Quality of life, Management, and Psychological Well-Being of Patients with Obesity in the Aseer Region, Saudi Arabia: A Cross-Sectional Study

Reem Jaber Suhluli[1], Lamia Hassan Aseery [2], Abdulrahman Nasser Alhooti[3], Saleh Mubarak Aldawsari[4], Mujahid Fahad Aldakhil[5], Arwa saeed alasmari[6], Hamza Mohammed Aleid[7], Lobna aldawalibi[8],
Faisal nasser mohammed qahl[9]

[1]Aseer central Hospital replace it with Family Medicine Senior Registrar, Ministry Of Health- Aseer Health Cluster, Saudi Arabia, rsuhluli@moh.gov.sa
[2]Aseer central Hospital replace it with Family Medicine Registrar
Ministry Of Health- Aseer Health Cluster, Saudi Arabia
[3]MOH First Cluster - Riyadh
[4]MOH First Cluster - Riyadh
[5]MOH second cluster - Riyadh
[6]Eastern Health Cluster, Dammam Health Network
[7]Ministry of Health Cluster 1 Riyadh
[8]Nurse, King Faisal Specialist Hospital & Research Centre
[9]Jazan cluster

ABSTRACT

Introduction: Obesity emerges as a global health issue that creates substantial physical impacts while affecting psychological states and social dynamics.

Aim of Work: This research aims to examine life quality and mental health status alongside obesity control strategies in individuals who have body mass index values greater than 25 kg/m² in the Aseer region of Saudi Arabia by assessing various demographic characteristics.

Methods: The research included 100 adult participants who were aged 18 or older and had a BMI above 25 kg/m². The participants filled out an anonymous survey that contained demographic information along with BMI categories and psychological evaluation sections which included the Beck Depression Inventory (BDI), Bulimia Test (BULIT) and WHO Quality of Life Assessment (WHOQOL) as well as a body dissatisfaction checklist. The statistical analysis done through SPSS 26 version incorporated descriptive statistics along with chi-square tests, ANOVA, and correlation analysis.

Results: The majority of participants were female (83.1%) and 71.5% possessed either a university or postgraduate degree. BMI revealed statistically significant relationships with gender ($p = 0.008$), education level ($p = 0.012$), age ($p < 0.001$) and employment status ($p = 0.04$). The study revealed BMI increased with age ($r = .443$, p

< 0.001) and healthcare visits ($r = .177$, $p = 0.020$) but did not relate to physical activity. BMI showed a strong relationship with pain and discomfort because the two variables had a significant correlation of $.231$ ($p = 0.002$) but autonomy was negatively correlated at -0.218 ($p = 0.004$). Self-acceptance presented a negative correlation of -0.153 ($p = 0.045$).

Conclusion: The effects of obesity on quality of life and psychological well-being primarily manifest through pain experiences and self-image problems as well as restrictions on personal independence. The research results show obesity treatment requires solutions which tackle physical health alongside emotional health needs. Future studies must conduct long-term research to both confirm cause-and-effect relationships and evaluate the successful implementation of obesity intervention approaches which enhance health results.

KEYWORDS: Obesity, Quality of Life, Psychological Well-being, Health-Related Quality of Life (HRQoL), Body Mass Index (BMI), Aseer Region, Saudi Arabia..

INTRODUCTION

Obesity has become a pressing worldwide health problem in recent decades, presenting major difficulties to public health systems on a global scale. It is defined as the excessive buildup of body fat caused by an imbalance between the amounts of energy consumed and the amount of energy expended [1]. According to the World Health Organization's figures, in 2016, more over 1.9 billion individuals were categorized as overweight and 650 million as obese. This concerning pattern highlights the urgent need to comprehend the many elements that contribute to obesity [2].

Dietary habits have a significant impact, since the intake of foods that are high in calories, especially those that are high in sugars and fats, is a major factor. In addition, contemporary lives marked by inactive habits and insufficient physical exercise exacerbate the difficulty [3]. Genetic factors have a role in determining an individual's vulnerability to obesity, impacting the body's mechanisms for storing and using fat. Environmental variables, such as the easy accessibility of poor food choices and restricted chances for physical exercise, play a key role in the increase of obesity rates [3]. Psychological problems such as stress and despair may contribute to excessive eating and weight gain, which worsens the issue [4].

