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Prevalence of Physical and Mental Health Outcomes among Individuals with obesity Receiving Ozempic, Mounjaro, and Saxenda

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Abstract

Background: The prevalence of obesity is projected to reach 51%, or over 4 billion people, of the global population by 2035, and it is considered a significant public health concern in Saudi Arabia. **Aim:** to evaluate the physical and mental outcomes among individuals with obesity receiving Ozempic, Mounjaro, and Saxenda. Subjects/Methods: Research design: A descriptive cross-sectional design was applied. **Setting:** The study was conducted at a private hospital in Saudi Arabia. Sample: 370 individuals with obesity who used Ozempic, Mounjaro, and Saxenda were recruited. We collected data using a side effects questionnaire, Patient-Reported Outcomes (PROs), and the Patient Health Questionnaire (PHQ-9) to assess physical and mental outcomes. **The results:** The most reported side effects for injections were diarrhea (10.8%), hair loss (9.2%), fever (8.6%), constipation (8.1%), and tiredness (7.8%). Mounjaro (Tirzepatide) was associated with the highest prevalence of gastrointestinal issues. Regarding daily living activities, 93.8% of participants experienced a moderate to severe impact from Ozempic, Mounjaro, and Saxenda on their daily activities. However, Mounjaro (Tirzepatide) demonstrated the highest impact on daily activities. Most of the participants reported no depression (63.3%). Saxenda (Liraglutide) showed the least depressive symptoms, while Ozempic (Semaglutide) showed the highest rate of severe depression (9.8%). **Conclusion:** The overall prevalence of reported side effects from Ozempic, Mounjaro, and Saxenda remained consistent across groups. While the impact on participants' depression levels was minimal, the injections had a significant effect on their daily activities. **Recommendations:** Educational programs are required alongside weight reduction injections to improve the quality of life for individuals with obesity.

Keywords: Physical Outcomes, Mental Outcomes, Obesity, Ozempic, Mounjaro, and Saxenda

Introduction

Obesity is a global health issue affecting millions of people, characterized by excessive body fat accumulation that poses serious health hazards. This chronic illness is typically categorized by the Body Mass Index (BMI), with a BMI of 30 or higher, signifying obesity. The increasing prevalence of obesity has made it a significant public health concern linked to a range of serious health complications **(World Health Organization. Obesity and overweight, 2021).** The causes of obesity are multifactorial, involving genetic predispositions, environmental influences, poor dietary choices, sedentary lifestyles, and psychological factors such as stress and emotional eating. Effective obesity management includes lifestyle changes, behavioral therapy, pharmacotherapy, and, in some cases, bariatric surgery to promote sustainable weight loss and mitigate health risks **(Algari A, et.al 2020).**

Obesity significantly affects health and quality of life by increasing risks for cardiovascular diseases (e.g. hypertension, heart failure), type 2 diabetes due to insulin resistance, and musculoskeletal issues like osteoarthritis **(National Institute of Diabetes and Digestive and Kidney Diseases, 2016).** It also raises the likelihood of respiratory problems such as sleep apnea and asthma, certain cancers (e.g., breast, colorectal, endometrial), and GERD due to abdominal pressure **(World Health Organization. Obesity and overweight, 2021).** Psychologically, obesity is linked to depression, anxiety, social isolation, and low self-esteem, often stemming from stigma and negative body image, as well as cognitive decline and disordered eating behaviors **(Ryan D & Yockey S, (2017).**

Medication, bariatric surgery, and lifestyle changes can lead to weight loss and the reduction of obesity-related comorbidities. Injections used to lose weight, like Ozempic (Semaglutide), Saxenda (Liraglutide), and Mounjaro (Tirzepatide), work by affecting hormones that control hunger, insulin production, and glucose metabolism. Ozempic and Saxenda are glucagon-like peptide-1 (GLP-1) receptor agonists that promote insulin secretion in reaction to elevated blood glucose levels, prolong stomach emptying, and diminish hunger by influencing the hypothalamus **(Głuszczyk A, et al., 2024)** Saxenda necessitates daily injections, but Ozempic is administered weekly and has demonstrated greater effectiveness in weight reduction and glycemic regulation **(Mukhtar B, 2024).**

Mounjaro (Tirzepatide) is distinctive as it functions as a dual agonist for GLP-1 and glucose-dependent insulinotropic polypeptide (GIP) receptors. This multimodal approach enhances the effects of GLP-1, increases insulin production, and decreases glucagon, resulting in improved glucose management and substantial weight loss **(Jaswal S, et.al.,2024).** Pharmacotherapy enhances mean weight loss by 2.5–8.9 kg; therefore, patients who cannot reduce sufficiently with lifestyle interventions may be candidates for this treatment. Both Liraglutide (Saxenda) and subcutaneous Semaglutide (Ozempic) have received FDA approval for treating obesity and secondary prevention of cardiovascular disease **(Alamuddin N, Bakizada Z, Wadden T. 2016).**

