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Promise and pitfalls of GLP-1 injections: health beliefs, obesity bias, and the debate around Mounjaro and Ozempic

Anas Ali Alhur[1*], Abdulmajeed Alqahtani[2], Abdulaziz Jabali[3], Raed Almutairi[4], Aisha Asiri[5], Abdullah Alshehri[2], Adil Ayed[6], Mohamed Joubari[7], Manar Alzahrani[8], Saqer Alzahrani[9], Rayan AlGhamdi[9], Faisal Alanzei[4], Bashayer Alqurashi[8], Waad Albikhan[10], Mosa Alzahrani[9]

[1]Department of Health Informatics, College of Public Health and Health Informatics, University of Hail, Hail, Saudi Arabia
[2]College of Pharmacy, King Khalid University, Abha, Saudi Arabia
[3]Pharmaceutical Care Department, King Abdulaziz Medical City, Jeddah, Saudi Arabia
[4]Department of Pharmacy Practice, College of Pharmacy, University of Hafr Al Batin, Hafr Al Batin, Saudi Arabia
[5]Department of Pharmaceutical Care, Armed Forces Hospital, Southern Region, Khamis Mushait, Saudi Arabia
[6]Consultant Family Medicine, King Khalid University Medical City, Abha, Saudi Arabia
[7]Baterjee Medical College, Khamis Mushait, Asir Province, Saudi Arabia
[8]Department of Clinical Nutrition, College of Applied Medical Sciences, Umm Al-Qura University, Makkah, Saudi Arabia
[9]Community Pharmacy Employee, Al-Dawaa Pharmacy, Al-Baha, Saudi Arabia
[10]Department of Pharmacy Practice, College of Pharmacy, University of Aljouf, Aljouf, Saudi Arabia

*Corresponding to:
Anas Ali Alhur; Department of Health Informatics, College of Public Health and Health Informatics, University of Hail, Hail, Saudi Arabia;
anas.ali.alhur@gmail.com

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ABSTRACT

Introduction: Glucagon-like peptide-1 receptor agonists (GLP-1 RAs), such as semaglutide and tirzepatide, have recently become prominent in the treatment of type 2 diabetes and obesity due to their ability to enhance glycemic control and reduce body weight. However, the rapid rise in demand for cosmetic or nonmedical use has raised ethical and clinical concerns. In Saudi Arabia, public interest in these drugs has increased sharply, yet evidence on public awareness, beliefs, and attitudes toward GLP-1 use remains limited. This study examined the level of public awareness, knowledge, and perceptions regarding GLP-1 injections and identified factors influencing support for their wider use in obesity management.

Methods: A cross-sectional online survey was conducted between May and October 2024 among adults residing in Saudi Arabia. The validated questionnaire assessed sociodemographic characteristics, awareness, perceived benefits and risks, and attitudes toward GLP-1 therapy. Descriptive statistics were generated, and binary logistic regression was used to determine predictors of public support for expanding GLP-1 use. Ethical approval was obtained from the Research Ethics Committee at the University of Hail (H-2024-473).

Results: A total of 897 responses were analysed. Most participants were aware of GLP-1 injections but showed moderate knowledge regarding their purpose and safety. Attitudes were generally favourable toward the drugs' effectiveness but cautious regarding side effects, long-term outcomes, and cost. The strongest predictors of support for expanding GLP-1 use were perceived long-term safety, higher self-rated knowledge, and belief in treatment efficacy. Education level was also associated with stronger support, while gender and media influence were not significant. Reported concerns included gastrointestinal discomfort, uncertain safety, and affordability.

Conclusion: The findings reveal high awareness but limited understanding of GLP-1 therapy among the Saudi public. Perceptions of safety and efficacy strongly influence acceptance, highlighting the need for clear, evidence-based communication and regulated access. Educational initiatives addressing safety, cost, and stigma could promote responsible use in line with national health priorities and the preventive-care goals of Saudi Vision 2030.

