise, medication or supplements for weight control, and the other barriers were not significantly different between groups.

Table 5. Weight-management Practices and Perceived Barriers by Weight Status.

Characteristic	Category	Normal weight, n (%)	Obese, n (%)	p-value
Weight monitoring frequency	Never	4 (10.0%)	3 (7.9%)	1.000
	Yearly	5 (12.5%)	4 (10.5%)	
	Monthly	25 (62.5%)	24 (63.2%)	
	Weekly	5 (12.5%)	6 (15.8%)	
	Daily	1 (2.5%)	1 (2.6%)	
Weight-management motivation	Not motivated	6 (15.0%)	4 (10.5%)	0.132
	Slightly motivated	7 (17.5%)	13 (34.2%)	
	Moderately motivated	14 (35.0%)	16 (42.1%)	
	Motivated	6 (15.0%)	4 (10.5%)	
	Very motivated	7 (17.5%)	1 (2.6%)	
Currently trying to lose weight	No	34 (85.0%)	19 (50.0%)	<0.001
	Yes	6 (15.0%)	19 (50.0%)	
Weight management: dietary modification	No	34 (85.0%)	13 (34.2%)	<0.001
	Yes	6 (15.0%)	25 (65.8%)	
Weight management: exercise	No	27 (67.5%)	21 (55.3%)	0.267
	Yes	13 (32.5%)	17 (44.7%)	
Weight management: medication	No	39 (97.5%)	37 (97.4%)	1.000
	Yes	1 (2.5%)	1 (2.6%)	
Weight management: supplements	No	35 (87.5%)	36 (94.7%)	0.432
	Yes	5 (12.5%)	2 (5.3%)	

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Barrier: lack of time for exercise	No	13 (32.5%)	5 (13.2%)	0.043
	Yes	27 (67.5%)	33 (86.8%)	
Barrier: work-related stress	No	13 (32.5%)	16 (42.1%)	0.380
	Yes	27 (67.5%)	22 (57.9%)	
Barrier: unhealthy diet	No	18 (45.0%)	12 (31.6%)	0.223
	Yes	22 (55.0%)	26 (68.4%)	
Barrier: lack of sleep	No	20 (50.0%)	17 (44.7%)	0.642
	Yes	20 (50.0%)	21 (55.3%)	
Barrier: medical conditions	No	39 (97.5%)	35 (92.1%)	0.352
	Yes	1 (2.5%)	3 (7.9%)	
Barrier: lack of motivation	No	26 (65.0%)	21 (55.3%)	0.380
	Yes	14 (35.0%)	17 (44.7%)	
Barrier: lack of access to healthy foods	No	29 (72.5%)	24 (63.2%)	0.377
	Yes	11 (27.5%)	14 (36.8%)	
Barrier: financial constraints	No	36 (90.0%)	35 (92.1%)	1.000
	Yes	4 (10.0%)	3 (7.9%)	

Weight-management methods and perceived barriers were assessed as separate binary items: multiple responses were possible. Comparative tables include normal-weight (n=40) and obese (n=38) participants.

In univariable logistic regression using the full analytic cohort, male sex was associated with higher odds of obesity (OR 3.12, 95% CI 1.34-7.48, $p=0.009$). Married status (OR 2.59, 95% CI 1.12-6.12, $p=0.028$) and immediate family history of obesity (OR 2.99, 95% CI 1.24-7.38, $p=0.015$) also showed nominal associations. However, none of these associations remained statis-

tically significant after false discovery rate correction, with FDR-adjusted p -values of 0.100, 0.120, and 0.100, respectively. Exercise frequency, sitting time, work duration, job stress, sleep measures, smoking, and comorbidity did not show significant univariable associations with obesity (Table 6 and Fig. 2).

Table 6. Univariable Logistic Regression of Factors associated with Obesity.