Dagenais et al. (2020) mentioned that dulaglutide is effective in the primary and secondary prevention of cardiovascular disease; it can be an effective option for managing cardiovascular risks in individuals with type 2 diabetes, potentially leading to better health outcomes. Only Semaglutide is accessible orally as an incretin mimetic; however, a results trial found no cardioprotection and decreased weight reduction with the oral formulation compared to the subcutaneous option. While Ozempic, Saxenda, and Mounjaro are effective GLP-1 receptor agonists used for weight loss and diabetes management, they carry risks of gastrointestinal

discomfort, pancreatitis, and, in rare cases, thyroid malignancies **(Feier C, 2024& Mahase E 2023).** Ozempic (Semaglutide) is associated with common side effects such as gastrointestinal issues, headaches, fatigue, and decreased appetite, while serious side effects can include pancreatitis and gallbladder disorders **(Feier C, 2024).**

A specific concern with Ozempic is the aesthetic change known as "Ozempic face," which involves facial fat loss **(Głuszczyk A, et al., 2024).** Saxenda (Liraglutide) also presents common gastrointestinal symptoms and injection site reactions, with serious risks, including pancreatitis and gallbladder diseases (**Mahase E 2023 & Wen J, et al., 2024).** Notably, Saxenda has higher discontinuation rates due to gastrointestinal intolerance compared to other GLP-1 agonists **(Silva C, et al., 2023).** Mounjaro (Tirzepatide) shares similar common side effects, with serious risks including pancreatitis and contraindications for certain patients **(Siddiqui T, Doultani P. 2023) & Caruso I, et al., 2024).** It is generally well-tolerated and has higher weight loss efficacy than Ozempic (Semaglutide). Monitoring and patient-specific adjustments are crucial to minimizing adverse effects. Clinical guidelines suggest adjunctive weight reduction injections, particularly for adults with a body-mass index of 30 or greater or greater in persons with coexisting conditions **(Garvey W, et al., 2016)**

Despite weight reduction injections demonstrated efficacy, they are under-prescribed in clinical settings due to cost, awareness, or side effects (**Mahase E 2023).** Few studies have examined the long-term impact of GLP-1/GIP-GLP-1 agonists on weight maintenance, quality of life, and comorbidities such as cardiovascular disease and type 2 diabetes **(Mukhtar B, 2024).** They focused on the physiological effects of weight reduction injections, such as weight loss and gastric emptying, without addressing psychological and social factors like sleep, sexual life, social interactions, and self-esteem. Additionally, limited studies have been conducted on the correlation between obesity and mental disorders, including depression. Depression can negatively impact the quality of life and professional performance **(Yao H, et al., 2024).**

Management of obesity and depression incurs significant costs; thus, further research is necessary to assess the correlation between obesity and psychological disorders, such as depression, to enhance clinical management strategies. This study examines depression in individuals with obesity receiving various weight reduction treatments. Therefore, evaluating the patient-reported physical and mental outcomes, the level of depression, and identifying the most common side effects related to different weight reduction injections are the aim of this study.

The aim of the study is to:

Explore prevalence of physical and mental health outcomes among individuals with obesity receiving Ozempic, Mounjaro, and Saxenda. Physical outcomes will be assessed by examining reported medication side effects and the impact of weight reduction treatments on daily activities. Mental health outcomes will be evaluated by measuring individuals' depression levels.

Research questions:

1. What is the most common side effect among individuals with obesity who receive Ozempic, Mounjaro, and Saxenda?
2. To what extent have Ozempic, Mounjaro, and Saxenda affected the daily living activities of individuals with obesity?
3. What is the level of depression among individuals who receive Ozempic, Mounjaro, and Saxenda?
4. What is the relationship between depression levels and weight reduction injections (Ozempic, Mounjaro, and Saxenda) among individuals with obesity?

Materials and Methods

Research design:

A descriptive cross-sectional research design was used in this study.

Setting:

The study was conducted at a private Hospital in the Eastern provinces of Saudi Arabia. The data were collected from May to November 2024.

Sample:

A convenient purposeful sample was utilized to recruit individuals with obesity who utilized Ozempic, Mounjaro, and Saxenda and attended follow-up appointments at outpatient clinics of private hospitals. The sample size is determined using the Raosoft sample size calculator, accessible at http://www.raosoft.com/samplesize.html. Given a margin of error of 5%, a confidence interval of 95%, and an expected response rate of 50%, the required sample size to accomplish the study's objective was 370 individuals with obesity who were convenience during data collection, use of one Ozempic, Mounjaro, and Saxenda and meet inclusion criteria. Ozempic (173) patents, Mounjaro (107), and Saxenda (90)

The operational definition for Obese is that individuals aged 18 years or older with a body mass index (BMI) of 30 kg/m² or above are classified as obese.

Inclusion criteria:

- The individuals' age groups are between 18 and 65 years old.
- Individuals with obesity (BMI of 30 or higher).
- Use weight reduction injections (Saxenda, Mounjaro, Ozempic) for at least 3-9 months and follow up in the outpatient clinic.