Keywords: cross-sectional study, hypercalcemia, supplementation, toxicity, Vitamin D.
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INTRODUCTION

Glucagon-like peptide-1 receptor agonists (GLP-1 RAs), including semaglutide (Ozempic®, Wegovy®) and tirzepatide (Mounjaro®), have become major therapeutic options for the management of type 2 diabetes and obesity. Their clinical effectiveness lies in their ability to mimic the actions of incretin hormones, which enhance insulin secretion, suppress glucagon release, and slow gastric emptying. These combined effects contribute to improved glycemic control and significant weight reduction.[1–5] Although GLP-1 therapies were originally developed for patients with metabolic disease, their popularity has expanded rapidly among individuals seeking weight loss for aesthetic purposes.[1,2] This trend has raised ethical and social concerns about appropriate use, fair access, and the influence of appearance-based health ideals. At the same time, media attention and celebrity endorsements have shaped public discourse, often simplifying complex medical therapies into lifestyle products.

The public fascination with GLP-1 drugs intersects with deeper societal

beliefs about body image and weight. While these medications offer new hope for people struggling with obesity and related metabolic disorders, they may also reinforce negative stereotypes that associate thinness with self-discipline and obesity with personal weakness. Furthermore, the increased off-label use of these medications has contributed to global shortages, affecting individuals who depend on them for diabetes management and metabolic stability.[6–9]

In Saudi Arabia and neighbouring Gulf countries, the growing use of GLP-1 injections for nonmedical weight reduction has become a significant public health concern. A national study by Alhur et al. (2024) examined public awareness of the risks associated with weight-loss injections and found that misconceptions about safety, mechanisms, and long-term outcomes were widespread.[10] Many respondents believed these drugs were harmless or could be used without medical guidance, reflecting the impact of social media marketing and the limited reach of formal health education. These findings demonstrate the need for effective communication strategies and regulatory frameworks to ensure that GLP-1 use occurs under appropriate clinical supervision.

Despite their clinical benefits, GLP-1 RAs are not without drawbacks. Nausea and gastrointestinal discomfort are common side effects, and the evidence on long-term cardiovascular, renal, and psychological safety remains incomplete.[11] Moreover, weight regain is frequent once treatment is discontinued, which highlights the necessity of combining pharmacologic management with nutritional counselling, behavioural therapy, and physical activity.[12]

In light of these factors, understanding how the public perceives the benefits, risks, and ethical dimensions of GLP-1 therapy is essential for guiding responsible clinical practice and public health policy. Insight into these attitudes can assist healthcare providers, educators, and decision-makers in promoting informed use that balances medical effectiveness with ethical and social accountability.

METHODS

Study Design and Setting

This cross-sectional analytical study was conducted between May and October 2024 to assess public awareness, beliefs, and attitudes toward glucagon-like peptide-1 (GLP-1) receptor agonist injections (e.g., *Ozempic*, *Mounjaro*) in the Kingdom of Saudi Arabia. Data were collected using an online self-administered questionnaire disseminated via social media and institutional networks. The study adhered to the ethical principles outlined in the Declaration of Helsinki (2013 revision) and received approval from the Research Ethics Committee at the University of Hail (approval number H-2024-473).

Participants and Sampling

Participants were adults (≥18 years) residing in Saudi Arabia who consented to participate electronically before starting the survey. Eligibility criteria included the ability to read Arabic and no prior participation in related pilot surveys. Convenience and snowball sampling were used to maximise geographic and demographic diversity. A total of 897 valid responses were included in the final analysis after excluding incomplete or duplicate entries.

Survey Instrument

The questionnaire was developed based on previous literature on weight-management pharmacotherapy and obesity perception,[3–5] with adaptations for the Saudi context. The instrument comprised four sections: (1) Sociodemographic data (age, gender, education, and medical history), (2) awareness and knowledge regarding GLP-1 injections (heard of GLP-1, perceived definition, and self-rated knowledge), (3) attitudes and beliefs measured by eight five-point Likert-scale items (1 = strongly disagree to 5 = strongly agree), covering perceived efficacy, safety, willingness to use, lifestyle attitudes, social stigma, and prescribing restrictions, (4) perceived benefits and concerns, allowing multiple selections (e.g., effective weight loss, long-term safety, cost, or social judgment), (4) the questionnaire was reviewed by three experts in public health and pharmacology for face validity and pretested among 30 adults for clarity and timing. Minor revisions were applied before full deployment.

