



Original Article

Prevalence of Overweight and Obesity Among Adults in Zakho City

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ABSTRACT

The Prevalence of overweight and obesity is rising globally, accompanied by numerous health concerns throughout the population. Obesity is becoming a significant public health concern of the 21st century, impacting children, adolescents, and adults. This study aimed to determine the Prevalence of overweight and obesity among adults and to identify the factors that may contribute to their Prevalence. A cross-sectional survey was executed, and 1,148 participants were selected randomly, comprising men and women aged 18 years and above, in Zakho City, northern Iraq, in 2024. A specifically crafted questionnaire was utilized to gather pertinent sociodemographic data from the participants. The height and weight of all participants were measured. The Prevalence of overweight/obesity was 52.4% (overweight=33% and obese = 19.4%). A statistically significant correlation was found between overweight/obesity and factors such as older age groups, marital status, female gender, physical inactivity, and medical conditions, including diabetes, hypertension, and heart disease ($p < 0.05$). A multivariate analysis identified several statistically significant factors associated with overweight/obesity: age groups (OR 4.93, 95% CI 3.32–7.3), marital status (OR 3.65, 95% CI 2.84–4.69), physical inactivity (OR 2.31, 95% CI 1.77–3.01), and medical conditions such as type 2 diabetes (OR 3.58, 95% CI 2.24–5.72), hypertension (OR 5.47, 95% CI 3.21–9.32), and cardiovascular disease (OR 11.2, 95% CI 3.42–36.54). The Prevalence of overweight and obesity among adults in Zakho City is significantly high. This matter requires prompt action by healthcare authorities to formulate and implement preventive strategies in conjunction with efforts to enhance public awareness via specialized health education programs.

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Keywords: Prevalence, Overweight/Obesity, Adults, Risk factors, Zakho city.

1 Introduction

Obesity is recognized as an essential public health problem and is the fifth leading cause of death worldwide ^[1]. Overweight and obesity are significant lifestyle diseases that result in additional health problems and contribute to other chronic illnesses, including cancer, diabetes, metabolic syndrome, and cardiovascular diseases. Effective identification and management of relevant risk factors and behavioral intervention techniques can help reduce the 30% of worldwide deaths estimated to be caused by lifestyle illnesses by 2030, according to the World Health Organisation (WHO). Consequently, early detection and diagnosis of obesity are essential ^[2]. The WHO characterizes obesity as an abnormal or excessive fat accumulation that may impair health and elucidates that the fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. The Body Mass Index (BMI),

calculated by the formula $[(\text{weight in kg}) / (\text{height in m}^2)]$, is a straightforward metric designed to categorize humans into one of three classifications: underweight, overweight, or obese. The WHO often uses body mass index (BMI) guidelines to classify adult obesity; a BMI of 25 kg/m² or above is considered overweight, while a BMI of 30 kg/m² or more is considered obese ^[3]. Worldwide, 2.5 billion adults (or 43% of the total) were overweight in 2022, with 890 million (16%) of those individuals being obese, according to the WHO. It also showed that Obesity prevalence among those aged 18 and up more than doubled between 1990 and 2022, rising from 7% to 16% ^[3]. In the Eastern Mediterranean region, including Iraq, there is increasing evidence of elevated rates of overweight and obesity among adults, ranging from 25.0% to 81.9% ^[4]. With the help of the WHO stepwise method, a survey done in Iraq in 2005-2006 found that 66.9% of adults aged 25 to 65 were overweight or obese ^[5]. A study utilizing data from a nationally representative cross-sectional survey done in Iraq in 2015, which comprised 3,916 participants aged 18 years or older, revealed that the rate of overweight and obesity was 33.1% and 33.9%, respectively; this indicates that around two-thirds of the studied population were classified as