Exclusion criteria:

- Individuals' age groups are below 18 and above 65 years old
- Individuals with a BMI below 30
- Individuals with obesity used other modalities to decrease their weight rather than (Saxenda, Mounjaro, Ozempic)
- Individuals who receive drugs for less than 3 months

Tools of data collection:

Physical outcomes will be evaluated by examining individuals' reported side effects from Ozempic, Mounjaro, and Saxenda and their effects on their daily activities. This evaluation will be conducted using two instruments: a side effect questionnaire and Patient-Reported Outcomes (PROs).

1. **A Side effect questionnaire:** used after reviewing the recent relevant literature. It included demographic data, such as subjects' age, gender, marital status, level of education, occupation, family income, and residence. It also included individual health history, body measurement, weight reduction injection, and medication side effects.
2. **Patient-Reported Outcomes (PROs),** a questionnaire is used to assess whether Ozempic, Mounjaro, and Saxenda affected the individuals with obesity' daily living activities such as physical activity, pain, discrimination, sleep, sex, social life, work/school, and self-esteem. The researcher utilized the PROs tool, previously adopted by **Aasprang et al. (2019) and Hegland P, Kolotkin R, Andersen J, 2023).** to assess the impact of obesity or shape on daily living activities. The researcher utilized it to assess the impact of Ozempic, Mounjaro, and Saxenda on daily living activities. The questionnaire has four Likert scales: Not bothered (0), mildly bothered (1), moderately bothered (2), and considerably bothered (3). It can be analyzed

through sub-scores and a sum score. The average was calculated for each individual. Scores < 0.5 indicate no discomfort, 0.5-1.49 slight discomfort, 1.5-2.49 moderate discomfort, and > 2.5 Severe discomfort. Cronbach's alpha was calculated for the total, and it was 0.728.

3. Mental health outcomes were assessed by evaluating individuals' depression levels using the **Patient Health Questionnaire (PHQ-9**). It is used to screen depression severity developed by Kroenke et al. **[20].** It has a rate from"0" (not at all) to "3" (nearly every day). Everyone's score is the sum of all nine elements. A score between 5 and 9 indicates mild depression, while 0-4 shows no depression. Scores between 10 and 14 indicate "mild depression", 15 to 19 "moderately severe" depression, and 20 to 27 "severe depression" **(Mulder P. 2019).** For people with high-risk severe depression (scores of 10 or above), the PHQ-9 has a sensitivity and specificity of 88% **(Kroenke K, Spitzer RL, Williams JB, 2001)** 61% sensitivity and 94% specificity **(Mulder P. 2019).** and Cronbach's α coefficient of 0.892 **(Sun Y, 2020).**

An English expert translated tools 2 and 3 into Arabic. To ensure tool content correctness. First, the expert sent the English-to-Arabic translation. A different translator took over the Arabic translation and restored it to English. The researcher then reconciled the questionnaire's original and back-translated versions. Subject matter experts review the Arabic version to ensure it measures the intended concepts. A pilot study on 10% of study subjects used the above tools to verify their clarity, practicality, correctness, and application and make any necessary changes. The pilot study estimated questionnaire sheet completion time. Based on the pilot study, changes were made. The pilot sample was eliminated from the sample. Internal consistency was assessed using Cronbach's alpha test; it was 0.9 for Patient Health Questionnaire (PHQ-9) and 0.75 for Patient-Reported Outcomes (PROs).

Ethical Consideration:

IRB was taken from the MACHS IRB committee (**Reference Number: SR/RP/171**). The participants were informed of the study's title and objectives prior to requesting their informed permission. Individuals who answered the survey questionnaire were asked to sign an informed consent form to ensure their voluntary participation in the study. Participation in the research was voluntary, and the participants could withdraw by stopping participating (i.e., not answering the questions) whenever they wanted. The participants' data remained anonymous, private, and confidential.

Data Collection Procedures

Researchers met with the participants in the outpatient clinic, where they followed up with their physicians. The researcher collected data using a Google form with a barcode for easy scanning and access. The researcher explained the study's purpose and introduction before enrolling volunteers. Each volunteer received a Google bar code for the questionnaire, which began with a permission form (consent). If a participant had trouble filling out the form, the researcher used her phone or iPad. The researcher also offered hardcopy questionnaires for people who struggled using Google Forms. For individuals who cannot read or write or have eyesight impairments, the researcher asked questions and filled out the form. The questionnaire was anonymous to protect privacy and confidentiality during the study and publication.

Statistical Analysis: The data was analysed using SPSS version 23 for statistical evaluation and management. Descriptive statistics were computed using frequency and percentage, and a p-value less than 0.05 was considered statistically significant.

Results

The data analysis aimed for an equal sample size of individuals with obesity for each weight reduction medication; however, we relied on a convenient sample of individuals with obesity who were receiving follow-up care at the hospital's outpatient clinic, where we received IRB approval. As a result, the sample sizes across the groups were unequal, with more participants using Ozempic than the other two medications. Three hundred seventy individuals with obesity were enrolled in the study, with the majority being young aged between 18 and 40 (75.4%), with 65.7% female (Table 1). Most participants had a universal education (71.1%), indicating a high educational level. There is a significant presence of chronic health conditions, particularly hypertension (23.0%) and diabetes (17.8%). After 3-9 taking weight reduction injections for the participants, obesity is a notable concern, with a large portion of the participants (70%) with either overweight (39.2%) or obese (20%). Additionally, 27.6 % were healthy (15.7%) or underweight (11.9%).

