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Original Article

Skin manifestations associated with Glucagon-Like Peptide-1 (GLP-1) receptor agonist use for weight loss: A cross-sectional analysis

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Abstract

Background Glucagon-like peptide-1 (GLP-1) receptor agonists have become widely used for weight loss, but their cutaneous side effects are still underreported.

Objective This study aims to evaluate the prevalence and characteristics of skin manifestations associated with GLP-1 RA use for weight loss.

Methods A cross-sectional study was carried out from January to April 2024 at three tertiary care centers in Saudi Arabia. A total of 254 adult participants using GLP-1 Receptor Agonists (e.g., Ozempic, Mounjaro, or Saxenda) for weight loss were enrolled. Participants with pre-existing dermatologic conditions or systemic illnesses affecting the skin were excluded. Data were analyzed using SPSS version 29.

Results Out of the 254 participants, 102 (40.2%) reported at least one skin-related side effect. The most common was dry skin (21.2%), followed by itching (8.6%) and erythema (3.9%). Mounjaro users experienced dry skin and itching, while Saxenda users had the highest rate of combined symptoms. No statistically significant differences were found between the drug types in terms of overall skin reaction rates.

Conclusion Skin manifestations are common among GLP-1 RA users, with dry skin and itching being the most common reports. Although usually mild, these effects underscore the importance of clinician awareness and potential dermatologic evaluation as part of comprehensive patient care.

Keywords GLP-1 receptor agonists; Skin manifestations; Cutaneous side effects; Ozempic; Mounjaro; Saxenda.

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Introduction

Obesity has been recognized as a significant global health challenge since 1975, and its prevalence has risen to 650 million adults worldwide.[1] This metabolic disorder is a significant risk factor for various diseases, including type 2 diabetes mellitus (T2DM), cardiovascular disease, osteoarthritis, and certain cancers.[2] Therefore, effective weight-management strategies are essential for decreasing the risk of complications related to obesity.[3] In this context, pharmacological treatments have become increasingly important, especially for individuals

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who do not achieve sufficient results from lifestyle changes alone. Glucagon-like peptide-1 (GLP-1) receptor agonists are among the most promising drug options.[4] These incretin-based treatments aimed initially to help people with type 2 diabetes manage their blood sugar levels, but they are now commonly used to assist non-diabetics in losing weight.[5]

GLP-1 receptor agonists, such as liraglutide and semaglutide, enhance metabolic rates by mimicking the functions of the GLP-1 hormone produced by the human body. These agents suppress glucagon release, stimulate glucose-dependent insulin secretion, increase satiety, and slow gastric emptying, all of which contribute to significant weight loss.[6] Various clinical trials and real-world studies have demonstrated the effectiveness of these GLP-1 RAs in promoting weight loss and enhancing metabolic health markers.[7,8] For example, a weekly dose of semaglutide 2.4 mg has been strongly linked to an average weight loss in overweight and obese adults without diabetes.[9-11] This fact results in the approval of semaglutide 2.4 mg by regulatory agencies like the FDA and EMA for long-term weight management.[12] However, new research has raised concerns about the potential side effects of these drugs, especially skin-related issues, as their use has expanded from diabetics to broader clinical and aesthetic areas.[13] Although GLP-1 receptor agonist medication is less frequently mentioned, skin-related adverse effects are becoming increasingly recognized due to a rise in reports in pharmacovigilance databases and clinical practice. Localized injection site reactions, as well as more widespread dermatological symptoms, including urticaria, eczema, and pruritus, and, infrequently, more severe reactions such as vasculitis or bullous eruptions, are examples of these presentations.[14,15] Although rashes and nodules at the injection site are relatively common and usually harmless, recent case reports have connected the use of GLP-1 agonists to inflammatory and autoimmune skin conditions, prompting further research into possible immunologic or pharmacodynamic causes.[15] Clinicians need to understand the patterns and importance of these adverse skin reactions, as they can negatively affect patient adherence, quality of life, and ongoing treatment. The exact mechanism behind the skin symptoms related to GLP-1 receptor agonists remains unknown. Theories include allergic sensitization to the medication or its delivery system, immune changes caused by long-term exposure to a synthetic peptide, and off-target effects through peripheral GLP-1 receptors found in skin tissues.[16] According to certain research, the use of GLP-1 agonists may be associated with diseases such as drug-induced lupus or eosinophilic dermatoses, which are linked to changes in cytokine profiles or mast cell activation.[16,17] However, it is challenging to draw definitive conclusions due to the varied nature of these symptoms and the scarcity of reliable epidemiological data. Additionally, attribution becomes more complicated because symptoms can overlap with those of other dermatological conditions, and due to patient factors such as atopy, medication use, or a history of skin diseases. Therefore, this study aims to examine the prevalence and types of skin manifestations associated with the use of GLP-1 receptor agonists among individuals prescribed these medications specifically for weight loss.