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overweight or obese ^[6]. Numerous local surveys across various regions in Iraq have indicated elevated rates of obesity among people. A 2017 community-based survey in Erbil city, Iraq, encompassing 1,480 persons, revealed that 33.4% were classed as overweight and 40.9% as obese ^[7]. In Duhok City, a study conducted among secondary school students reported that 13.27% were overweight, while 14.91% were obese, with higher overweight Prevalence among females and higher obesity prevalence among males ^[8]. Furthermore, a study in Erbil City among primary school children aged 6–13 years identified an obesity prevalence of 26%, with dietary habits and parental obesity as major contributing factors ^[9]. Similarly, a study conducted in Erbil among primary school children reported a prevalence of overweight and obesity at 30.4%, with 7.7% classified as obese and 22.7% as overweight ^[10]. According to a study conducted among Kurdish undergraduate students aged 18–25 years, the Prevalence of overweight and obesity was 19.5% and 4.5%, respectively ^[11]. Furthermore, a study done between September 2021 and April 2022 among a sample of public school teachers in Iraqi Kurdistan indicated that the aggregate Prevalence of overweight and obesity was 71.4% ^[12]. Also, a higher prevalence of overweight (54.7%) and obesity (18%) was found among the academic and administrative staff at Koya Technical Institute, Erbil Polytechnic University ^[13]. According to a systematic review and meta-analysis on the Prevalence of overweight and obesity among adults in Middle Eastern countries, it was found the Prevalence of overweight and obesity among adults is high in Iran (33.9% and 22.41%), Egypt (30.73% and 21.35%), Saudi-Arabia(31.8% and 24.9%), Kuwait(38.7% and 29.25%), Jordan(33.1% and 16.8%), Palestine(31.45% and 22.55%), Syria (31.64% and 40.62%)and Turkey(32.66% and 23.56%) ^[14]. However, Chinese adults' rates of being overweight, obese, and abdominally obese all increased between 1993 and 2015, rising from 26.6% to 41.3% for overweight, from 4.2% to 15.7% for obese, and from 20.2% to 46.9% for abdominally obese ^[15]. Potential risk factors for obesity in the Eastern Mediterranean countries may encompass physical inactivity, marital status, reduced breastfeeding duration, frequent snacking, nutritional transition, urbanization, increased dining out, excessive consumption of sugary beverages, prolonged television viewing, breakfast omission, body image perception, food subsidy policies, stunting, cultural influences, and extensive marketing of high-fat foods ^[16]. Contributing factors include elevated socioeconomic class, female gender, illiteracy, particularly among women, middle and older age, physical inactivity, marriage status, poor dietary practices (high fat/sugar consumption, low fruit/vegetable consumption), and urban residency. Some research indicates a negative correlation between tobacco smoking and obesity ^[16,17–20]. This study aimed to determine the Prevalence of overweight and obesity among adults in Zakho City, located in the Iraqi Kurdistan Region, and identify the factors that may contribute to their Prevalence.

2 Method

2.1 Design

A cross-sectional study, which took place from early November 2024 to mid-January 2025, involved 1,148 individuals aged 18 and older across different locations in Zakho City.

2.2 Inclusion and Exclusion Criteria

The study included adults aged 18 and older, regardless of gender, who lived in the Zakho Autonomous Administration. Individuals were excluded if they were under 18, lived outside the Zakho district, or were originally from the Zakho district but had been living elsewhere for a long time.

2.3 Data Collection

A specially designed questionnaire was used to conduct direct interviews with randomly selected participants. The questionnaire utilized in this study was segmented into two distinct sections. The initial section comprised demographic data such as gender, marital status, age, place of residence, work status, and educational attainment—the second component comprised anthropometric measures, including height, weight, and BMI. The survey encompassed inquiries regarding dietary and hydration practices, physical activity, health history, and smoking and alcohol intake (see [Supplementary File 1](#) for the full questionnaire). Participants' height and weight were recorded in centimeters and kilograms via a portable tape measure and a calibrated digital scale on a hard, flat surface. Body Mass Index (BMI) is calculated using the formula weight (kg) divided by height (m²). The WHO Growth Reference for Adults categorizes individuals as underweight, normal weight, overweight, or obese based on defined criteria.

2.4 Analysis of the data

Descriptive data, including standard deviation, mean, percentage, and frequency, were examined using statistical analysis using the Statistical Package for the Social Sciences (SPSS 26.0). The relationship between variables was evaluated using Chi-square tests, with statistical significance set at a P value of ≤ 0.05 . The multivariate analysis used binary logistic regression to control for and investigate potential confounding factors. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. The strength of relationships was measured by estimating odds ratios (ORs), and significance was determined by estimating 95% confidence intervals and p-values.

2.5 Ethical assessment

The Research Ethics Committee of the College of Medicine at the University of Zakho approved this study in November 2024 (Ref: NOV2024/UOZE28). Before the data collection, each participant gave their informed consent. The participants were notified that their involvement in the study was completely voluntary. Additionally, they were assured that all data would be kept secret and used exclusively for this research without being shared with anyone else. Participants were informed of their freedom to withdraw from the study at any point.