Question (1): What is the most common side effect among individuals with obesity who receive Ozempic, Mounjaro, and Saxenda?

Table 2 outlines the side effects experienced by individuals with obesity on three different weight reduction injections: Ozempic, Saxenda, and Mounjaro. The five most common side effect symptoms among all participants were diarrhea (10.8%), hair loss (9.2%), fever (8.6%), constipation (8.1%), and tiredness (7.8%) (Table 2). The least common symptoms included anxiety (0.5%), suicidal thoughts (1.1%), altered taste (1.6%), injection site reaction (1.6%), restlessness (1.9%), fatigue (1.9%)

Gastrointestinal symptoms were the most reported side effects by the participants who received weight reduction injections. Mounjaro was notably more commonly reported for gastrointestinal symptoms, such as diarrhea (17%), constipation (12%), dry mouth (7%), burping (7%), gas flatulence (6%), soft stool (6%), and belly pain (6%). Nausea/vomiting (8%), oily spotting (10%) and faecal incontinence (8%) were reported relatively slightly higher with Saxenda group than the other two medications (Table 2).

Moreover, the Mounjaro group had higher rates of dermatology complaints, including hair loss (18%), allergic reactions (11%), fever (14%), and dark skin patches (6%). Saxenda and Ozembic reported hot flushes (8%) equally. Furthermore, the Mounjaro group reported sleep-related symptoms, such as difficulty sleeping (9%) and sleepiness (7%), while insomnia was highly reported by Saxenda (7%) (Table 2).

Additionally, the Mounjaro group most experienced neurological symptoms, especially nervousness (10%) and tremors (7%), while the Saxenda group had a slightly greater incidence of headache (10%) and increased blood pressure (8%). Tiredness was the most often reported musculoskeletal symptom, occurring significantly more in the Ozempic and Saxenda groups equally (8%). The three groups very minimally reported mental and sexual symptoms (Table 2).

The Shapiro-Wilk test results for the depression scores demonstrated a significant deviation from a normal distribution (p-value < .001) for both Patient-Reported Outcomes **(**PROs) and PHQ-9 (depression scores). Consequently, non-parametric procedures, such as Chi-square and Kruskal-Wallis tests and pairwise comparisons, were employed to analyze Patient-Reported Outcomes and

depression scores among individuals utilizing three distinct weight reduction injections (Ozempic, Saxenda, and Mounjaro).

Question (2): To what extent have Ozempic, Mounjaro, and Saxenda affected the daily living activities of individuals with obesity?

Table 3 indicates the levels of discomfort reported by individuals with obesity in performing eight daily living activities, as assessed through Patient-Reported Outcomes (PROs), during the use of weight reduction injections. Most participants (93.8%) experienced moderate to severe discomfort in daily activities, highlighting the significant impact of weight reduction injections on their daily lives. With nearly half of the participants (48.7%) reporting severe discomfort, it suggests that while the injections might aid weight reduction, they may come with substantial side effects or challenges that affect individuals' physical and mental well-being. The Chi-Square test compares PRO tool-measured discomfort levels regarding medication's impact on daily living activities between groups (Table 3). There is no statistically significant difference among the three medications ((χ^2 (4) =3.005, p = 0.154). These findings suggest that the distribution of reported outcomes does not differ significantly across the groups. Mounjaro has the highest "Sever Discomfort" impact on the participants' daily activities (52.3%), indicating more bother to participants than the others. It is followed by Ozempic (49.7%). Saxenda has the highest percentage of "Moderate Discomfort" (48.9%) (Table 3).

In the subscale of the eight activities, Saxenda has a more significant impact on users' psychological well-being and social lives, likely due to its daily administration and associated side effects (e.g., sleep (39%), sexual life (34%), social interactions (34%), and self-esteem (33%). Mounjaro has the highest impact on bodily pain (41%) and discrimination (28%), suggesting these are areas where it impacts users more significantly. Additionally, 34% of the Saxenda group reported that the medication "Considerably Bothered" with their sexual life compared to 20% for both Ozembic and Mounjaro groups.

Question (3): What is the relationship between depression levels and weight reduction injections (Ozempic, Mounjaro, and Saxenda) among individuals with obesity?

Nearly two-thirds of the sample (63.3%) reported either no depression or minimal depression, indicating that the psychological impact of weight reduction injections may be minimal for most individuals (Table 4). About one-quarter of the sample (24.3%) reported moderate to severe depression, which suggests a significant mental health burden for these participants. The majority of individuals who used Saxenda (63.3%) reported no depression, followed by Mounjaro (45.8%) and then Ozempic (38.7%) groups. The highest rates of moderate depression were found in the Ozempic and Mounjaro cohorts, with 22.5% and 23.4%, respectively. Ozempic has a more evenly spread-out individual population across all levels of depression, but 9.8% of individuals reported severe depression, which is a slightly higher number than the other two groups (Table 4).