Methods

A cross-sectional observational study was conducted from January to June 2025 at tertiary care center and affiliated weight management clinics across Saudi Arabia. A total of 254 adult participants were recruited through purposive sampling. Eligible individuals were 18 years or older, had a history of GLP-1 RA use (Ozempic, Mounjaro, or Saxenda) for at least four weeks, and were using these medications primarily for weight loss. Patients with pre-existing dermatological conditions, immunosuppressive therapy, or systemic illnesses known to affect skin integrity were excluded to minimize confounding factors.

The study was approved by the Institutional Review Board (IRB) of King Khalid University vide approval number (ECM#2024-2108) dated 3rd September 2024 and all participants provided

informed written consent before participation. Confidentiality and anonymity were maintained throughout the research process.

Data were collected through structured questionnaires and a review of medical records. The questionnaire included items on demographics (age, gender, nationality), medication history (type of GLP-1 RA, dosage, duration of use), and the presence and type of cutaneous symptoms experienced during treatment. Participants were explicitly asked about dry skin, itching, erythema, rashes, and other new-onset skin symptoms temporally associated with the initiation of GLP-1 RAs. The primary outcome was the prevalence of self-reported cutaneous side effects among GLP-1 RA users. Secondary outcomes included the distribution of specific skin manifestations by GLP-1 RA type and the relationship between skin effects and demographic or treatment-related variables (e.g., age, gender, duration of use). These patients were not admitted indoor patients, and no concomitant drugs were identified.

Data were stored and analyzed using SPSS version 29. Descriptive statistics were employed to summarize demographic characteristics and the prevalence of skin manifestations. Categorical variables were reported as frequencies and percentages, while continuous variables were expressed as means with standard deviations. The chi-square test was used to assess differences in the prevalence of skin manifestations among different groups of GLP-1 receptor agonists, with statistical significance set at $p < 0.05$.

Result

A total of 254 participants were included in the study. The mean age was 33.3±9.7 years. The sample consisted predominantly of females (181, 71.3%), while males comprised 73 (28.7%). Most respondents were Saudi nationals 243(95.7%), and 11 (4.3%) were non-Saudi. Most participants were married 153 (60.2%), with the remainder being single 92 (36.2%).

Regarding weight loss therapy, Mounjaro was the most commonly reported weight loss injection (188, 74.0%), followed by Ozempic (50, 19.7%), Saxenda (15, 5.9%), and Victoza (1, 0.4%). The reported duration of injection use was less than three months for 78 (30.7%), three to six months for 104 (40.9%), six to twelve months for 48 (18.9%), and more than twelve months for 24 (9.4%) (**Table 1)**.

The most frequently reported cutaneous manifestation among participants was dry skin, reported by 54 (21.2%) of respondents, followed by itching (22, 8.6%), unspecified skin rash (12, 4.7%), and erythematous skin (10, 3.9%). A minority of participants, 4 (1.6%), reported multiple or other skin manifestations, including urticaria, hyperpigmentation, or more than one concurrent symptom **(Table 2, Figure 1)**.

Table 1 Demographic characteristics of the study participants (n=254).