3 Results

Of the 1148 participants in this study, 609 were male (53%), and 539 were female (47%), with ages spanning from 18 to over 60 years, with an overall mean age of 35.2 ± 14.2 years. A significant proportion of participants belonged to this age group, 18–29 (45.3%). In all, 3.2% of individuals were classified as underweight, 44.3% as having normal weight, 33% as overweight, and 19.4% as obese. The participants were predominantly married and possessed a college or university education. The majority resided in urban areas and indicated consuming three or more meals daily, with the majority eating homemade meals daily. Most of the Participants infrequently consumed meals outside the home and rarely or one to two times per week consumed sugary or fizzy beverages. The majority of individuals adhere to a balanced diet. Significant percentages were employed in government or private office settings. The majority of them do not smoke, although alcohol consumption was nearly absent. A minority engaged in physical activity, while the majority maintained a sedentary lifestyle. The proportion of participants with type 2 diabetes was 9.5%, whereas 9.3% had hypertension and 3.3% had cardiovascular disease. (as shown in Table 1, Table 2, and Table 3). The Prevalence of overweight and obesity was greatest among older age groups, especially individuals aged 50–59 years (81.1%). Individuals aged 40–49 years (72.8%) and those aged 60 years and above (72.6%) exhibit higher percentages compared to younger age groups ($p < 0.001$). Females exhibited a greater prevalence of overweight and obesity (54.9%) than males (50.2%) ($p = 0.0114$). Married participants demonstrated a greater prevalence rate (66.7%) than single ones (33.3%) ($p < 0.001$). A low level of education was significantly correlated with increased Prevalence of overweight and obesity, with illiterate individuals exhibiting the highest Prevalence (67.7%), followed by those with primary/secondary education (57.6%) and those with college/university education (42.2%) ($p < 0.001$). The Prevalence of overweight and obesity did not exhibit significant differences based on residence, with urban inhabitants at 52% and rural people at 53.2% ($p = 0.702$). The prevalence rate was significantly higher among participants consuming three or more meals daily (62.6%) than among those consuming 1–2 meals (36.5%) ($p < 0.001$). Additionally, the consumption of homemade meals per day or week did not show significant differences ($p = 0.9$). Dining out 3–4 times weekly was associated with the highest prevalence rate (75.2%) ($p <$

0.001). The consumption of sugary or fizzy drinks 3 to 5 times weekly showed a prevalence of 61.6% ($p < 0.001$). A diet rich in fats and sugars correlated with the highest Prevalence of overweight and obesity (79%), in contrast to balanced diets (31.9%) ($p < 0.001$). Employment status was a crucial determinant, as jobless individuals exhibited the greatest rates of overweight and obesity (66.2%) relative to other groups ($p < 0.001$). The smoking status demonstrated no significant correlation, with smokers having a prevalence of 51.9% versus 52.6% for non-smokers ($p = 0.835$). Also, Alcohol consumption exhibited no significant correlation with weight status ($p = 0.056$). Physical inactivity (58.1%, $p < 0.001$) and prolonged sitting/lying for over 8 hours daily (62.4%, $p < 0.001$) exhibited the greatest rates of overweight and obesity compared to others (<0.001). Individuals with type 2 diabetes (78%), hypertension (84.1%), and cardiovascular disease (92.1%) exhibited significant correlation with weight status (all $p < 0.001$). (as shown in Table 4 and Table 5). The multivariate analysis showed multiple factors statistically significantly correlated with overweight and obesity. including older age specifically, 40–49 years (OR 4.93, 95% CI 3.32–7.3, $p < 0.001$) and 50–59 years (OR 7.93, 95% CI 4.87–12.91, $p < 0.001$), married (OR 3.65, 95% CI 2.84–4.69, $p < 0.001$), and low educational attainment, such as illiteracy (OR 2.88, 95% CI 2.03–4.07, $p < 0.001$). Also, Lifestyle characteristics such as consuming more than three meals per day (OR 2.92, 95% CI 2.28–3.73, $p < 0.001$), frequent dining outside the home (OR 3.29, 95% CI 2.13–5.1, $p < 0.001$), and the intake of sugary or fizzy beverages (OR 1.54, 95% CI 1.05–2.26, $p = 0.023$). Other factors included high-fat diets (OR 8.1, 95% CI 6–10.81, $p < 0.001$), unemployment (OR 4.3, 95% CI 2.43–7.6, $p < 0.001$), physical inactivity (OR 2.31, 95% CI 1.77–3.01, $p < 0.001$), prolonged sitting time (>8 hours/day, OR 1.86, 95% CI 1.7–3.1, $p < 0.001$), and health conditions such as type 2 diabetes (OR 3.58, 95% CI 2.24–5.72, $p < 0.001$), hypertension (OR 5.47, 95% CI 3.21–9.32, $p < 0.001$), and cardiovascular diseases (OR 11.2, 95% CI 3.42–36.54, $p < 0.001$). Nonetheless, certain factors were not statistically significant, including rural residence (OR 1.048, 95% CI 0.82–1.34, $p = 0.702$), frequency of homemade meal consumption (e.g., 3–4/week, OR 1.43, 95% CI 0.57–3.6, $p = 0.45$), gender (females: OR 1.21, 95% CI 0.96–1.52, $p = 0.114$) and smoking status (OR 1.03, 95% CI 0.8–1.4, $p = 0.84$). (as shown in Table 6 and Table 7).