Kruskal Wallis test indicates a statistically significant disparity in depression levels between the three drug groups (χ^2 (2) =19.9, p < .001). Pairwise Comparisons (Post-Hoc Tests) indicate a significant difference between Saxenda and both Ozempic (W = -6.21, p < .001) and Mounjaro (W = 4.27, p = 0.007) (Table 5). However, no significant difference exists between Ozempic and Mounjaro (W = -2.04, p = 0.320). Saxenda demonstrated the most favorable outcome, with a median of 0, suggesting that most participants experienced no depressive symptoms. In contrast, both Ozempic and Mounjaro had a median of 2, indicating that most participants reported mild depression scores, although some individuals had higher levels of

depression. The effect size is small ($\varepsilon^2 = 0.0538$), suggesting that although the differences are statistically significant, the influence of the weight reduction injections on depression may not be practically considerable. Saxenda showed the least depressive symptoms. Around 16% of Mounjaro and Ozempic groups experienced moderate depression levels, while 9.8% reported severe depression in Ozempic (Table 5).

Table 1: Demographic data

		Frequency	**percentage**
Age	18->30	186	50.3%
	30- >40	93	25.1%
	40 ->50	46	12.4%
	50 -65	45	12.2%
	Total	**370**	**100%**
Sex	Male	127	34.3%
	Female	243	65.7%
Marital status	Single	194	52.4%
	Married	172	46.5%
	Widow	4	1.1%
Education Level	Read And write	12	3.2%
	Secondary Education	55	14.9%
	Universal Education	263	71.1%
	Postgraduate	40	10.8%
Job	Worked	183	49.5%
	Not Worked	112	30.3%
	Housewife	35	9.5%
	Retired	40	10.8%
Monthly income	Enough	275	74.3%
	Not Enough	95	25.7%
Residency	Rural	43	11.6%
	Urban	327	88.4%
Comorbidity (Chronic Disorders)	Hypertension	85	23.0%
	Cardiac disease	12	3.2%
	Renal Disease	10	2.7%
	Diabetes Mellitus	66	17.8%
	Hepatic disorder	12	3.2%
	Blood disorder	40	10.8%
	Other	9	2.4%
Body Weight	underweight < 18.5	44	11.9 %
	Standard BMI 18.5-24.9	58	15.7 %
	overweight 25-29.9	145	39.2 %
	Obesity Class I (30-34.9)	74	20.0 %
	Obesity Class II (35-39.9)	33	8.9 %
	Obesity Class III ≥ 40	12	3.2 %
	Obesity Class IV ≥ 50	4	1.1 %
Total		**370**	**100%**

Table 2: Prevalence of common side effects for the total sample and per each weight reduction injection groups

	Symptoms After 3 Months	OZEMPIC (Semaglutide)	SAXENDA (Liraglutide)	MOUNJARO (Tirzepatide)	Total Frequent (%)
Gastrointestinal Symptoms	Dry Mouth	7(4%)	2(2%)	**8(7%)**	17(4.6%)
	Altered Taste	2(1%)	2(2%)	2(2%)	6(1.6%)
	Acid Reflux	**3 (1.7%)**	2(2%)	2(2%)	7(1.9%)
	Burping	7(4%)	4(4%)	**8(7%)**	19(5.1%)
	Nausea /Vomiting	12(7%)	**7(8%)**	6(6%)	25(6.8%)
	Stomach Pain	**7(4%)**	0	**4(4%)**	11(3%)
	Gas Flatulence	9(5%)	2(2%)	**6(6%)**	17(4.6%)
	Constipation	15(9%)	2(2%)	**13(12%)**	**30(8.1%)**
	Diarrhea	14(8%)	8(9%)	**18(17%)**	**40(10.8%)**
	Oily Spotting	7(4%)	**9(10%)**	6(6%)	22(5.9%)
	Soft Stool	7(4%)	3(3%)	**6(6%)**	16(4.3%)
	Fecal Incontinence	4(2%)	**7(8%)**	8(7%)	19(5.1%)
	Belly Pain	2(1%)	2(2%)	**6(6%)**	10(2.7%)
	Fecal Urgency	5(3%)	**4(4%)**	**4(4%)**	13(3.5%)
	Unusual Taste	5(3%)	**4(4%)**	**4(4%)**	13(3.5%)
Skin Symptoms	Allergic Reaction	2(1%)	2(2%)	**12(11%)**	16(4.3%)
	Injection Site Reaction	2(1%)	0	**4(4%)**	6(1.6%)
	Hot Flush	**13(8%)**	**7(8%)**	8(7%)	28(7.6%)
	Fever	12(7%)	5(6%)	**15(14%)**	**32(8.6%)**
	Dark Skin Patch	5(3%)	0	6(6%)	11(3%)
	Swelling Skin	2(1%)	4(4%)	2(2%)	8(2.2%)
	Hair Loss	10(6%)	5(6%)	**19(18%)**	**34(9.2%)**
Cardiac Symptoms	Increase Heartrate	0	4(4%)	4(4%)	8(2.2%)
	Increase Blood Pressure	4(2%)	**7(8%)**	4(4%)	15(4.1%)
Musculoskeletal Symptoms	Restlessness	**5(3%)**	0	2(2%)	7(1.9%)
	Fatigue	3(2%)	2(2%)	2(2%)	7(1.9%)
	Tiredness	**14(8%)**	**7(8%)**	8(7%)	**29(7.8%)**
Nervous System Symptoms	Headache	8(5%)	**9(10%)**	8(7%)	25(6.8%)
	Anxiety	0	0	**2(2%)**	2(0.5%)
	Nervousness	7(4%)	7(8%)	**11(10%)**	25(6.8%)

