RESEARCH ARTICLE

An evaluation of the public's knowledge regarding the risks associated with weight loss injections in Saudi Arabia

Anas Ali Alhur[1*], Moayad Alhamdani[2], Ruba Khunayn[2], Maram Alshehri[3], Lubna Alqahtani[3], Raghad Alsufyani[4], Samren Alhadi[3], Wejdan Alqarni[5], Farah Alasmari[6], Khalid Shaher[3], Jumana Almalki[6], Abdullah bin Shahbal[2], Sarah Alahmari[4], Leena Al Shehri[3], Mawaddah Barniyah[6]

[1]Department of Health Informatics, College of Public Health and Health Informatics, University of Hail, Hail, Saudi Arabia
[2]Department of Pharmaceutical Sciences, Prince Sattam bin Abdulaziz University, Saudi Arabia
[3]Department of Pharmacy, King Khalid University (KKU), Saudi Arabia
[4]Department of Pharmacy, Taif University, Saudi Arabia
[5]Department of Pharmacy, Al-Nuairiyah Medical Complex, Saudi Arabia
[6]Department of Clinical Nutrition, Umm Al-Qura University, Saudi Arabia

*Corresponding author: Anas Ali Alhur, Department of Health Informatics, College of Public Health and Health Informatics, University of Hail, Hail, Saudi Arabia
E-mail: Anas.ali.alhur@gmail.com

Abstract

Background: Obesity remains a critical public health issue globally and in Saudi Arabia, where the increasing prevalence of obesity has heightened interest in interventions such as liraglutide and semaglutide injections. Despite their widespread use, public knowledge about potential risks, including gastrointestinal distress, pancreatitis, and thyroid complications, is limited, raising concerns about safe practices.

Objective: This study evaluates public knowledge and perceptions regarding the risks of weight loss injections in Saudi Arabia, identifies demographic factors influencing awareness, and proposes strategies to enhance education and safety.

Methods: A quantitative cross-sectional study was conducted, targeting Saudi residents aged 18 and older. A sample of 1,300 participants was selected through random sampling. Data were gathered using an online questionnaire distributed via social media platforms and analyzed with SPSS version 26.0. Descriptive statistics and chi-square tests were employed to examine associations between demographic variables and knowledge levels. Ethical approval was secured from the University of Hail.

Results: The findings reveal high awareness (96%) of weight loss injections, with 95% of participants recognizing potential side effects. However, misconceptions about the mechanisms and purposes of these injections were evident, with 58% associating them mainly with appetite suppression. Social media emerged as the dominant source of information (42%), surpassing healthcare providers (30%). Logistic regression highlighted significant communication gaps between patients and healthcare providers, emphasizing the need for proactive healthcare engagement.

Conclusion: While public awareness of weight loss injections is high, a comprehensive understanding of their risks and mechanisms remains inadequate. Bridging these gaps through targeted public health campaigns, regulatory oversight, and

improved patient-provider communication is crucial to promoting informed and safe use. Future research should explore cultural and behavioral factors influencing perceptions and behaviors surrounding weight loss treatments.

Introduction

Obesity is a pervasive global health issue, significantly contributing to chronic conditions such as cardiovascular diseases, diabetes, and hypertension (World Health Organization [WHO], 2022). In Saudi Arabia, the rising prevalence of obesity has necessitated the adoption of diverse weight management strategies, including injectable treatments like liraglutide and semaglutide. These Glucagon-Like Peptide-1 (GLP-1) receptor agonists have demonstrated promising outcomes in managing weight and improving metabolic health. Despite their potential, these treatments are associated with adverse effects such as gastrointestinal distress, pancreatitis, and thyroid-related complications, risks that remain underexplored among the general population (Kang & Park, 2017).

The limited awareness of these risks poses significant concerns regarding the misuse and unsupervised application of weight loss injections. The growing reliance on informal information sources, particularly social media, has exacerbated misconceptions about the mechanisms, efficacy, and safety of these treatments (WHO, 2022). This lack of accurate knowledge highlights an urgent need for targeted public health strategies aimed at addressing these gaps and promoting safe, informed practices under medical supervision.