Variable Classification and Operational Definition

The variables included in this study were classified according to their analytical role and measurement scale. The dependent variable was support for the use of GLP-1 injections, which was treated as a binary categorical variable. Participants' responses were categorised into two groups: supportive, not supportive, or neutral. This variable was interpreted as an indicator of acceptance toward GLP-1–based therapy.

Several independent variables were analysed as categorical variables. Sex was categorised into male and female. Marital status was classified as single or married. Educational level was categorised into diploma, bachelor's degree, and postgraduate degree, representing increasing levels of formal education. Employment status was classified as employed and unemployed, or student, reflecting participants' occupational engagement. The history of chronic disease was categorised into the presence or absence of chronic medical conditions. Previous awareness of GLP-1 injections was classified into awareness and unaware, reflecting prior exposure to information regarding GLP-1 therapy. These categorical variables were interpreted by comparing differences in support for GLP-1 use across their respective categories.

In addition, several variables were treated as continuous variables. Age was measured in years and analysed as a continuous variable, with increasing values reflecting older age. Perceived knowledge of GLP-1 injections was assessed using a numerical scale ranging from 0 to 10, with higher scores indicating greater self-reported knowledge regarding GLP-1 therapy. Perceived long-term safety of GLP-1 injections was measured using a five-point Likert-based scale and analysed as a continuous variable by calculating the average score, where higher values represented a more favourable perception of long-term safety. These continuous variables were interpreted based on their magnitude and direction of association with support for GLP-1 injection use.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics, Version 29 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarise participant characteristics, awareness of GLP-1 injections, perceived long-term safety, attitudes toward GLP-1 use, and obesity-related beliefs. Categorical variables were presented as frequencies and percentages, whereas continuous variables were reported as means and standard deviations. All questionnaire responses were transformed into numerical values according to predefined scoring procedures to enable statistical analysis. Knowledge was assessed using a four-point scale ranging from very low to high. Likert-scale items were scored from 1 to 5, with higher scores indicating more positive or agreement-oriented attitudes. Multiple-response items were recoded into binary variables to indicate whether a specific option was selected. A composite Attitude Index was calculated as the mean score of eight Likert-scale items, demonstrating acceptable internal consistency (Cronbach's $\alpha = 0.70$). Belief in the efficacy of GLP-1 injections was measured using a five-point Likert scale. Continuous variables were retained in their original form without categorisation to preserve statistical power.

Prior to regression analysis, several diagnostic checks were conducted. Normality of continuous predictors was assessed using histograms, Q–Q plots, and the Shapiro–Wilk test. Mild deviations from normality were considered acceptable due to the robustness of logistic regression. Multicollinearity was evaluated by examining the variance inflation factor (VIF) and tolerance values, with all predictors demonstrating VIF values below 2.5, indicating no significant multicollinearity. Linearity of the logit was assessed using the Box–Tidwell test to confirm a linear relationship between continuous predictors and the log-odds of the outcome. Variables meeting this assumption were retained in their continuous form, whereas variables violating the assumption were categorised when necessary. Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test, Nagelkerke R^2, and classification accuracy. The final model demonstrated acceptable calibration and discriminatory ability.

A multivariable binary logistic regression analysis was performed to identify factors associated with support for GLP-1 injection use. Variables with a p-value <0.20 in bivariate analyses were included in the multivariable model. The results are presented as adjusted odds ratios (aORs) with corresponding standard errors (SEs), 95% confidence intervals (CIs), and p values. Predictors included demographic characteristics (age, sex, and

Table 1. Sociodemographic Characteristics of Participants

Variables	n	%
Age group, years		
18–24	352	39.2
25–34	271	30.2
35–44	167	18.6
45–54	64	7.1
55+	43	4.8
Gender		
Male	455	50.7
Female	442	49.3
Education level		
High school	106	11.8
Diploma	118	13.2
Bachelor	615	68.6
Postgraduate	55	6.1
No formal education	3	0.3
Medical history		
None	704	78.5
Obesity	146	16.3
Type 2 diabetes	47	5.2

Table 2. Awareness and Knowledge About GLP-1 Injections

Variables	N=897
Heard about GLP-1 injections, n(%)	
Yes	786(87.6)
No	111(12.4)
Perceived definition of GLP-1 injections, n(%)	
Used to treat both diabetes and obesity	508(56.6)
Not sure	228(25.4)
Weight-loss drugs only	112(12.5)
Diabetes drugs only	49(5.5)
Self-rated knowledge, n(%)	
Very low	166(18.5)
Low	265(29.5)
Moderate	320(35.7)
High	146(16.3)
Knowledge score (1–4), mean±SD	2.50±0.97

Note: Knowledge score coded as 1 = very low, 2 = low, 3 = moderate, 4 = high.

education level), health-related factors (chronic disease status), prior awareness of GLP-1 injections, perceived knowledge, belief in GLP-1 efficacy, and perceived long-term safety. Statistical significance was defined as a two-tailed p-value < 0.05.