Variable	N	Events	Crude OR (95% CI)	p-value	FDR-adjusted p
Male sex	99	38	3.12 (1.34-7.48)	0.009	0.100
Married	99	38	2.59 (1.12-6.12)	0.028	0.120
Exercise <3 times/week	99	38	1.28 (0.37-5.11)	0.702	0.912
Sitting >6 hours/day	99	38	1.56 (0.66-3.67)	0.308	0.599
Working >10 hours/day	99	38	0.95 (0.36-2.43)	0.919	0.919
Working >80 hours/week	99	38	1.30 (0.53-3.16)	0.566	0.835
High/very high job stress	99	38	0.58 (0.25-1.30)	0.189	0.599
Short sleep on non-call days	99	38	1.26 (0.56-2.85)	0.578	0.835
Short sleep while on-call	99	38	0.40 (0.05-2.50)	0.322	0.599
Sleep disturbance	86	32	1.13 (0.46-2.74)	0.785	0.919
Immediate family obesity	99	38	2.99 (1.24-7.38)	0.015	0.100
Current smoker	99	38	2.53 (0.40-19.91)	0.322	0.599
Any comorbidity	99	38	1.08 (0.26-4.05)	0.912	0.919

OR, odds ratio; CI, confidence interval; FDR, false discovery rate using the Benjamini-Hochberg procedure. Obesity was modeled against all non-obese participants in the final analytical cohort.

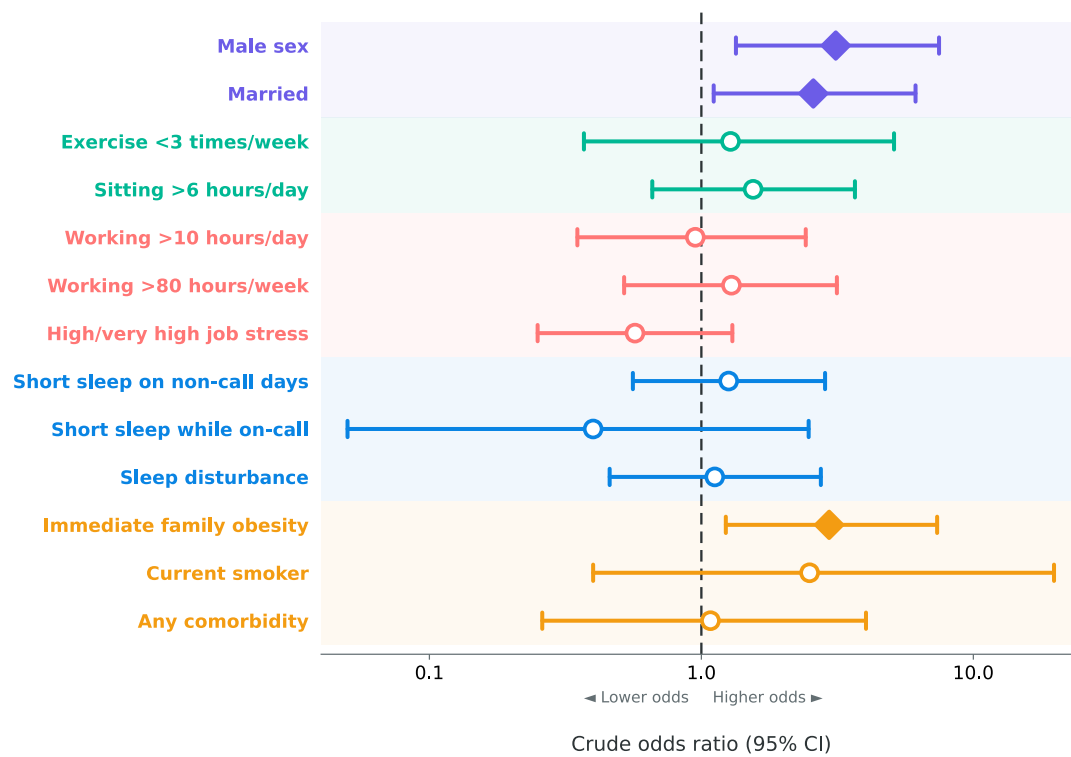


Fig. (2). Forest Plot of Crude Odds Ratios for Factors associated with Obesity.