This study seeks to evaluate the awareness and understanding of the Saudi public regarding the risks associated with weight loss injections. By examining the demographic factors influencing knowledge levels and identifying misconceptions, the research aims to provide actionable insights for the development of public health initiatives. These efforts will enhance the dissemination of accurate information, improve patient-provider communication, and support safer use of these interventions.

Addressing the disparity between the rising popularity of weight loss injections and the limited understanding of their risks is essential. Existing literature emphasizes the importance of bridging this gap to ensure patient safety and optimize the effectiveness of these treatments (Astrup et al., 2018). This study contributes to this growing body of knowledge by adopting a rigorous methodological approach to assess public perceptions and inform evidence-based public health policies. The findings will provide a foundation for future research and interventions to mitigate obesity-related health challenges in Saudi Arabia.

Methods

Study design and population

This research employed a quantitative, cross-sectional design to comprehensively assess public knowledge and perceptions regarding weight loss injections in Saudi Arabia. The cross-sectional methodology allowed for a systematic capture of data at a single point in time, offering a snapshot of current public awareness and attitudes. The target population included residents of Saudi Arabia aged 18 years and above, ensuring the inclusion of a diverse demographic. Young adults, characterized by frequent use of social media and engagement with contemporary health interventions, were purposefully included alongside older individuals who may exhibit varied levels of awareness and exposure to these treatments. These criteria were carefully chosen to enhance the representativeness and applicability of the findings to the broader Saudi population.

Sample size and sampling technique

The sample size was calculated using Israel's (1992) formula, a widely accepted method for estimating sample sizes in large populations. While a minimum of 380 participants was deemed statistically adequate for reliable analysis, the sample was increased to 1,300 participants to account for potential non-responses and ensure the generalizability of results. This deliberate oversampling facilitated a nuanced examination of subgroups, including variations in age, gender, and educational attainment. Participants were selected through a random sampling technique, which minimized

selection bias and ensured proportional representation across different demographic strata, thereby improving the robustness of the study's conclusions.

Data collection

Data were gathered using an online questionnaire distributed via popular social media platforms such as Twitter, Instagram, and WhatsApp, commencing on October 10, 2024. The choice of social media as the primary dissemination channel was driven by its extensive penetration in Saudi Arabia, enabling efficient and widespread geographic outreach. The questionnaire was developed in collaboration with experts in public health, health informatics, and epidemiology to ensure it aligned with the study's objectives and effectively captured the required information. To confirm clarity, reliability, and cultural appropriateness, the tool underwent rigorous pretesting with a pilot group.

The questionnaire was structured into four main sections:

Demographic information: Collected participants' age, gender, educational level, and geographic location.

Awareness of weight loss injections: Evaluated participants' familiarity with these treatments and their primary sources of information.

Knowledge of potential risks: Assessed the understanding of side effects and associated risks of weight loss injections.

Attitudes and perceptions: Explored participants' perspectives on the safety and effectiveness of weight loss injections, emphasizing the significance of medical supervision.

This online format was selected to ensure ease of access and to maintain the confidentiality of responses, thereby encouraging honest and unbiased participation.

Data analysis

The analysis was conducted using SPSS version 26.0, adhering to rigorous statistical standards to ensure accuracy and reliability. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were employed to summarize demographic characteristics and participants' responses. To investigate relationships between demographic variables (e.g., age, education level) and knowledge of risks associated with weight loss injections, chi-square tests were utilized. These analyses enabled the identification of significant associations and trends, such as the potential correlation between age and awareness levels or educational attainment and risk comprehension.

Inferential statistical methods were further applied to explore subgroup differences, providing deeper insights into demographic disparities. Findings were systematically organized into tables and figures to facilitate clarity and interpretability.

Ethical approval

The study protocol received ethical approval from the Research Ethics Committee at the University of Hail (approval number H-2024-383). All procedures adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring the protection of participants' rights and well-being. Participants were comprehensively informed about the study's purpose, the voluntary nature of their involvement, and their right to withdraw at any stage without penalty. Informed consent was obtained electronically before participants began the questionnaire. To safeguard privacy, all data were anonymized, and stringent measures were implemented to ensure secure data storage.