RESULTS

A total of 897 participants were included in the analysis. As shown in Table 1, most respondents were aged 18–34 years (69.4%), with nearly equal representation of males (50.7%) and females (49.3%). The majority held a bachelor's degree (68.6%), while 19.3% had a diploma or postgraduate qualification. Most participants reported no chronic medical conditions (78.5%), although 16.3% indicated a history of obesity and 5.2% reported type 2 diabetes.

Awareness of GLP-1 injections was generally high; 87.6% of participants had heard of these medications (Table 2). Over half (56.6%) correctly identified them as treatments for both diabetes and obesity, while one quarter (25.4%) was unsure of their purpose. Self-rated knowledge varied, with 35.7% describing it as moderate and 16.3% as high. The overall mean knowledge score was M = 2.50, SD = 0.97 (on a 4-point scale), indicating moderate knowledge of GLP-1 agents among the general public.

Attitudinal responses are summarised in Table 3. Participants generally agreed that GLP-1 injections are effective for weight loss (M = 3.65, SD = 0.89) but were less confident in their long-term safety (M = 2.62, SD = 0.99). While many were willing to use GLP-1 injections if recommended by a physician (M = 3.35, SD = 1.13), most participants placed strong emphasis on lifestyle modification as the preferred approach for obesity management (M = 4.12, SD = 1.00). Respondents also expressed high agreement with statements promoting personal effort in weight control (M = 4.14, SD = 0.96) and restricting prescription to severe obesity or type 2 diabetes (M = 3.73, SD = 0.99). Perceived social stigma associated with injection use was moderate (M = 3.21, SD = 0.94). Media and social media were viewed as influential in shaping public opinions (M = 2.58, SD = 0.57).

Perceived benefits of GLP-1 injections are presented in Figure 1. The most

Table 3. Attitudes and Beliefs Toward GLP-1 Injections

Item (abbreviated)	Description	M	SD
Efficacy for weight loss	"GLP-1 injections are effective for weight loss."	3.65	0.89
Long-term safety	"GLP-1 injections are safe for long-term use."	2.62	0.99
Willing if the doctor recommends	"I would consider using GLP-1 injections if my doctor recommended them."	3.35	1.13
Benefits outweigh risks	"The benefits of GLP-1 injections outweigh their possible side effects."	3.1	0.93
Lifestyle more important	"Lifestyle changes are more important than GLP-1 injections for managing obesity."	4.12	1
Effort without drugs	"People with obesity should try harder to manage weight without medications."	4.14	0.96
Perceived stigma	"Society stigmatises people who use injections for weight loss."	3.21	0.94
Restrict prescribing	"Doctors should prescribe GLP-1 only for severe obesity or type 2 diabetes."	3.73	0.99
Media influence	"Media and social media influence public opinion on GLP-1 injections." (1–3)	2.58	0.57
Support expansion	Support for expanding GLP-1 use for obesity in Saudi Arabia (0–2)	1.15	0.76
Support financial aid	Support for financial coverage by health authorities (0–2)	1.55	0.67

Note: Unless otherwise stated, items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Media influence was coded 1 = no influence, 2 = somewhat, 3 = strong influence. Support items were coded 0 = no, 1 = unsure, 2 = yes.