Table 1: Sociodemographic characteristics of the study population.

Variable	Sample	Underweight	Normal Weight	Overweight	Obesity
	N (%)	N (%)	N (%)	N (%)	N (%)
All	1148	37(3.2)	509(44.3)	379 (33)	223(19.4)
Age (years)	1148				
18–29	520(45.3)	32(6.2)	305(58.7)	127(24.4)	56(10.8)
30–39	253 (22)	5(2)	112(44.3)	90(35.6)	46(18.2)
40–49	153(13.8)	0(0)	43(27.2)	77(48.7)	38(24.1)
50–50	122(10.6)	0(0)	23(18.9)	46(37.7)	53(43.4)
60+	95(8.3)	0(0)	26(27.4)	39(41.1)	30(31.6)
Sex	1148				

Female	539 (47)	22(4.1)	221(41)	176(32.7)	120(22.3)
Male	609 (53)	15(2.5)	288(47.3)	203(33.3)	103(16.9)
Marital Status	1148				
Single	447(38.9)	33(7.4)	265(59.3)	99(22.1)	50(11.2)
Married	701(61.1)	4(0.6)	244(34.8)	280(39.9)	173(24.7)
Education	1148				
Illiterate	195(17)	0(0)	63(32.3)	73(37.4)	59(30.3)
Primary & secondary school	443(38.6)	12(2.7)	176(39.7)	147(33.2)	108(24.4)
College/university	510(44.4)	25(4.9)	270(52.9)	159(31.2)	56(11)
Employment Status	1148				
Government office-based	274(23.9)	6(2.2)	128(46.7)	102(37.2)	38(13.9)
Private office-based	336(29.3)	10(3)	144(42.9)	113(33.6)	69(20.5)
Student	159(13.9)	14(8.8)	94(59.1)	35(22)	16(10.1)
Self-employed	67(5.8)	4(6)	42(62.7)	18(26.9)	3(4.5)
Unemployed	305(26.48)	3(1)	100(32.8)	109(35.7)	93(30.5)
Retired	7(0.6)	0(0)	1(14.3)	2(28.6)	4(57.1)
Residence	1148				
Rural	406 (35.4)	10(2.5)	180(44.3)	137(33.7)	79(19.5)
Urban	742 (64.6)	27(3.6)	329(44.3)	242(32.6)	144(19.4)

Table 2: Dietary habits of the study population.

Variable	Sample N (%)	Underweight N (%)	Normal Weight N (%)	Overweight N (%)	Obesity N (%)
Meals/day	1148				
1-2	447(38.9)	12(2.7)	272(60.9)	136(30.4)	27(6)
3 and more	701(61.1)	25(3.6)	237(33.8)	243(34.7)	196(28)
Homemade meal intake	1148				
Daily	990(86.2)	35(3.5)	436(44)	325(32.8)	194(19.6)
1-2/week	31(2.7)	0(0)	15(48.4)	16(51.6)	0(0)
3-4/week	105(9.1)	2(1.9)	46(43.8)	29(27.6)	28(26.7)
rarely	22(1.9)	0(0)	12(54.5)	9(40.9)	1(4.5)
Meals outside the home	1148				
Never/Rarely	585(51)	18(3.1)	282(48.2)	189(32.3)	96(16.4)
Daily	65(5.7)	1 (1.54)	24(37)	27(41.5)	13(20)
1-2/week	357(31.1)	17(4.8)	169(47.3)	115(32.2)	56(15.7)
3-4/week	141(12.3)	1(0.7)	34(24.1)	48(34)	58(41.1)
Sugary/fizzy drink intake	1148				
Never/Rarely	415(36.1)	18(4.3)	209(50.4)	133(32)	55(13.3)
daily	198(17.2)	5(2.5)	68(34.3)	76(38.4)	49(24.7)
1-2/week	384(33.4)	8(2.1)	180(46.9)	127(33.1)	69(18)
3-5/week	151(13.2)	6(4)	52(34.4)	43(28.5)	50(33.1)
Diet type	1148				
Balanced	545(47.5)	26(4.8)	345(63.3)	157(28.8)	17(3.1)
Low in fat and sugar	173(15.1)	3(1.7)	81(46.8)	56(32.4)	33(19.1)
High in fat and sugar	429(37.4)	8(1.9)	82(19.1)	166(38.7)	173(40.3)