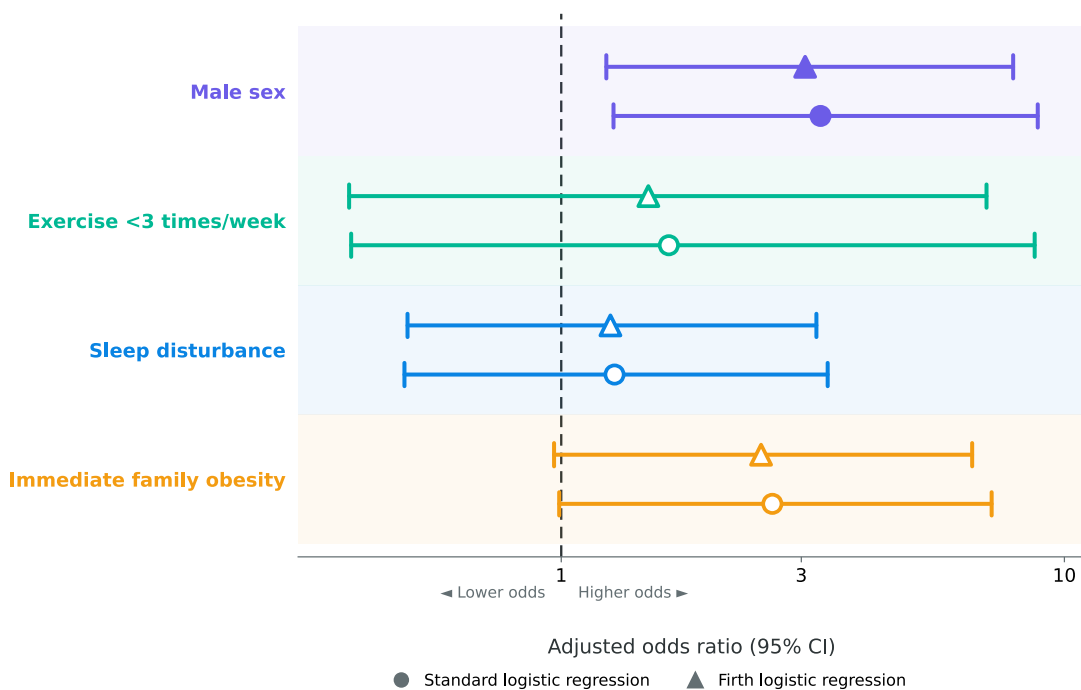


Fig. (3). Adjusted Odds Ratios from Standard and Firth Logistic Regression Models.

In the multivariable model, male sex remained independently associated with obesity, with an adjusted odds ratio of 3.29 (95% CI 1.27-8.83, $p=0.015$). Immediate family history of obesity showed an adjusted odds ratio of 2.63 (95% CI 0.99-7.19), although this missed statistical significance ($p=0.054$). Exercise less than three times per week and sleep disturbance were not independently

associated with obesity. Firth penalized logistic regression produced very similar estimates: male sex remained significant (OR 3.06, 95% CI 1.23-7.93, $p=0.016$), while immediate family history of obesity remained borderline (OR 2.50, 95% CI 0.97-6.58, $p=0.058$). The consistency between the standard and Firth models is shown in Table 7 and Fig. (3).

Table 7. Multivariable Standard and Firth Logistic Regression for Factors Associated with Obesity.

Variable	Adjusted OR (95% CI)	p-value	Firth OR (95% CI)	Firth p-value
Male sex	3.29 (1.27-8.83)	0.015	3.06 (1.23-7.93)	0.016
Exercise <3 times/week	1.64 (0.38-8.74)	0.526	1.49 (0.38-7.01)	0.576
Sleep disturbance	1.28 (0.49-3.39)	0.619	1.25 (0.49-3.21)	0.633
Immediate family obesity	2.63 (0.99-7.19)	0.054	2.50 (0.97-6.58)	0.058

OR, odds ratio; CI, confidence interval. The Firth model was used as a penalized-likelihood sensitivity analysis to assess the stability of estimates in the modest sample.

DISCUSSION

This study identified obesity in 38.4% of doctors in the final analytic cohort, while 54.5% were either overweight or obese according to Asian BMI criteria. The observed frequency of obesity was higher than that reported in several studies involving medical students and physician populations. A Saudi study of medical students also described a substantial burden of excess weight, although obesity remained lower than in the present sample [12]. A Syrian study of 540 medical students reported obesity in 7.4% and overweight in 24.0% [13], while a multi-centre study of physicians in Northern Nigeria reported obesity in 18.4% and overweight in 37.7% [14]. These differences may partly reflect the hospital-based nature of the present population and the use of Asian BMI thresholds, which identify cardio metabolic risk at lower BMI values in South Asian populations [11, 15].