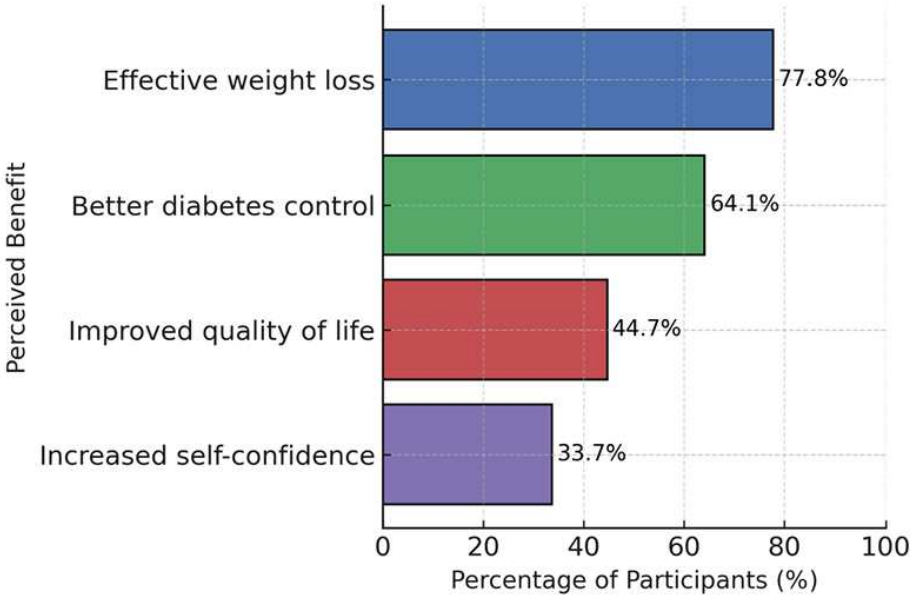

Figure1. Perceived Benefits of GLP-1 Injections

frequently reported benefits were effective weight loss (77.8%) and better diabetes control (64.1%), followed by improved quality of life (44.7%) and increased self-confidence (33.7%).

As shown in Table 4, the most common concerns were gastrointestinal side effects (74.6%), uncertain long-term safety (71.5%), and high cost (53.4%). Dependence on the medication (38.7%) and negative social judgment (16.3%) were reported less frequently.

A binary logistic regression analysis was conducted to identify predictors of support for expanding GLP-1 use for obesity management (Table 5; Figure 1). The model was statistically significant ($\chi^2(10, N = 897)$, $p < 0.001$), demonstrating that the included predictors collectively improved the prediction of support for GLP-1 use compared with the null model. The model showed moderate explanatory power, with a Nagelkerke R^2 of 0.32, and achieved an overall classification accuracy of approximately 77%. Among the predictors, perceived long-term safety emerged as the strongest determinant of support (OR = 2.15, 95% CI [1.79, 2.58], $p < 0.001$), followed by higher perceived knowledge scores (OR = 1.24, 95% CI [1.03, 1.49], $p = 0.023$) and stronger belief in the efficacy of GLP-1 injections for weight loss (OR = 1.25, 95% CI [1.01, 1.56], $p = 0.043$). In addition, participants with a diploma or postgraduate level of education were significantly more likely to support the expansion of GLP-1 use compared with those with lower educational attainment (OR = 1.56, 95% CI [1.01, 2.42], $p = 0.046$; OR = 2.38, 95% CI [1.29, 4.39], $p = 0.005$, respectively).

Perceived stigma, media influence, gender, and prior awareness of GLP-1 were not significant predictors ($p > 0.05$). These findings are visualised in Figure 2, which displays adjusted odds ratios and 95% confidence intervals on a logarithmic scale.

Table 4. Perceived Concerns About GLP-1 Injections (Multiple Response)

Perceived Concern	n	%
Gastrointestinal side effects (e.g., nausea, GI problems)	669	74.6
Unclear long-term safety	641	71.5
High cost	479	53.4
Dependence on the medication	347	38.7
Negative social judgment	146	16.3

Note: Participants could select more than one option; percentages sum to more than 100%.