Table 3: lifestyle factors and health conditions of the study population.

a	Sample N (%)	Underweight N (%)	Normal Weight N (%)	Overweight N (%)	Obesity N (%)
Smoking status	1148				
Yes	266(23.2)	8(3)	120(45.1)	90(33.8)	48(18)
No	882(76.8)	29(3.3)	389(44.1)	289(32.8)	175(19.8)

Alcohol intake	1148				
Yes	4(0.3)	0(0)	0(0)	4(100)	0(0)
No	1144(99.7)	37(100)	509(100)	375(98.9)	223(100)
Physical activity	1148				
Yes	317(27.6)	17(5.4)	181(57.1)	96(30.3)	23(7.3)
No	831(72.4)	20(2.4)	328(39.5)	283(34.1)	200(24.1)
Sitting/lying time	1148				
<4 hours	262(22.8)	13(5)	138(52.7)	87(33.2)	24(9.2)
4-8 hours	407(35.5)	11(2.7)	204(50.1)	147(36.1)	45(11.1)
>8 hours	479(41.7)	13(2.7)	167(34.9)	145(30.3)	154(32.2)
Type 2 Diabetes	1148				
Yes	109(9.5)	0(0)	24(22)	35(32.1)	50(45.9)
No	1039(90.5)	37(3.6)	485(46.7)	344(33.1)	173(16.7)
Hypertension	1148				
Yes	107(9.3)	0(0)	17(15.9)	34(31.8)	56(52.3)
No	1041(90.7)	37(3.6)	492(47.3)	345(33.1)	167(16)
Cardiovascular disease	1148				
Yes	38(3.3)	0(0)	3(7.9)	12(31.6)	23(60.5)
No	1110(96.7)	37(3.3)	506(45.6)	367(33.1)	200(18)

Table 4: Correlation between Weight Status and Sociodemographic & Dietary Factors.

Variable	Sample	Normal Weight	Overweight/ Obesity	Total	p-Value
	N (%)	N (%)	N (%)	N (%)	
All	1148				
Age (years)	1148				<0.001
18–29	520(45.3)	337(64.8)	183(35.2)	520(100)	
30–39	253 (22)	117(46.2)	136(53.8)	253(100)	
40–49	153(13.8)	43(27.2)	115(72.8)	158(100)	
50–50	122(10.6)	23(18.9)	99(81.1)	122(100)	
60+	95(8.3)	26(27.4)	69(72.6)	95(100)	
Sex	1148				0.0114
Female	539 (47)	243(45.1)	296(54.9)	539(100)	
Male	609 (53)	303(49.8)	306(50.2)	609(100)	
Marital Status	1148				<0.001
Single	447(38.9)	298(64.6)	149(33.3)	447(100)	
Married	701(61.1)	248(35.4)	453(66.7)	701(100)	
Education	1148				<0.001
Illiterate	195(17)	63(32.3)	132(67.7)	195(100)	
Primary & secondary school	443(38.6)	188(42.4)	255(57.6)	443(100)	
College/university	510(44.4)	295(57.8)	215(42.2)	510(100)	
Residence	1148				0.702
Rural	406 (35.4)	190(46.8)	216(53.2)	406(100)	
Urban	742 (64.6)	356(48)	386(52)	742(100)	
Meals/day	1148				<0.001
1-2	447(38.9)	284(63.5)	163(36.5)	447(100)	
3 and more	701(61.1)	267(37.4)	439(62.6)	701(100)	
Homemade meal intake	1148				0.9
Daily	990(86.2)	471(47.6)	519(52.4)	990(100)	
1-2/week	31(2.7)	15(48.4)	16(51.6)	31(100)	
3-4/week	105(9.1)	48(45.7)	57(54.3)	105(100)	
rarely	22(1.9)	12(54.5)	10(45.5)	22(100)	
Meals outside the home	1148				<0.001