	Dizziness	7(4%)	6(7%)	4(4%)	17(4.6%)
	Tingling Sensation	5(3%)	**6(7%)**	6(6%)	17(4.6%)
	Tremor	7(4%)	4(4%)	8(7%)	19(5.1%)
Mental Symptoms	Depression	6(3%)	2(2%)	**4(4%)**	12(3.2%)
	Suicidal Thoughts	0	2(2%)	2(2%)	4(1.1%)
Sleep Symptoms	Insomnia	3(2%)	**6(7%)**	4(4%)	13(3.5%)
	Difficult Sleeping	5(3%)	4(4%)	**10(9%)**	19(5.1%)
	Sleepiness	**12(7%)**	0	**8(7%)**	20(5.4%)
Sexual Symptoms	Unwanted Sexual Relation	6(3%)	2(2%)	4(4%)	12(3.2%)
Total		**173**	**90**	**107**	**370**

Table 3: Frequency of Patient-reported outcomes for daily activities affected by weight reduction injections per group

Descriptive Data				
Discomfort level	**Total Sample**	**OZEMPIC (Semaglutide)**	**SAXENDA (Liraglutide)**	**MOUNJARO (Tirzepatide)**
No Discomfort	-	-	-	-
Slight Discomfort	23 (6.2%)	10 (5.8%)	8 (8.9%)	5 (4.7%)
Moderate Discomfort	167 (45.1%)	77 (44.5%)	44 (48.9%)	46 (43%)
Severe Discomfort	180 (48.7%)	86 (49.7%)	38 (42.2%)	56 (52.3%)
Total	**370**	**173**	**90**	**107**

Chi-Square Tests: Participants' reported outcomes among groups.

	Value	**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**
Pearson Chi-Square	3.005a	4	.557	.562
Likelihood Ratio	2.946	4	.567	.575
Fisher's Exact Test	2.992			.563
N of Valid Cases	370			

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 5.59.

Table 4: Participants' depression levels per weight reduction injection group

Depression Level	**Total Sample**	**OZEMPIC (Semaglutide)**	**SAXENDA (Liraglutide)**	**MOUNJARO (Tirzepatide)**

No Depression	173 (46.8%)	67 (38.7%)	57 (63.3%)	49 (45.8%)
Minimal Depression	61 (16.5%)	31 (17.9%)	17 (18.9%)	13 (12.1%)
Mild Depression	46 (12.4%)	19 (11%)	9 (10%)	18 (16.8%)
Moderate Depression	66 (17.8%)	39 (22.5%)	2 (2.2%)	25 (23.4%)
Severe Depression	24 (6.5%)	17 (9.8%)	5 (5.6%)	2 (1.9%)
Total	**370**	**173**	**90**	**107**

Table 5: Kruskal-Wallis test compares participants' depression scores among weight reduction injection groups

Descriptive Data				
	Total Sample	**OZEMPIC**	**SAXENDA**	**MOUNJARO**
Mean	5.1	6.5	2.62	4.89
Median	2	2	0	2
SD	7.04	7.87	5.62	6.09
Minimum	0	0	0	0
Maximum	27	27	27	24
Kruskal-Wallis test				
	χ^2	**df**	**p**	
Depression Level	19.9	2	< .001	
Pairwise comparisons among groups– (Depression Level)				
		W	**P**	
OZEMPIC	**SAXENDA**	-6.21	< .001	
OZEMPIC	**MOUNJARO**	-2.04	0.320	
SAXENDA	**MOUNJARO**	4.27	0.007	

Reject null hypothesis. Effect size ($\varepsilon^2 = 0.0538$), small effect

Discussion

The current study revealed that gastrointestinal symptoms were the most often reported side effects among individuals utilizing weight reduction injections such as Ozempic, Saxenda, and Mounjaro. These findings are consistent with the typical adverse effect profile of GLP-1 receptor agonists used in weight reduction management **(Collins L, Costello RA, 2024).** A systemic study by **Yao, et al., (2024)** found that gastrointestinal symptoms were among the most frequently cited side effects in individuals using GLP 1 receptor agonists for weight loss, especially nausea and diarrhea. This is consistent with the **American Diabetes Association (2014)** report regarding the adverse effects of GLP-1 receptor agonists. During the initial treatment stage, nausea, vomiting, diarrhea, and constipation are frequently reported **(Gorgojo-Martínez, 2022).** All three medications commonly induce mild to moderate nausea, vomiting, diarrhea, and abdominal pain **(Sagratzki RMG, et al., 2023) & (Pedro O, et al., 2024).** According to **Ghusn,**

et al., (2022) gastrointestinal symptoms were the common adverse effects reported with Semaglutide, nausea and vomiting (36.6%), diarrhea (8.6%) and fatigue (6.3%). These results also align with a systemic review by **Tan et al., (2022)** which found the risk for gastrointestinal adverse outcomes was 1.59 times higher with Semaglutide.