Variable	*n*	*%*
Age (years)	33.3±9.7	
Gender		
Male	73	28.7
Female	181	71.3
Nationality		
Saudi	243	95.7
Non-Saudi	11	4.3
Marital Status		
Single	92	36.2
Married	153	60.2
Divorced	9	3.5
Type of Injection Used		
Victoza	1	0.4
Saxenda	15	5.9
Ozempic	50	19.7
Mounjaro	188	74
Duration of Injection Use		
< 3 months	78	30.7
3–6 months	104	40.9
6–12 months	48	18.9
> 12 months	24	9.4

Table 2 Frequency of reported cutaneous manifestations among weight loss injection users.

Skin Manifestation	*n*	*%*
No skin changes	152	59.8
Dry skin	54	21.2
Itching	22	8.6
Unspecified skin rash	12	4.7
Erythematous skin	10	3.9
Multiple/ Other*	4	1.6

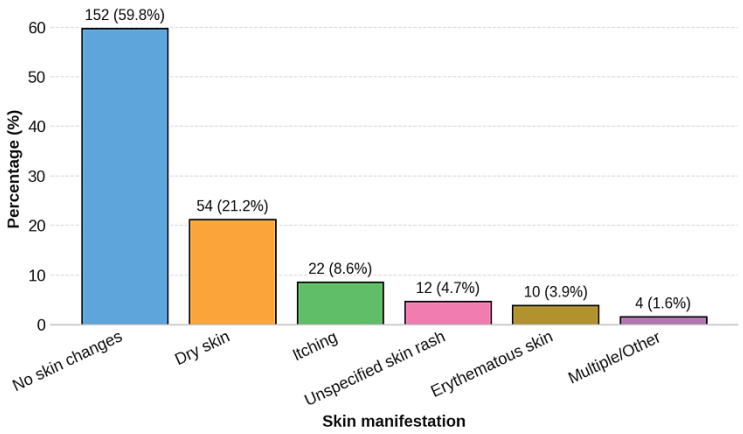

Figure 1 Cutaneous manifestations among weight loss injection users

*Multiple/ Other includes urticaria, pimples, hyperpigmentation, and cases with more than one symptom

Table 3 presents the distribution of specific cutaneous manifestations by type of weight loss injection. Among Mounjaro users (n=188), the most frequently reported side effect was dry skin, affecting 39 (20.7%), followed by itching in 18 (9.6%) and erythematous skin in 9 (4.8%). Among Ozempic users (n=50), dry skin was reported by 11 (22.0%), itching was reported by 9 (18.0%), and erythematous skin with itching was reported by 3 (6.0%). For Saxenda users (n=15), dry skin was noted in 4 (26.7%), erythematous with itching in 2 (13.3%), and erythematous skin in 1 (6.7%). Among Victoza users (n=1), a single participant reported erythematous with itching 1 (100.0%). Urticaria was only observed in three Mounjaro users 3 (1.6%).

Table 4 shows a comparison of demographic, lifestyle, and injection-related characteristics between participants who reported skin side effects and those who did not. The mean age was slightly higher in the skin side effect group (34.4±9.8 years) compared to those without skin issues (32.3±9.3 years) (t=-1.75, p=0.08). The proportion of females was similar between groups, with 70 (68.6%) in the skin side effect group and 111 (73.0%) in the group without side effects (χ^2 = 0.09, p = 0.76).

Current smoking was reported by 23 participants (22.5%) with skin side effects and by 23 (15.1%) without (χ^2=1.73, p=0.19). A balanced diet was noted in 82 (80.4%) of those with skin side effects and 128 (84.2%) without (χ^2=0.29, p=0.59). The number of physical activity hours per day did not differ significantly between groups (0.44±2.4 vs. 0.42±2.7; t=0.07, p=0.89).

Regarding the type of injection, Mounjaro was the most common in both groups, used by 70 (68.6%) of those with skin issues and 118 (77.6%) of those without (χ^2=2.08, p=0.72). Ozempic was used by 23 (22.5%) with and 27 (17.7%) without skin side effects. Saxenda was reported by 8 (7.8%) participants with and 7 (4.6%) without skin issues, while Victoza was used by only 1 (0.98%) participant with skin issues and none without.