Male sex was the only factor that remained independently associated with obesity in the final multivariable model. Male participants had approximately three times higher adjusted odds of obesity, and the finding remained almost unchanged when Firth penalized logistic regression was applied. The consistency between the standard and penalized models supports the stability of this association within the present dataset. National Pakistani data have previously shown important sociodemographic variation in overweight and obesity [6]. The present study was not designed to establish why male doctors had higher odds of obesity, and possible differences in body composition, dietary patterns, physical activity, or weight-related behavior between men and women were not directly examined in sufficient detail. This finding

should therefore be interpreted as an association rather than a causal effect.

Immediate family history of obesity was also an important finding. Family history was present in 44.7% of obese participants compared with 17.5% of normal-weight participants, and the crude odds of obesity were almost three-fold higher. The adjusted estimate remained of similar magnitude, although the confidence interval included unity and the p-value was slightly above the threshold for statistical significance. Family history has also been associated with higher BMI in medical student populations [13]. This may reflect inherited susceptibility together with shared family dietary and lifestyle patterns. The persistence of a relatively large effect estimate after adjustment suggests that family predisposition remains clinically relevant, even though the present sample did not provide sufficient precision to establish a statistically significant independent association.

Eating pattern was the main lifestyle characteristic that differed between normal-weight and obese participants. Half of the obese participants reported irregular eating compared with one quarter of normal-weight participants. In contrast, fast-food consumption, sugary-drink intake, specific diet plans, exercise frequency, sitting time, and transport patterns did not differ significantly. Previous studies among physicians and healthcare shift workers have described adverse food choices and work-hour feeding practices in relation to excess weight [14, 16]. The present findings suggest that meal regularity may be relevant in this group, but the cross-sectional design does not establish whether irregular eating contributed to obesity or occurred as part of broader work

and lifestyle patterns. The absence of significant differences in individual food-frequency measures also argues against attributing obesity to any single dietary behavior in this sample.

A notable finding was the lack of clear association between obesity and most occupational, stress, physical-activity, and sleep variables. Long daily or weekly work hours, on-call frequency, standing time, perceived job stress, exercise frequency, sitting time, sleep duration, and sleep disturbance were not significantly associated with obesity in the regression analyses. This differs from literature linking sedentary behavior, low physical activity, and poor sleep with adiposity [17-19]. However, exposure to demanding work schedules was common across both weight groups in the present study. For example, around four-fifths of participants in both groups reported that stress affected eating or activity, and less than four hours of sleep while on call was reported by 84.2% of obese and 72.5% of normal-weight participants. When an adverse exposure is common across an occupational group, there may be limited contrast to detect differences according to weight status. The modest sample size and self-reported nature of these variables may also have reduced the ability to identify smaller associations.

The findings related to obesity awareness and weight-management behavior should be interpreted differently from potential risk factors. Previous professional diagnosis of obesity, self-perception of being overweight, current attempts to lose weight, and dietary modification were all substantially more frequent among obese participants [20, 21]. These findings most likely reflect recognition of existing weight status and subsequent attempts at weight control rather than causes of obesity. It is encouraging that most obese participants recognized excess weight, but the high prevalence of obesity despite this awareness suggests that recognition alone may not be sufficient [22, 23]. Lack of time for exercise was also more frequently reported as a barrier by obese participants. Hospital wellness measures may therefore need to combine awareness with practical opportunities for physical activity, healthier shift-compatible food choices, and support that can be used within demanding clinical schedules [24, 25]. Hospital-based interventions incorporating healthier food access, physical-activity opportunities, and behavioral/weight-management support have shown to improve obesity outcomes in healthcare workers [26].