Notably, the Mounjaro group showed higher incidences of several adverse effects, especially gastrointestinal, dermatological, sleep-related, and neurological symptoms. Mounjaro has a high rate of diarrhea (17%), constipation (12%), and dry mouth (7%). This is consistent with **Aronne, (2024)** found that gastrointestinal nausea (35.5%), diarrhea (21.1%), constipation (20.7%), and vomiting (16.3%) were the most reported side effects treated with Tirzepatide. The cause of these gastrointestinal side effects is likely related to the mechanism of action of GLP-1 agonists, which slow gastric emptying and make individuals feel full, but they can also lead to discomfort such as bloating, nausea, and constipation **(Collins L, Costello RA, 2024) & (Feier C, 2024).** One reason for the differences in side effects across the three medications may be related to their pharmacodynamic profiles. While all three are GLP-1 receptor agonists, Mounjaro has dual action (GLP-1 and GIP agonist) which may explain its higher gastrointestinal and neurological symptoms rate **(O'Neill E, 2024).** Mounjaro's dual-target action could lead to more significant effects on both gastrointestinal motility and neurological pathways compared to the more specific GLP-1 action of Saxenda and Ozempic. On the other hand, **Silva et al. (2023)** reported that Saxenda has higher discontinuation rates due to gastrointestinal intolerance compared to other GLP-1 agonists. In the Saxenda group, nausea/vomiting (8%) and oily spotting (10%) were more prevalent than in the other two groups. These results align with **Pi-Sunyer et al. (2015). study** which identified nausea and diarrhea as the most common side effects associated with Saxenda (Liraglutide). Oily spotting and fecal incontinence could be linked to the drug's effect on fat metabolism, which leads to altered fat absorption in some patients.

Mounjaro also showed higher rates of dermatological complaints, such as hair loss (18%) and allergic reactions (11%). Although hair loss is not typically highlighted in many large-scale studies on GLP-1 receptor agonists. Concerns about the effects of GLP1 agonists on hair health arise in a few articles. Some reported risks of hair loss or premature androgenetic alopecia (AGA), while others reported benefits, like better insulin sensitivity and improved scalp blood supply to hair **(Desai D, et al., 2024).** Research by **Guo and Katta, (2017)** suggested that rapid weight loss, familiar with these medications, leads to nutritional deficiencies that affect hair growth and hair structure. Other research reported that specific concerns lead to injection site reactions for Saxenda **(Wen J, et al., 2024).**

On the other hand, Saxenda users also reported a slightly higher incidence of headache (10%) and increased blood pressure (8%) compared to users of Ozempic and Mounjaro. These results contradict two systemic and meta-analyses. **Robinsonet al. (2013).** observed that liraglutides are linked to elevation in heart rate and have a moderate effect on decreasing diastolic blood pressure. In a meta-analysis of randomized trial data on individuals with type 2 diabetes mellitus, **Zhao, Liu, and Dong, (2020).** noticed that Liraglutide increased heart rate more than placebo while decreasing systolic blood pressure and body weight in a systematic review and meta-analysis of cardiovascular outcome trials. GLP-1 receptor agonist treatment in type 2 diabetes patients reduced major adverse cardiovascular events by 12% **(Kristensen S, et al., 2019).**

For the Ozempic and Saxenda groups, tiredness emerged as the most frequently reported musculoskeletal symptom. This fatigue may result from the medication's metabolic effects, including changes in blood glucose levels and energy consumption that may impact medication adherence if patients experience difficulties with daily activities. Conversely, published research reported that GLP-1RAs positively affect bone health and strength in experiments. However, their actions are different, and there are not enough clinical studies to prove they protect bones **(Mabilleau G, Pereira M, Chenu C, 2018).**

Interestingly, all three medication groups reported minimal mental and sexual symptoms. The low incidence of these symptoms in the present study could suggest that, for the majority of users, these medications do not significantly affect mental or sexual health. However, in the patient-reported outcomes questions, 34% of the Saxenda group reported that the medication "Considerably Bothered" them in their sexual life compared to 20% for both Ozembic and Mounjaro groups. One of the studies identified an association between Ozempic and an increased risk of erectile dysfunction and testosterone deficiency in non-diabetic males **(Liao B, et al., 2024).** There is also an increased risk of testosterone deficiency in men using Semaglutide (Ozempic), with rates of 3.83% compared to 1.7% in controls **(Liao B, et al., 2024).** The difference in findings between our study and the study by Liao et al. may be attributed to the demographic composition of our sample. Specifically, males represented only **34%** of our sample, potentially limiting the statistical power to detect such associations.