Results

The results consisted of 2,159 respondents, with a majority being female (67%). The predominant age group was 18 years-24 years (51%), followed by 25 years-34 years (34%), indicating a younger participant base. In terms of educational attainment, over half of the respondents (52%) held a Bachelor's degree, while 18% had completed a Master's degree, suggesting that the sample was highly educated. The smallest age group was 45 and above, comprising only 4% of the

respondents. This demographic profile highlights the representation of a predominantly young and educated population in the survey (Tab. 1).

Table 1. Demographic characteristics of respondents.

Characteristic	Frequency	Percentage (%)
Gender		
- Male	708	33
- Female	1,451	67
Age Group		
-42 Years	1,113	51
-59 Years	734	34
-79 Years	234	11
- 45 Years and above	78	4
Education Level		
- High School	244	11
- Diploma	276	13
- Bachelor's	1,115	52
- Master's	381	18
- PhD	143	6

The data reveals a high level of awareness about weight loss injections among respondents, with 96% having heard about them. Notably, 95% of participants believe that these injections have side effects, indicating a strong perception of potential risks. Furthermore, 92% of respondents expressed concerns about the potential harm of using weight loss injections without medical supervision. This suggests that while awareness is high, there is also a significant perception of risk associated with these treatments, emphasizing the need for cautious use and professional guidance (Tab. 2).

Table 2. Awareness and perception of weight loss injections.

Variable	Yes (%)	No (%)	Not Sure (%)
Have you heard about weight loss injections?	96	4	N/A
Do you think weight loss injections have side effects?	95	2	3
Could weight loss injections be harmful without supervision?	92	3	5

The most common response was "Not Sure", with 59.9% (1,008 individuals) indicating uncertainty about the specific injection type they used or are aware of fig. 1. Among the known injection types, Semaglutide was the most frequently reported (23.3%, 392 individuals), followed by Liraglutide (20.0%, 336 individuals). Other injection types were less frequently mentioned, including Orlistat (8.9%, 149 individuals) and Phentermine (7.7%, 129 individuals). The data suggest a significant gap in knowledge about the specific types of weight loss injections used, highlighting the need for improved public education and clearer information on these treatments.
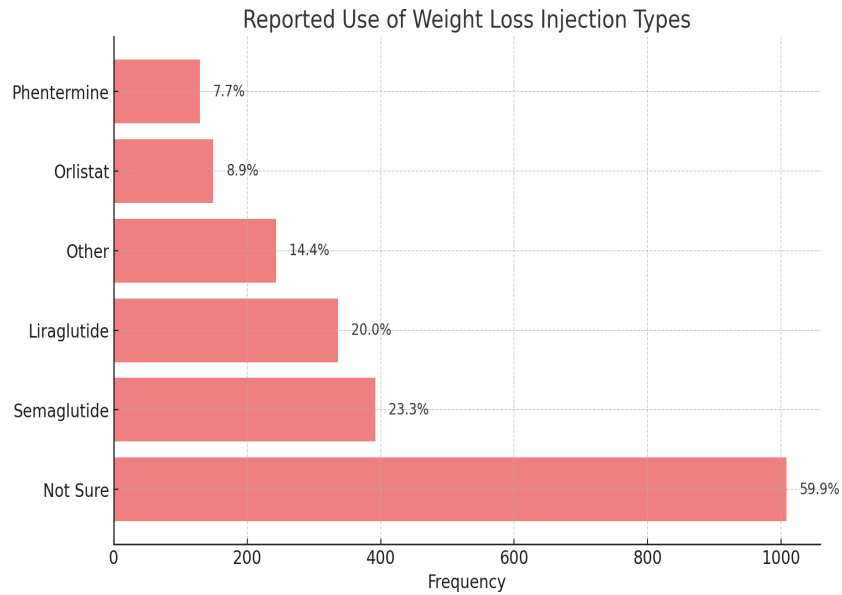
Reported Use of Weight Loss Injection Types

Figure 1. Reported use of weight loss injection types.

When asked about the primary purpose of weight loss injections, the majority of respondents (58%) identified appetite reduction as the main goal. Approximately 28% of participants believed that the injections were intended to increase metabolism, while 14% viewed fat breakdown as the primary purpose. These results indicate that most people associate weight loss injections with appetite suppression, reflecting common marketing narratives and public understanding of these treatments (Tab. 3).