Obesity is linked to physical, emotional, and economic ramifications. The economic ramifications of obesity are significant and on the rise [5]. By 2050, it is projected that the annual social and corporate costs of obesity in the UK would amount to £49.9 billion [6]. The costs associated with treating obesity and its related diseases have been divided into three categories: direct costs, societal costs, and personal costs. Direct costs refer to the expenses directly related to medical treatment. Societal costs include the economic impact of increased absence from work, physical limitations, lower life expectancy, and unemployment benefits. Personal costs encompass the negative effects of stigmatization and discrimination, such as reduced income and higher healthcare expenses [6].

Chronic mental and physical illnesses may affect one another as well as one's health- related quality of life (HRQoL). The existence of additional illnesses and variables including medication usage and multiple drug use (polypharmacy) might complicate and alter the relationship between obesity and HRQoL [7].

AIM OF WORK
The aim of this study was to assess the quality of life, management and psychological well-being of patients with obesity

METHODS
• **Study Design**
This study aims to assess the quality of life, management strategies, and psychological well-being of patients with obesity through a cross-sectional study design.

• **Study Population and Participants**
The study focused on individuals with a Body Mass Index (BMI) greater than 25 kg/m², categorizing them as overweight or obese. The study population consists of adult patients aged 18 years and older who meet the BMI criteria for overweight or obesity. The sample size for this study is set at 100 patients.

• **Study Tools**
Within a reasonable amount of time, participants will anonymously complete the questionnaires. The participants' age, height, weight, job position, education level, marital status, and monthly income were all determined via the questionnaire. The body mass index will be calculated using the individual's self-reported weight and height. The demographic survey will ask participants about their perceived ideal weight, whether they have family members who are obese, when they first became obese, what stressful events led them to become obese, how many times they tried to lose weight before getting help, and whether they have ever been made fun of for being obese .

A 21-item self-report tool called the Beck Depression Inventory was used to assess depressive symptoms. Its validity and trustworthiness have been well-established. The bulimia and binge eating tendencies will be evaluated with the Bulimia Test (BULIT). The World Health Organization (WHO) created the World Health Organization Quality of Life Assessment Instrument (WHOQOL), a self-report questionnaire, to measure quality of life in various cultural contexts.

A 25-item checklist of self-portraits was used to measure the degree of body dissatisfaction. Higher scores correspond to a more significant negative self-body image. The scoring system goes from 1 (representing the greatest degree of satisfaction) to 5 (showing the lowest level of contentment). The ratings that participants thought best reflected their level of satisfaction with their bodies will be asked [15].

• **Ethical consideration:**
Each participant was provided with information on the methods and objectives of this research. All individuals who will consent to participate in the research will be guaranteed confidentiality. The participants will get a concise overview of the research and its goals.

• **Statistical Analysis:**
The data collected was examined using SPSS Statistics 26. Descriptive statistics will be used to assess the overall characteristics of the study populations. The frequencies of BDI grades, BULIT grades, and BULIT quartiles among the study groups were assessed using the chi-square test. The research used Analysis of Variance (ANOVA) to examine the relationship between WHOQOL and three different study groups. The correlation was deemed significant if the values are below 0.05. The findings was consolidated and presented in tabular and graphical formats.

RESULTS

Table (1) description of demographic data

		n	%
Age	<=20	63	36.6
	21-40	88	51.2
	>40	21	12.2
\Sex	\female	143	83.1%
	Male	29	16.9%
Education	Uneducated	7	4.1
	Secondary and diploma	42	24.4
	University and postgraduate education	123	71.5
. Working status	No working	118	68.6%
	Working	54	31.4%
Smoking	No	158	91.9%
	Yes	14	8.1%

Table (1) showed that a majority of 51.2% of participants fall between 21 and 40 years old in our research while 36.6% are 20 years old or younger and 12.2% exceed the 40-year mark. Females make up most of the study group at 83.1% compared to 16.9% male participants which indicates women exhibit higher levels of participation. The majority of participants (71.5%) possess university or postgraduate degrees whereas 24.4% completed secondary education or received diplomas but 4.1% have no education at all. Among our study participants 31.4% are currently employed and 68.6% do not have any form of employment. Among the participants 91.9% do not smoke but 8.1% have confirmed being smokers.

Table (2) BBMI classification of study group

	Frequency	Percent
Under weight	23	13.4
Normal	59	34.3

Data in Table (2) indicates that the study group's BMI classification exhibits various weight categories across all BMI levels. The research data demonstrates that 34.3% of participants maintain normal BMI values alongside 13.4% who fall into the underweight classification. About 53% of the research participants display either overweight (26.7%) or obese (25.6%) conditions which mean nearly a majority of the research sample exceeds their healthy weight limits.