Never/Rarely	585(51)	300(51.3)	285(48.7)	585(100)	
Daily	65(5.7)	25(38.5)	40(61.5)	65(100)	
1-2/week	357(31.1)	186(52.1)	171(47.9)	357(100)	
3-4/week	141(12.3)	35(24.8)	106(75.2)	141(100)	
Sugary/fizzy drink intake	1148				<0.001
Never/Rarely	415(36.1)	227(54.7)	188(45.3)	415(100)	
Daily	198(17.2)	73(36.9)	125(63.1)	198(100)	
1-2/week	384(33.4)	188(49)	196(51)	384(100)	
3-5/week	151(13.2)	58(38.4)	93(61.6)	151(100)	

P-value: <0.05 is significant, <0.01 is highly significant, and >0.05 is not significant.

Table 5: Correlation between Weight Status and Lifestyle & Health-Related Factors.

Variable	Sample	Normal Weight	Overweight/ Obesity	Total	p-Value
	N (%)	N (%)	N (%)	N (%)	
Diet type	1148				<0.001
Balanced	545(47.5)	372(68.1)	174(31.9)	546(100)	
Low in fat and sugar	173(15.1)	84(48.6)	89(51.4)	173(100)	
High in fat and sugar	429(37.4)	90(21)	339(79)	429(100)	
Employment Status	1148				<0.001
Government office-based	274(23.9)	134(48.9)	140(51.1)	274(100)	
Private office-based	336(29.3)	154(45.8)	182(54.2)	336(100)	
Student	159(13.9)	108(67.9)	51(32.1)	159(100)	
Self-employed	67(5.8)	46(68.7)	21(31.3)	67(100)	
Unemployed	305(26.48)	103(33.8)	202(66.2)	305(100)	
Retired	7(0.6)	1(14.3)	6(85.7)	7(100)	
Smoking status	1148				0.835
Yes	266(23.2)	128(48.1)	138(51.9)	266(100)	
No	882(76.8)	418(47.4)	464(52.6)	882(100)	
Alcohol intake	1148				0.056
Yes	4(0.3)	0(0)	4(100)	4(100)	
No	1144(99.7)	546(47.7)	598(52.3)	1144(100)	
Physical activity	1148				<0.001
Yes	317(27.6)	198(62.5)	119(37.5)	317(100)	
No	831(72.4)	348(41.9)	483(58.1)	831(100)	
Sitting/lying time	1148				<0.001
<4 hours	262(22.8)	151(57.6)	111(42.4)	262(100)	
4-8 hours	407(35.5)	215(52.8)	192(47.2)	407(100)	
>8 hours	479(41.7)	180(37.6)	299(62.4)	479(100)	
Type 2 Diabetes	1148				<0.001
Yes	109(9.5)	24(22)	85(78)	109(100)	
No	1039(90.5)	522(50.2)	517(49.8)	1039(100)	
Hypertension	1148				<0.001
Yes	107(9.3)	17(15.9)	90(84.1)	107(100)	
No	1041(90.7)	529(50.8)	512(49.2)	1041(100)	
Cardiovascular disease	1148				<0.001
Yes	38(3.3)	3(7.9)	35(92.1)	38(100)	
No	1110(96.7)	543(48.9)	567(51.1)	1110(100)	

P-value: <0.05 is significant, <0.01 is highly significant, and >0.05 is not significant.

Table 6: Multivariate Analysis of Sociodemographic and Dietary Factors Associated with Overweight/Obesity.

Variable	OR	95% CI	95% CI	P-value
		Lower	Upper	
All	1148			
Age (years)				
18–29	Ref.			
30–39	2.14	1.58	2.91	<0.001
40–49	4.93	3.32	7.3	<0.001
50–50	7.93	4.87	12.91	<0.001
60+	4.88	3	7.94	<0.001
Sex				
Male	Ref.			
Female	1.21	0.96	1.52	0.114
Marital Status				
Single	Ref.			
Married	3.65	2.84	4.69	<0.001
Education				
College/university	Ref.			
Primary & secondary school	1.9	1.43	2.41	<0.001
Illiterate	2.88	2.03	4.07	<0.001
Residence				
Urban	Ref.			
Rural	1.048	0.82	1.34	0.702
Meals/day				
1-2	Ref.			
3 and more	2.92	2.28	3.73	<0.001
Homemade meal intake				
Rarely	Ref.			
Daily	1.32	0.57	3.1	0.52
1-2/week	1.3	0.43	3.83	0.66
3-4/week	1.43	0.57	3.6	0.45
Meals outside the home				
1-2/week	Ref.			
Daily	1.74	1.01	2.99	0.045
Never/Rarely	1.03	0.79	1.35	0.81
3-4/week	3.29	2.13	5.1	<0.001
Sugary/fizzy drink intake				
Never/Rarely	Ref.			
Daily	1.54	1.05	2.26	0.028
1-2/week	1.64	1.16	2.33	0.006
3-5/week	1.11	0.601	1.05	0.105