The results indicate that the distribution of reported outcomes is not significantly different among the groups. Mounjaro (Tirzepatide) has the highest "severe discomfort" affecting participants' everyday activities, followed by Ozempic (52.3% and 49.7%). On the contrary, one study found that Tirzepatide therapy enhances BMI classifications and patient-reported outcomes in adults with type 2 diabetes, significantly improving self-image, quality of life, and daily functional abilities **(Lee C, et al., 2023).** Additionally, weight reduction improved the patient's physical condition and positively impacted WRQOL and HRQOL beyond physical functioning **(Rubino D, et al., 2024). Rubin, et al., (2013)** findings also indicated that patients who lost more weight reported better results in all areas except sleep quality. This discrepancy arises because the researchers focused on assessing the impact of BMI reduction on patients' performance in daily activities after the course of treatment without examining the daily influence of weight reduction medication side effects on their activities during the treatment period.

The participants reported insignificant mental effects across the three groups, with the majority of the participants expressing minimal and no depression effects (63.3%) and 30.3% stating mild to moderate depression levels from these medications. Consistent with these results, **(Shalaby AS, Sadik SA, Mahmoud DA, 2020).** indicated that concurrent with the reported weight loss, there was a substantial drop in depression, anxiety, and stress. Similarly, another study revealed that about one-quarter of the participants developed anxiety or depression after weight loss treatment. Injection-based weight loss treatments elevate the risk of depression **(Ahmed B, et al., 2024)**. On the contrary, another study reported that during the three-month intervention course, anxiety and depressive symptoms got better with the liraglutide medication **(Apperley L, et al., 2021)** Additionally, a clinical audit was conducted on a group of 54 individuals with obesity who were given liraglutide treatment, revealing a negative correlation between anxiety symptoms and depressive symptoms **(Tempia Valenta S, et al., 2023).** They underscore the need for future research to examine not only the direct impact of these medications on mental health but also the role of confounding factors, such as individual differences, the duration of treatment, and the inclusion of mental health interventions alongside pharmacotherapy. The contrasting results could

be attributed to improvements in BMI, as weight reduction can enhance self-image and overall psychological well-being in individuals with obesity. whereas our study focused on depression levels during treatment period without specifically considering the influence of BMI-related changes on participants' mental health.

Conclusion

The study results concluded that weight reduction injection is associated with side effects, especially on the gastrointestinal tract, and the overall prevalence remained below 11% across the group. The incidence of side effects was notably higher in the Mounjaro group, followed by Saxenda and Ozempic. The impact of weight reduction injections on participants' depression levels was mild to no effect, though Ozempic had the highest incidence of severe depression. However, most participants experienced a significant influence of these injections on their daily activities.

Recommendations & implications

The study suggests that healthcare providers should be proactive in managing the side effects of weight reduction injections, especially those affecting the gastrointestinal tract and other side effects. An educational program that includes proper education and supporting measures could help individuals with obesity improve their quality of life. It also highlights the need for better symptom management strategies, such as dietary guidance and personalized support. While weight reduction injections may be effective in reducing weight, they could negatively impact the daily living activities of individuals with obesity. To optimize treatment plans, it is important to identify factors that contribute to severe discomfort, such as medication type, dosage, or pre-existing health conditions. It is recommended to implement integrated mental health support and routine monitoring for individuals experiencing moderate to severe depression during weight reduction treatment, with a focus on the early identification and management of severe depression cases.

Nurses should incorporate patient-reported outcomes into nursing care plans for individuals with obesity undergoing weight reduction treatments. They should develop tailored interventions to manage side effects, screen for mental health concerns, and emphasize the psychological aspects of obesity management. Nurses should educate patients about potential side effects and offer counselling sessions.

Furthermore, the study should be replicated and generalized for a large sample, considering the medication dose and other effects of these medications on comorbidity disease and assessing the potential long-term effects of weight reduction injection on individuals' health outcomes and quality of life. In addition, further research is needed to improve nursing practices in obesity management.

Limitations of the Study

A limitation of this study is that, although we aimed to achieve an exact sample size for each medication group, reliance on a convenient sample of participants from the outpatient clinic affected our ability to meet this target. Consequently, sample size variations across the weight reduction medications groups may impact the findings' generalizability and comparability. Furthermore, using a convenient sample may limit the generalizability of the findings to a broader population.

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Authors' contribution
HE and SSh were responsible for designing the research protocol, drafting the proposal, obtaining IRB approval, conducting the research, analyzing the data, extracting and interpreting results, updating the reference lists, writing the final manuscript, and overseeing the publication process. Other RN co-authors were given responsibility with disseminating the tools to participants, collecting data, and contributing to data analysis and interpretation of results.

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Data Availability
The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests
The authors declare that they have no competing interests.

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