Table (3) Relation of BMI to socio-demographic

		BMII								P value
		low weight		Normal weight		Overweight		obese		
		n	%	n	%	n	%	n	%	
\sex	\female	23	16.1%	52	36.4%	32	22.4%	36	25.2%	0.008
	Male	0	0.0%	7	24.1%	14	48.3%	8	27.6%	
Education	Uneducated	2	28.6%	0	0.0%	0	0.0%	5	71.4%	0.012
	Secondary and diploma	4	9.5%	20	47.6%	12	28.6%	6	14.3%	
	University and postgraduate education	17	13.8%	39	31.7%	34	27.6%	33	26.8%	
age	<=20	21	33.3%	18	28.6%	15	23.8%	9	14.3%	<0.001
	21-40	2	2.3%	37	42.0%	27	30.7%	22	25.0%	
	>40	0	0.0%	4	19.0%	4	19.0%	13	61.9%	
.	No working	21	17.8%	42	35.6%	27	22.9%	28	23.7%	0.04

Working status	Working	2	3.7%	17	31.5%	19	35.2%	16	29.6%	

Table (3) demonstrates significant connections between BMI and socio-demographic factors through gender-based and educational status along with age group and employment conditions. The data reveals that females display relatively higher rates of underweight status (16.1%) than males (0.0%) but males show higher prevalence of being overweight (48.3%) and obese (27.6%) than females (22.4% and 25.2%) (p = 0.008). The study demonstrates that uneducated participants (71.4%) exhibit obesity most frequently whereas participants with university or postgraduate education show better weight balance (p = 0.012). BMI varies significantly based on age as participants between 20 years old and under had 33.3% underweight individuals combined with 14.3% obesity cases yet those above 40 years displayed 61.9% obesity prevalence (p < 0.001). Workers exhibit a statistically significant relationship among employment status (p = 0.04) because underweight participants make up 17.8% of unemployed respondents yet overweight individuals represent 35.2% of working individuals alongside obese individuals totaling 29.6% of employed people. Research indicates that obesity affects older adults and less-educated people as well as employed individuals hence requiring specific intervention plans based on these social characteristics.

Table (4) Correlation of BMI with physical and history findings

		BMI
Age	R	.443**
	P value	.000
Time spent on physical exercise	R	-.066
	P value	.388
Number of visits to a healthcare professional	R	.177*
	P value	.020
Number of sick leave days taken from work in the past three months:	R	-.087
	P value	.254
Number of outpatient hospital visits in the past three months:	R	.176*
	P value	.021
. Number of day-case hospital visits in the past three month:	R	-.029
	P value	.709

P value   .709

Table (4) evaluated the relationship between Body Mass Index (BMI) and multiple elements from physical and health evaluation history. The statistical analysis indicates that BMI increases significantly with age since older individuals demonstrate a strong BMI correlation (r = .443 with p < 0.001). The physical exercise time for the sample group reveals a slight anti-correlation with BMI but statistical significance is absent (r= -0.066, p = 0.388).

A patient's BMI directly influences how often they visit healthcare providers (r = .177, p = 0.020). The relationship between BMI levels and outpatient hospital visits is demonstrated through their positive statistical association (r = .176, p = 0.021) which confirms BMI's impact on healthcare utilization patterns. BMI does not affect work absenteeism because the number of sick leave days taken in the past three months exhibits a weak but non-statistical negative correlation with BMI (r = -0.087, p = 0.254).

BMI shows no significant correlation to past three-month day-case hospital visit frequency (r = -0.029, p = 0.709). This research shows that older patients with higher BMIs visit healthcare facilities more frequently while not affected by physical activity levels or work attendance rates.

Table (5) Assessment of quality of life study group

	no problem		slight problems		moderate problems		severe problems		unable to/extreme problems	
	n	%	n	%	n	%	n	%	n	%
Mobility	144	83.7%	16	9.3%	11	6.4%	1	0.6%	0	0.0%
Self-Care	162	94.2%	2	1.2%	8	4.7%	0	0.0%	0	0.0%
Usual Activities	143	83.1%	21	12.2%	5	2.9%	0	0.0%	3	1.7%
Pain / Discomfort	119	69.2%	38	22.1%	11	6.4%	3	1.7%	1	0.6%
Anxiety / Depression	119	69.2%	37	21.5%	12	7.0%	3	1.7%	1	0.6%

Table (5) demonstrates that the evaluated quality of life scale reveals most participants experience minimal functional disabilities and well-being challenges. Research data shows mobility challenges are minimal because 83.7% of participants face no barriers but moderate barriers exist for 6.4% and severe obstacles are extremely rare among only 0.6% of participants. Most participants maintain good self-care abilities since 94.2% have no problems but 4.7% encounter moderate difficulties. The majority of people maintain no problems with their usual activities but 2.9% face moderate challenges and extreme limitations affect 1.7% of the group.