OR (Odds Ratio): Measures the association between exposure and outcome, 95% CI (Confidence Interval): Range where the true OR is expected to lie, Ref. (Reference Group): Baseline category for comparison, P-value: <0.05 is significant, <0.01 is high significant, and >0.05 is not significant.

Table 7: Multivariate Analysis of Lifestyle and Health-Related Factors Associated with Overweight/Obesity.

Variable	OR	95% CI	95% CI	P-value
		Lower	Upper	
Diet type				
Balanced	Ref.			
High in fat and sugar	8.1	6	10.81	<0.001
Low in fat and sugar	2.27	1.6	3.21	<0.001
Employment Status				

Self-employed	Ref.			
Government office-based	2.3	1.3	4.04	0.004
Private office-based	2.6	1.5	4.53	0.001
Student	1.03	0.6	1.91	0.91
Unemployed	4.3	2.43	7.6	<0.001
Retired	13.14	1.5	116.2	0.021
Smoking status				
Yes	Ref.			
No	1.03	0.8	1.4	0.84
Physical activity				
Yes	Ref.			
No	2.31	1.77	3.01	<0.001
Sitting/lying time				
<4 hours	Ref.			
4-8 hours	1.22	0.89	1.7	0.223
>8 hours	1.86	1.7	3.1	<0.001
Type 2 Diabetes				
No	Ref.			
Yes	3.58	2.24	5.72	<0.001
Hypertension				
No	Ref.			
Yes	5.47	3.21	9.32	<0.001
Cardiovascular disease				
No	Ref.			
Yes	11.2	3.42	36.54	<0.001

OR (Odds Ratio): Measures the association between exposure and outcome, 95% CI (Confidence Interval): Range where the true OR is expected to lie, Ref. (Reference Group): Baseline category for comparison, P-value: <0.05 is significant, <0.01 is high significant, and >0.05 is not significant.

4 Discussion

The results of the study indicated that overweight and obesity are common medical problems among adults in the city of Zakho in the Kurdistan region of Iraq, with a total prevalence of 52.4%. Specifically, 33% were classified as overweight, while 19.4% were classified as obese. In comparison to other cities in Iraq, these statistics are inferior to those of Erbil, where 74.3% of adults were classified as overweight or obese (overweight = 33.4% and obesity = 40.9%)^[7], and also lower than Basrah's with a total prevalence of 70% overweight = 35.6% and obesity = 38%^[21]. Furthermore, this Prevalence in Zakho City exceeds recent data from Duhok, Sulaymaniyah, and Iran, where the Prevalence of overweight and obesity was estimated at 39%, 31.9%, and 44.59%, respectively^[22–24]. The differences can be attributed to many factors, such as varying dietary patterns, physical activity levels, and differences in income and culture. The data indicate that older adults aged 40–49 years (72.8%), 50–59 years (81.1%), and 60+ years (72.6%) showed a greater prevalence of overweight and obesity than younger adults. This pattern reflects findings from research in Iraq^[6], studies conducted among adults in Middle Eastern countries^[14], and globally, including India, where older adults have a higher prevalence of overweight and obesity^[25]. This difference results from reduced physical activity and metabolic changes associated with aging. By gender analysis, the Prevalence of overweight and obesity was significantly higher (54.9%) among females than