Table 3. Primary purpose of weight loss injections (perceived).

Purpose	Frequency	Percentage (%)
Appetite Reduction	1,253	58
Increased Metabolism	594	28
Fat Breakdown	312	14

The analysis of reported side effects from weight loss injections reveals that nausea was the most common adverse effect, experienced by 69.5% of respondents (1,169 individuals) fig. 2. This was followed by diarrhea, reported by 40.8% of participants (686 individuals), and allergic reactions, noted by 40.5% (682 individuals). Additionally, abdominal changes were reported by 37.4% of respondents (630 individuals), indicating a significant prevalence of gastrointestinal-related side effects.

Less frequently reported, but still notable, were concerns about thyroid tumors (26.6%, 448 individuals) and gallbladder issues (26.1%, 439 individuals). A smaller proportion of respondents (21%, 354 individuals) indicated that they were not sure about the specific side effects they experienced or observed.

Reported Side Effects of Weight Loss Injections

Figure 2. The reported side effects from weight loss injections.

Social media was identified as the primary source of information about weight loss injections, cited by 42% of respondents. Healthcare providers were the second most common source (30%), followed by friends and family (17%). Traditional media sources like TV and radio accounted for only 7%, while other sources made up 4%. The dominance of social media as an information source underscores its significant influence on public perceptions, yet it also raises concerns about the reliability of health related information obtained through these platforms (Tab. 4).

Table 4. Sources of information.

Information Source	Frequency	Percentage (%)
Social Media	916	42
Healthcare Providers	648	30
Friends/Family	365	17
TV/Radio	145	7
Other Sources	85	4

The logistic regression model aimed to predict whether respondents had discussed weight loss injections with a healthcare provider based on demographic and awareness variables. The model achieved an accuracy of 78%, demonstrating a reasonable fit. It performed well in predicting individuals who did not engage in discussions (Class 0), with a precision of 79% and a recall of 94%. However, it was less effective in identifying those who did discuss the injections (Class 1), with a precision of 72% and a recall of only 37%. The F1-score was higher for Class 0 (0.86) compared to Class 1 (0.49), indicating an imbalance in predictive performance. These results suggest that while demographic factors and awareness contribute to the likelihood of discussing weight loss injections, additional variables related to patient behavior and healthcare engagement may be necessary to improve the model's accuracy (Tab. 5).

Table 5. Logistic regression model summary.

Metric	Value
Accuracy	78%
Precision (Class 0: No Discussion)	79%

Precision (Class 1: Discussed)	72%
Recall (Class 0: No Discussion)	94%
Recall (Class 1: Discussed)	37%
F1-Score (Class 0: No Discussion)	0.86
F1-Score (Class 1: Discussed)	0.49

Discussion

Insights into public knowledge and perceptions

This study highlights key insights into the Saudi public's understanding and attitudes toward weight loss injections. Despite high awareness levels, a significant portion of participants displayed limited comprehension of the mechanisms and associated risks of these treatments. Misconceptions, such as the belief that these injections solely act by suppressing appetite, reflect gaps in knowledge shaped by marketing messages that often fail to convey a complete picture. These findings align with earlier research emphasizing how simplified and sometimes misleading information can influence public perceptions (Astrup et al., 2018; Kang & Park, 2017; Alhur et al., 2024).

Influence of social media

Social media platforms emerged as the most prominent source of information for participants, surpassing healthcare providers. This aligns with global trends in health information-seeking behavior, where digital platforms play a central role. However, reliance on social media also raises concerns regarding misinformation due to the lack of oversight in content accuracy. Public health initiatives could leverage the expansive reach of these platforms to disseminate reliable, evidence-based information while simultaneously encouraging individuals to consult healthcare professionals. Such a dual approach has been recommended to enhance public health literacy and mitigate the risks posed by misinformation (Alhur et al., 2024; WHO, 2022).

Risk perception and the role of healthcare providers

Participants displayed an acute awareness of the risks associated with weight loss injections, including potential side effects and the dangers of unsupervised use. This finding emphasizes the critical need for medical oversight to minimize misuse, as echoed in previous studies (WHO, 2022; Alhur et al., 2024). Nonetheless, the study identified a communication gap between patients and healthcare providers, potentially fueled by systemic barriers such as time constraints and the increasing prevalence of online self-education. Bridging this gap requires proactive engagement from healthcare professionals, fostering an environment where patients feel empowered to seek guidance.