The data reveals widespread discomfort among participants because 30.8% of them reported pain while 22.1% noted slight issues along with 6.4% who faced moderate discomfort and 1.7% experiencing severe pain. Anxiety and depression symptomatology affects 30.8% of the population at different levels—slight psychological distress was reported by 21.5% of participants as well as moderate by 7.0% and severe by 1.7%.

Table (6) Correlation of BMI with quality of life

		BMII
Mobility	R	.110
	P value	.151
Self-Care	R	-.008
	P value	.914
Usual Activities	R	.070
	P value	.362
Pain / Discomfort	R	.231**
	P value	**.002**
Anxiety / Depression	R	.034
	P value	.654

Table (6) indicates that quality of life factors show BMI has a significant relationship to pain and discomfort while other aspects remain unrelated. Research demonstrates that BMI shows no meaningful relationship with Mobility (r = .110) and Self-care (r = -.008) and Usual Activities (r = .070) performance among this participant group. This study determines that BMI does not relate significantly to psychological distress outcomes because the relationship between BMI and depression and anxiety scores is insignificant (r = .034, p = .654). The research data shows how people with higher BMI show greater susceptibility to pain and discomfort manifestations (r = .231, p = .002).

Table (7) Correlation of BMI with Psychological Wellbeing

		obese
autonomy	R	-.218**
	P value	.004
The Environmental Mastery subscale	R	-.079
	P value	.303
The Personal Growth	R	-.152*
	P value	.046
The Positive Relations	R	-.013
	P value	.867
The Purpose in Life subscale	R	-.084
	P value	.275
The Self-Acceptance	R	-.153*
	P value	.045
Total **Psychological Wellbeing**	R	-.155*
	P value	.042

Table (7) reveals how higher BMI levels are linked to reduced psychological well- being but demonstrates different correlation strengths across psychological domain subscales. Research demonstrates that people with higher BMI levels tend to report diminished feelings of independence (r = -0.218, p = 0.004). Data reveals a negative association between BMI and personal growth (r = -0.152, p = 0.046) and self- acceptance (r = -0.153, p = 0.045) showing BMI increases correlate with reduced self-esteem and fewer perceived personal development opportunities. The correlation between BMI and psychological well-being dimensions environmental mastery, positive relations and purpose in life failed to achieve statistical significance (r = - 0.079, p = 0.303 and r = -0.013, p = 0.867 and r = -0.084, p = 0.275 respectively). BMI presents lower overall psychological well-being outcomes among those with greater body weight measurements (r = -0.155, p = 0.042).

DISUSSION

The relationship between Body Mass Index (BMI) and various socio-demographic factors, quality of life, and psychological well-being has been widely studied. Similarly, the study revealed through demographic statistics that women (83.1%) showed higher levels of obesity than men (16.9%). Research by Athieno et al [16] in Mukono Municipality, Uganda showed that female participants aged 18 to 69 years had higher obesity rates due to their demographic characteristics and marital status and number of children. Research data shows women between ages 65 and younger who live in lower income urban areas faced elevated obesity risks [17]. A study appearing in Obesity Science & Practice showed BMI climbs as individuals age leading to enhanced vulnerability for obesity-related medical problems [18].

Educational data showed that 71.5% of people with university or postgraduate qualifications reported being obese. Research in Poland presented differing results showing a negative relationship between education level and obesity prevalence [19]. Multiple factors including cultural norms and economics and lifestyle practices differentiate the populations' obesity rates. Research indicates that people with reduced education face increased risks of high BMI because they lack both health knowledge and effective lifestyle management tools [18]. Occupational health studies have shown that sedentary employment settings promote weight gain among employees.

The study measured participants' BMI which showed that overweight status existed in 26.7% of subjects while obesity affected 25.6% of the cohort. These data points agree with international reports which show growing rates of overweight along with obesity cases across the world. A research study on U.S. adolescents shows that obesity

prevalence grew from 17.7% between 2009–2010 to 21.5% between 2017–2020 [20]. Research evidence shows BMI elevation leads to increased morbidity rates along with higher mortality risk [21].