males (50.2%). Similar findings were reported in studies conducted in Erbil and Iran^[7,26]. The cultural commonalities and few opportunities for women to practice physical activities may contribute to this trend. In several Asian countries, the rate of obesity among men is higher, possibly due to professional and lifestyle differences^[27]. A study carried out in Baghdad found no significant difference between genders in terms of overweight or obesity prevalence^[28]. Weight status and marital status were significantly correlated, with 66.7% of married people being overweight or obese, while 33.3% of single individuals were overweight or obese. These findings are consistent with research conducted in Baghdad^[29]. A similar study was also carried out in Jordan^[30]. Lifestyle modifications following marriage, such as increased frequency of meals and decreased levels of physical activity, may serve as potential factors. Overweight and obesity Prevalence were also related to educational attainment. The highest rates were recorded among the illiterate (67.7%), while the rates among participants with primary/secondary education were 57.6%, and among participants with college education were 42.2%. Comparable findings were reported in local studies conducted in Baghdad and Erbil^[7,29]. Also, similar associations have been reported in Kuwait^[31]. This might be due to the importance of education in fostering awareness of healthy living. Dietary habits significantly correlated with the higher Prevalence of overweight and obesity; persons consuming three or more meals daily (62.6%) and those eating out frequently (3–4 times weekly) had a significantly higher prevalence of overweight and obesity (75.2%), as was the regular consumption of sugary or

fizzy drinks (61.6%). The same correlations have been shown in Baghdad^[32] and other countries such as China^[20]. These findings suggest that consuming too many calories and having unhealthy eating habits can lead to weight gain. Numerous studies have shown the association between higher caloric intake and increased weight gain^[33]. Additionally, employment status plays a role in overweight and obesity rates. The rates of obesity and being overweight were notably higher among unemployed individuals (66.2%) and retirees (85.7%) compared to those in other employment situations. Similar trends have been noted in Baghdad^[28] and Erbil^[7], indicating that unemployment is linked to higher rates of being overweight and obese. This relationship may stem from lower levels of physical activity, financial challenges in accessing healthy food options, and increased sedentary behaviors among those who are unemployed. Conversely, self-employed and employed individuals might have favorable resources and opportunities for physical activity, which could result in a decreased prevalence of obesity. Low levels of physical activity and sitting for extended periods (more than eight hours per day) were shown to be related to high Prevalence of overweight and obesity (58.1% and 62.4%), respectively^[7]. Other research indicates that sedentary behaviors negatively influence health^[34]. This can be attributed to lower energy expenditure due to physical inactivity and prolonged sitting, which reduces calorie burning. Also, a diet high in fats and sugars was considered a significant contributing factor to overweight and obesity, with a Prevalence of 70%. These findings agree with wider global evidence indicating a correlation between high-calorie diets and overweight and obesity^[35,36]. Being overweight and obese was significantly correlated with various chronic health disorders. The highest percentage of people with cardiovascular disease is 92.1%, a group of disorders affecting the heart and blood vessels^[37], followed by hypertension at 84.1%, a medical condition where the blood pressure in the arteries is consistently high^[38], and diabetes at 78%, a chronic condition where the body either does not produce enough insulin or does not use it effectively^[39]. It was found among individuals classified as overweight and obese. Furthermore, similar patterns have been observed in other Iraqi cities, including Baghdad^[29] and globally^[3], indicating an alarming bidirectional association between obesity and these medical conditions. This can be attributed to many factors. Individuals who are overweight or obese may have more systemic inflammation, insulin resistance, and cardiovascular strain than normal-weight people. However, this study found no correlation between living areas, such as rural and urban, alcohol consumption, homemade meal intake, smoking status, and overweight or obesity ($P>0.05$), contrary to some prior research^[40]. This may be due to cultural and lifestyle differences in our research population compared to other regions or countries. Having a larger number of male participants is the study's main limitation. Male respondents predominated since the sample was mostly collected from markets, bazaars, and other places where males are more likely to be found. Cultural norms could also have played a role in this disparity since women might be less willing to share private information with a male interviewer. This restriction may have an impact on the overall results.

Conclusion

The Prevalence of overweight and obesity among adults in Zakho City, Iraq, is significantly high, with a cumulative rate of 52.4%. Being overweight and obese were markedly correlated with advancing marital status, female gender, increasing age, lower educational levels, poor food habits, and sedentary behaviors. Reducing the high Prevalence of overweight and obesity may be possible via implementing preventative interventions such as programs that enhance healthy eating, suitable food policies, encouragement of physical activity, interruption of sedentary behavior, and community awareness campaigns. Such therapies are essential to alleviate the significant health repercussions associated with obesity and its related comorbidities.

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Authors contribution

The second author devised the project framework during the research period and offered guidelines. The first author managed all data collection, analysis, and literature research facets. The first author composed the manuscript of this study. Both authors evaluated and ratified the final version.

Conflict of interest

There are no competing interests.

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