Public health implications

Addressing the misconceptions surrounding weight loss injections and improving digital health literacy should be priorities for public health policymakers. Regulatory authorities could enforce stricter monitoring of advertising practices to ensure that promotional claims are grounded in evidence. Incorporating discussions about weight management into routine healthcare visits could further support informed decision-making, enhancing patient safety (Alhur et al., 2023). Such integrative efforts are critical to mitigating the risks associated with the misuse of these treatments.

Limitations and future research directions

While this study offers valuable insights, it is not without limitations. The use of an online survey may have introduced selection bias, favoring younger, more tech-savvy individuals and potentially limiting the generalizability of findings. Future research should aim to include a more representative sample, employing diverse data collection methods to capture a broader demographic spectrum. Additionally, exploring cultural and systemic factors that influence public perceptions and healthcare-seeking behaviors would provide deeper insights. Adopting mixed methods approaches could

illuminate the underlying motivations and barriers affecting patient engagement with healthcare providers (Alhur et al., 2024).

Conclusions

The study underscores a critical disconnect between public awareness and comprehensive understanding of weight loss injections, exacerbated by limited patient-provider communication. Addressing these issues through targeted educational efforts, stricter regulation, and enhanced healthcare engagement is vital for ensuring the safe and informed use of these treatments. Building trust, fostering open dialogue, and improving digital health literacy are essential steps toward bridging the identified gaps and promoting patient safety.

References

Alhur A, Alghamdi L, Alqahtani F, Alshammari M, Hattany H, Akshah A. (2024). A study of awareness, knowledge, attitudes, and practices regarding antibiotic resistance. *Cureus*. **16**:62854.

Alhur A, Alhur A, Alfayiz A, Alotaibi A, Hansh B, Ghasib N. (2023). Patterns and prevalence of self-medication in Saudi Arabia: insights from a nationwide survey. *Cureus*. **15**:51281.

Alhur A, Alhur A, Alshehri AM, Alrashed AHF, Awad RI, Almomen A. (2024). A cross-sectional study on the knowledge and attitude of the general population in Saudi Arabia regarding weight management medications (WMMs). **47**:8391-8402

Alhur A, Alhur AA, Alrkad E, Alshammari MH, Harbi N, Alshareef L. (2024). Assessing the awareness of psychotropic medications among the Saudi population: benefits, risks, and prevalence. *Cureus*. **16**:66818.

Alhur A, Hedesh R, Alshehri M, Al Qasim S, Alkhaldi R, Bazuhair W. (2023). Incorporating technology in pharmacy education: students' preferences and learning outcomes. *Cureus*. **15**:50158.

Alhur AA, Alhur A, Alharbi R, Almulhim L, Alazzaz R, Asiri G. (2024). Determining the prevalence of self-medication with antibiotics in general populations: a cross-sectional study. *Nat Campano*. **28**:3185-3193.

Alhur AA. (2024). Exploring digital competencies in health informatics: A qualitative study of final semester undergraduate students at the University of Hail. *Kexue Tongbao/Chin Sci Bull*. **69**:234.

Astrup A, Carraro R, Finer N, Harper A, Kunesova M, Lean ME. (2018). Safety, tolerability and sustained weight loss over 2 years with the once-daily human GLP-1 analog, liraglutide. *Int J Obes*. **36**:843-854.

Friedman JM, Halaas JL. (1998). Leptin and the regulation of body weight in mammals. *Nature*. **395**:763-770.

Israel GD. (1992). Determining sample size. *Univ Fla Coop Ext Serv Inst Food Agric Sci EDIS*.

Kang JG, Park CY. (2017). Anti-obesity drugs: A review about their effects and safety. *Diabetes Metab J*. **36**:13-25.

Leibel RL, Rosenbaum M, Hirsch J. (1995). Changes in energy expenditure resulting from altered body weight. *N Engl J Med*. **332**:621-628.

Obesity and overweight. **(2022)** *World Health Organ (WHO)*.