LIMITATIONS

Several limitations should be considered. The cross-sectional design limits temporal inference and does not allow causality to be established. Dietary habits, physical activity, stress, sleep, and several weight-management variables were self-reported and may be affected by recall error or socially desirable responses. The study was conducted at a single tertiary-care setting, and most participants were postgraduate trainees, which may limit generalizability. Of the 142 participants initially enrolled, 43 were excluded during data-quality assessment because of incomplete key variables or inconsistent anthropometric data: this improved analytic reliability but may have introduced selection bias if excluded participants differed from those retained. The final sample contained only 38 obesity events, resulting in wide confidence intervals for several estimates. Some variables also had missing responses, including sleep disturbance, and several professional or departmental categories were sparsely represented. The normal-weight versus obese descriptive comparisons excluded underweight and overweight participants, while the regression models used the full cohort with obesity as a binary outcome: these analyses therefore answer related but not identical questions. Finally, BMI was used as the measure of adiposity and does not distinguish fat mass from lean mass or capture body-fat distribution. The relatively small sample size obtained in this study highlights the need for larger multicentre studies involving more doctors to confirm these findings and improve their generalizability.

CONCLUSION

Obesity was common among doctors in this tertiary-care hospital, and more than half of the final analytic cohort was either overweight or obese by Asian BMI criteria. Male sex was the only statistically significant independent factor associated with obesity and remained significant in the Firth sensitivity analysis. Immediate family history of obesity showed a strong but borderline adjusted association, while irregular eating was more common among obese participants in descriptive comparisons. In contrast, physical activity, workload, stress, and sleep measures did not show clear independent associations in this sample. Obese participants generally recognized their weight status and were more likely to be attempting weight loss, indicating that future hospital-based strategies should move beyond awareness alone and provide practical support for healthy eating, physical activity, and weight management within the realities of clinical work.

AUTHORS' CONTRIBUTIONS

Samar Abbas: Conceptualization, study design, methodology, data analysis and interpretation, drafting the manuscript, critical review and revision of the manuscript, and final approval of the version to be published.

Tooba Sardar: Conceptualization, study design, methodology, data analysis and interpretation, and drafting the manuscript.

Vijay Kumar: Methodology, data analysis and interpretation, and drafting the manuscript.

Syeda Rida e Zehra: Conceptualization and critical review and revision of the manuscript.

All authors approved the final version of the manuscript and agree to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Declared None.

ETHICAL DECLARATIONS

Data Availability

The data supporting the findings of this study are included in the article. Further inquiries regarding the data may be directed to the corresponding author, subject to applicable ethical, privacy, and institutional requirements.

Ethical Approval

This hospital-based analytical cross-sectional study was conducted at National Medical Centre, Karachi, Pakistan, from 16th January 2026 to 31th March 2026. Ethical approval was obtained from the Institutional Ethical Review Committee (ERC No. 005/2026 NMC, dated: 15th January 2026.) before commencement of the study.

Consent to Participate

Written informed consent was obtained from all patients before their participation in the study.

Consent for Publication

Written informed consent for publication was obtained from patients whose individual information, clinical details, images, or other potentially identifiable material are included in this article, where applicable.

Declaration of Competing Interest

The authors declare that they have no known financial or non-financial competing interests that could have influenced the work reported in this study.

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Use of AI-Assisted Technology

The authors used Google Gemini, an artificial intelligence (AI)-assisted language tool, to assist with improving the language, grammar, readability, and formatting of the manuscript. The use of AI was limited to language-related assistance and did not involve data collection, data analysis, interpretation of results, or generation of scientific conclusions. The authors critically reviewed, revised, and approved all AI-assisted content and take full responsibility for the accuracy, integrity, originality, and final content of the manuscript.

Editorial Note

In accordance with the journal's editorial policy, research articles are ordinarily limited to a maximum of two tables and two figures. For this article, an exception to the standard limits was approved by the Editor-in-Chief, permitting the inclusion of seven tables and three figures. These additional display items were considered justified because they facilitate a clearer presentation of the study findings and provide a more comprehensive synthesis of the evidence concerning obesity. The approved exception relates solely to the number of tables and figures and does not constitute an exemption from the journal's editorial or peer-review requirements. All seven tables and three figures were included in the manuscript submitted for peer review and were evaluated as part of the journal's standard editorial and peer-review process.

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