For injection duration, 34 (33.3%) of those with skin side effects and 44 (28.9%) without had used injections for less than three months; 45 (44.1%) vs. 59 (38.8%) had used them for three to six months; 20 (19.6%) vs. 28 (18.4%) for six to twelve months; and 9 (8.8%) vs. 15 (9.8%) for over one year (χ^2=10.18, p=0.43).

Discussion

This study investigated the incidence and patterns of dermatological manifestations associated with glucagon-like peptide-1 (GLP-1) receptor agonists, such as Mounjaro (tirzepatide), Ozempic (semaglutide), Saxenda (liraglutide), and Victoza. This study includes young to middle-aged adults (mean age, 33.3 years), with females comprising over 70% of the participants. This gender distribution aligns with broader literature suggesting

Table 3 Distribution of specific cutaneous manifestations by type of weight loss injection.

Skin Manifestation	*Mounjaro (n=188)*	*Ozempic (n=50)*	*Saxenda (n=15)*	*Victoza (n=1)*
Dry skin	39 (20.7%)	11 (22.0%)	4 (26.7%)	0 (0.0%)
Erythematous skin	9 (4.8%)	0 (0.0%)	1 (6.7%)	0 (0.0%)
Erythematous+itching	1 (0.5%)	3 (6.0%)	2 (13.3%)	1 (100.0%)
Urticaria	3 (1.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Itching	18 (9.6%)	9 (18.0%)	1 (6.7%)	0 (0.0%)

Table 4 Comparison of demographic, lifestyle, and treatment characteristics by skin side effect status.

Variable	*No Skin Issue (n = 152)*	*Skin Issue (n = 102)*	*t / χ²*	*p-value*
Age (years)	32.3 ± 9.3	34.4 ± 9.8	-1.75	0.08
Female (n, %)	111 (73.0%)	70 (68.6%)	0.09	0.76
Smoker (n, %)	23 (15.1%)	23 (22.5%)	1.73	0.19
Balanced Diet (n, %)	128 (84.2%)	82 (80.4%)	0.29	0.59
Physical activity hours	0.42±2.7	0.44±2.4	0.07	0.89
Injection Type				
Mounjaro	118 (77.6%)	70 (68.6%)	2.08	0.72
Ozempic	27 (17.7%)	23 (22.5%)		
Saxenda	7 (4.6%)	8 (7.8%)		
Victoza	0 (0.0%)	1 (0.98%)		
Injection Duration				
<3 months	44 (28.9%)	34 (33.3%)	10.18	0.43
3-6 months	59 (38.8%)	45 (44.1%)		
6-12 months	28 (18.4%)	20 (19.6%)		
>1 year	15 (9.8%)	9 (8.8%)		

a higher prevalence of pharmacologic weight-loss intervention usage among women, likely influenced by sociocultural pressures and aesthetic motivations.[18] Most participants were Saudi nationals, and the predominant use was Mounjaro (74.0%) for weight loss.

In this study, 40.2% of participants using GLP-1 receptor agonists (GLP-1 RAs) for weight loss reported cutaneous side effects, with dry skin (21.2%)**,** itching (8.6%)**,** and erythematous changes (3.9%) being the most common. Ozempic users reported higher rates of itching and erythema, while Mounjaro users predominantly experienced dry skin and itching; Saxenda users showed the highest incidence of dry skin with concurrent erythema and pruritus. These findings align with prior evidence indicating mild to moderate dermatological effects associated with GLP-1 RAs, likely due to their influence on mucocutaneous hydration, immune modulation, and local injection site reactions. Salazar *et al*.[17] highlighted rare but documented cases of urticaria, maculopapular rashes, and psoriasiform reactions linked to GLP-1 RAs, reinforcing the spectrum of cutaneous responses observed in clinical settings. Similarly, a retrospective analysis by Daniel S *et al*.[19] found that semaglutide was more frequently associated with pruritic and erythematous reactions, whereas tirzepatide users predominantly reported xerosis, corroborating our results. These findings are also supported by other studies in the literature.[20,21] A meta-analysis conducted by Yu *et al*.[22] encompassing 34 randomized controlled trials with 84,243 participants, identified alopecia as the only significant dermatological event, with no additional skin-related adverse effects reported. Moreover, post-marketing surveillance data and reports from the FDA Adverse Event Reporting System (FAERS) have linked the use of liraglutide and semaglutide to dermatological reactions such as urticaria, eczema, pruritus, and injection site reactions.[23] However, these manifestations have generally been reported in fewer than 5% of cases.[24]