The analysis revealed that BMI directly correlated with gender, education level, employment status and age group demographics. The analysis revealed that obesity existed most commonly in adults above 65 years and people who received less than college education. The research by [20] supports the finding that age and socioeconomic status play a crucial role in determining obesity rates. Research findings show inconsistent relations between employment status and BMI measurements because other aspects of work life and daily habits may affect this connection.

Data show that overweight (26.7%) and obesity (25.6%) affect a major population of participants and tend to affect older adults with lower educations and those who are employed. The results align with research by Batzel et al [22] which observed that increasing age corresponded to higher BMI values. The need for prompt weight- related intervention programs becomes obvious because of this discovery. People with lower levels of educational attainment tend to have higher body mass indexes (BMI). The research by [23] demonstrated that people with lesser educational attainment show higher BMI results because they lack proper health information and resources. Interventions in education show potential to become instrumental in obesity prevention methods.

Results show stronger positive relationships between BMI and pain/discomfort which demonstrates that elevated BMI leads to higher physical discomfort. Research results show BMI levels affect quality of life through decreased physical and mental health outcomes. According to Pazzianotto-Forti et al [24], research showed that people with higher BMI experienced more pain symptoms and reduced their ability to move. Obesity creates an elevated danger for anxiety and depression because of societal prejudices against fat people along with self-perceived weight-related biases and metabolic alterations affecting mood controls [25]. Yet the research found no major relationships linked BMI measurements to quality of life measures such as mobility self-care.

The research showed that higher BMI levels generated negative relationships with psychological well-being components including autonomy development and personal growth progression as well as self-acceptance acquisition and total psychological health standing. Higher body mass index shows a potential link with reduced psychological well-being according to this research. A study by Robinson et al [26] found higher Body Mass Index (BMI) values directly led to psychological problems affecting mood and self-esteem and negative perceptions of body image. The research reveals that older adults who are overweight or obese might experience decreased depression rates although Steptoe et al [27] demonstrate the opposing connection exists between BMI and mental wellness.

CONCLUSION

The condition of obesity creates negative consequences for both mental health and physical well-being and social connections which results in reduced quality of life and higher emotional suffering. An effective treatment approach for obesity needs coordinated medical care along with nutritional support and psychological intervention. Success in treating obesity requires a combination of lifestyle changes together with medical treatments and mental health services. Improvements to mental health services combined with combating obesity stigma would create additional benefits for patients. Future research needs to analyze long-term intervention outcomes and public health must establish accessible obesity management programs that will maintain improved quality of life.

REFERECNES

1. Asharaf, Hiba, et al. "Psychological impact of obesity: A comprehensive analysis of health-related quality of life and weight-related symptoms." Obesity Medicine 45 (2024): 100530.