In contrast, this study found dermatological symptoms in 40.2% of participants, higher than previously reported rates, likely due to broader inclusion criteria for symptoms and increased public awareness of potential side effects.

Interestingly, no statistically significant associations were found between age, gender, smoking, Diet, physical activity, or injection duration and the presence of cutaneous manifestations. Injection duration also did not correlate significantly with skin side effects (p=0.43), although slightly more participants with side effects had used the injections for three to six months (44.1% vs. 38.8%). This might reflect the latency of dermatologic adverse events in pharmacovigilance literature, which can emerge after initial therapy initiation.[24]

This study has important implications for clinical practice. Dermatological side effects from GLP-1 receptor agonists are relatively common, affecting up to 1 in 5 users, and while typically mild, they may impact treatment adherence among individuals using these agents for weight loss. Early recognition and management, such as maintaining skin hydration, using antihistamines, applying emollients, or discontinuing treatment when necessary, can help mitigate symptoms and improve patient outcomes. Educating patients about potential skin-related side effects as part of informed consent may also reduce anxiety and prevent premature discontinuation. The findings further emphasize the need for routine dermatologic monitoring during GLP-1 therapy, especially given its increasing off-label use. Finally, as these skin reactions appear unrelated to lifestyle factors like smoking or exercise, they are drug-induced, underscoring the importance of pharmacovigilance and personalized care in clinical settings.

Despite its valuable contributions, this study has several limitations. First, the cross-sectional design captures data at a single point in time, making it difficult to establish a causal relationship between GLP-1 use and dermatological symptoms. Second, reliance on self-reported skin issues introduces the risk of recall bias and misclassification, especially for vague symptoms like "rash" or "itching," which were not clinically or histologically confirmed. Third, the study's findings are limited in generalizability due to the homogeneous sample of primarily young, female Saudi participants. The small number of Victoza users further restricted comparative analysis across different GLP-1 agonists. Additionally, the lack of detailed data on dosage, coexisting skin conditions, and injection techniques may have confounded the results and hindered proper categorization of treatment duration. Additionally, the questionnaire used was not formally validated, and some subgroups (e.g., Victoza and Saxenda users) were small, which may limit the robustness of statistical comparisons, particularly with respect to chi-square test assumptions

Conclusion

Overall, this study identified a notable incidence of cutaneous manifestations, such as itching, dry skin, and rashes, among users of GLP-1 receptor agonists for weight loss. No significant associations were found with injection type, lifestyle factors, or duration of use. Mounjaro, the most frequently used agent, showed dermatologic patterns like Ozempic and Saxenda, indicating a class effect rather than drug-specific toxicity. Although symptoms were mild, their prevalence highlights the need for greater clinical and patient awareness. Incorporating routine dermatologic monitoring into GLP-1 therapy and conducting longitudinal studies will be key to enhancing safety and supporting long-term adherence.

Declaration of patient consent The authors certify that they have obtained all appropriate patient consent.

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Conflict of interest No conflict of interest.

Author's contribution

YA: Substantial contributions to concept, study design, analysis and interpretation of data, manuscript writing and critical review.

NSJ: Substantial contributions to concept, study design, acquisition of data, manuscript writing.

HBA,MSA,GMA,HAS,MAA: Substantial contributions to acquisition, analysis and interpretation of data, manuscript writing.

Every author has given final approval of the manuscript version to be published and agreed to be accountable for all aspects of the work.

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