2. Stephenson, John, et al. "The association between obesity and quality of life: a retrospective analysis of a large-scale population-based cohort study." BMC Public Health 21 (2021): 1-9.
3. Muinga E, Waudo J, Osur J. Relationship between intake of energy-dense diets and nutritional status of adolescents in primary schools in Nairobi City County, Kenya. The North African Journal of Food and Nutrition Research. 2024 Mar 11;8(17):52-65.
4. Jang HJ, Kim BS, Won CW, Kim SY, Seo MW. The relationship between psychological factors and weight gain. Korean journal of family medicine. 2020 Nov;41(6):381.
5. Okunogbe A, Nugent R, Spencer G, Ralston J, Wilding J. Economic impacts of overweight and obesity: current and future estimates for eight countries. BMJ global health. 2021 Oct 1;6(10):e006351.
6. Serrano-Fuentes N. Exploring the impact of multilevel environments influencing the adoption of health practices in adults with obesity in the United Kingdom (Doctoral dissertation, University of Southampton).
7. Rodríguez VM, Alemán GG, Aguilar MD, Valdez HR. Obesity, Mental Health, and Quality of Life in the Elderly People. The Role of Nutrition in Integral Health and Quality of Life. 2024:329-69.
8. Almojarthe, Bandar M., et al. "Assessment of health-related quality of life among obese patients in Abha, Saudi Arabia." Journal of family medicine and primary care 9.8 (2020): 4092-4096.
9. Aldossari, Khaled K., et al. "The association between overweight/obesity and psychological distress: A population based cross-sectional study in Saudi Arabia." Saudi journal of biological sciences 28.5 (2021): 2783-2788.
10. Almojarthe, Bandar M., et al. "Assessment of health-related quality of life among obese patients in Abha, Saudi Arabia." Journal of family medicine and primary care 9.8 (2020): 4092-4096.
11. Hecker J, Freijer K, Hiligsmann M, Evers SM. Burden of disease study of overweight and obesity; the societal impact in terms of cost-of-illness and health-related quality of life. BMC Public Health. 2022 Dec;22:1-3.
12. Gok K, Nas K, Tekeoglu I, Sunar I, Keskin Y, Kilic E, Sargin B, Acer Kasman S, Alkan H, Sahin N, Cengiz G. Impact of obesity on quality of life,Psychological status, and disease activity in psoriatic arthritis: a multi-center study. Rheumatology international. 2022 Apr;42(4):659-68.
13. Aldossari KK, Shubair MM, Al-Ghamdi S, Al-Zahrani J, AlAjmi M, Alshahrani SM, Alsalamah M, Al-Khateeb BF, Bahkali S, El-Metwally A. The association between overweight/obesity and psychological distress: A population based cross-sectional study in Saudi Arabia. Saudi journal of biological sciences. 2021 May 1;28(5):2783-8.
14. Meixner, Lara, et al. "Health-related quality of life in children and adolescents with overweight and obesity: results from the German KIGGS survey." BMC Public Health 20 (2020): 1-11.
15. Kim, Ji Yeong, et al. "The impacts of obesity on psychological well-being: a cross-sectional study about depressive mood and quality of life." J Prev Med Public Health 40.2 (2007): 191-195.
16. Athieno J, Seera G, Mayanja Namayengo FM, Galabuzi JN, Namasaba M. Socio-demographic predictors of obesity among women in Mukono Central Division in Central Uganda: a cross-sectional study. BMC Women's Health. 2023 Nov 6;23(1):571.
17. 17.   Pou SA, Diaz MD, Velázquez GA, Aballay LR. Sociodemographic disparities and contextual factors in obesity: updated evidence from a National Survey of Risk Factors for Chronic Diseases. Public health nutrition. 2022 Dec;25(12):3377-89.
18. Apple R, Samuels LR, Fonnesbeck C, Schlundt D, Mulvaney S, Hargreaves M, Crenshaw D, Wallston KA, Heerman WJ. Body mass index and health-related quality of life. Obesity science & practice. 2018 Oct;4(5):417-26.
19. Stoś K, Rychlik E, Woźniak A, Ołtarzewski M, Jankowski M, Gujski M, Juszczyk G. Prevalence and sociodemographic factors associated with overweight and obesity among adults in Poland: a 2019/2020 nationwide cross-sectional survey. International journal of environmental research and public health. 2022 Jan 28;19(3):1502.
20. Deng Y, Yli-Piipari S, El-Shahawy O, Tamura K. Trends and key disparities of obesity among US adolescents: the NHANES from 2007 to 2020. PLoS One. 2024 Oct 9;19(10):e0290211.
21. Vallis M. Quality of life and psychological well-being in obesity management: improving the odds of success by managing distress. International journal of clinical practice. 2016 Mar;70(3):196-205.
22. Batzella E, Gutierrez de Rubalcava Doblas J, Porcu G, Bressan S, Barbieri E, Giaquinto C, Cantarutti A, Canova C. Childhood BMI trajectories and sociodemographic factors in an Italian pediatric population. Scientific Reports. 2025 Jan 28;15(1):3525.
23. Sung B, Etemadifar A. Multilevel analysis of socio-demographic disparities in adulthood obesity across the United States geographic regions. Osong public health and research perspectives. 2019 Jun;10(3):137.
24. Pazzianotto-Forti EM, Sgariboldi D, Rasera Jr I, Reid WD. Impact of pain in overweight to morbidly obese women: preliminary findings of a cross-sectional study. Physiotherapy. 2018 Dec 1;104(4):417-23.
25. Sarwer DB, Polonsky HM. The psychosocial burden of obesity. Endocrinology and Metabolism Clinics. 2016 Sep 1;45(3):677-88.
26. Robinson E, Haynes A, Sutin A, Daly M. Self-perception of overweight and obesity: A review of mental and physical health outcomes. Obesity science & practice. 2020 Oct;6(5):552-61.
27. Steptoe A, Frank P. Obesity and psychological distress. Philosophical Transactions of the Royal Society B. 2023 Oct 23;378(1888):20220225.