Table 5. Binary Logistic Regression Predicting Support for Expanding GLP-1 Use

Predictor	AOR	95% CI	*p*
Knowledge score	1.24	[1.03, 1.49]	0.023
Perceived efficacy for weight loss	1.25	[1.01, 1.56]	0.043
Perceived long-term safety	2.15	[1.79, 2.58]	< .001
Perceived stigma (reverse)	0.97	[0.82, 1.16]	0.771
Media influence	0.91	[0.69, 1.20]	0.496
Heard of GLP-1	1.06	[0.64, 1.73]	0.831
Gender (Male)	0.96	[0.71, 1.31]	0.811
Education – Diploma	1.56	[1.01, 2.42]	0.046
Education – High school	1.47	[0.94, 2.30]	0.095
Education – Postgraduate	2.38	[1.29, 4.39]	0.005
Constant	0.02	[0.01, 0.07]	< 0.001

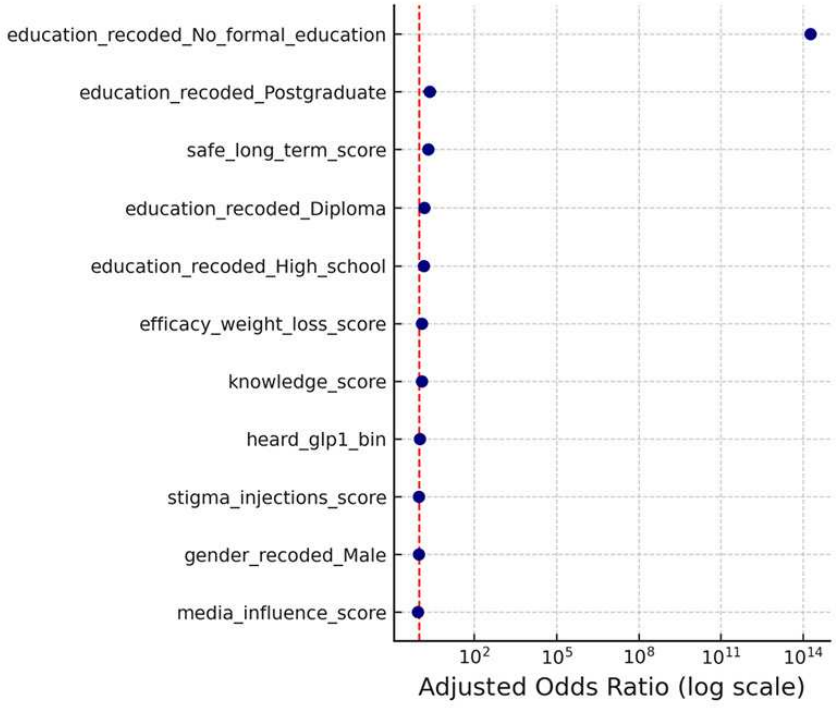

Figure 2. Adjusted Odds Ratios for Predictors of Public Support for Expanding GLP-1 Injection Use in Saudi Arabia.

DISCUSSION

The present study explored public awareness and perceptions of GLP-1 receptor agonist injections among adults in Saudi Arabia, offering an updated view of how these medications are understood outside clinical settings. Although most

participants had heard of GLP-1 agents, reflecting their growing visibility in media, pharmacies, and social conversations, gaps in accurate knowledge were evident. Many respondents viewed these medications as effective for weight reduction, yet uncertainty about safety, long-term effects, and affordability persisted. This mix of familiarity and hesitation mirrors international findings showing that public discourse surrounding GLP-1 therapies is shaped by both scientific evidence and widespread social narratives.[10,13–15]

The high level of recognition observed in this study aligns with recent global surveys showing that medications such as semaglutide and tirzepatide have rapidly entered public awareness due to their perceived benefits and prominent coverage in digital platforms.[10] However, as reported in earlier studies from Jordan and Europe, awareness does not necessarily equate to understanding; misconceptions about mechanisms, indications, and long-term safety remain common.[13,15] These patterns underscore the need for clear, accessible educational materials that help the public differentiate between evidence-based benefits and online speculation.

Despite acknowledging the potential of GLP-1 therapy, participants frequently highlighted lifestyle modification as the cornerstone of weight management. This sentiment reflects a well-documented global tension between personal responsibility narratives and acceptance of pharmacological treatments for obesity.[14] When obesity continues to be framed primarily as an individual behavioural issue, people may perceive medications as shortcuts or last-resort options, even when international guidelines emphasise their role in comprehensive obesity care. As noted, such narratives can inadvertently reinforce stigma and reduce willingness to consider legitimate medical therapy.[14,15] Clear communication that positions GLP-1 injections within a holistic clinical framework rather than as a replacement for lifestyle change is therefore essential.

Participants also expressed concerns about gastrointestinal side effects, unknown long-term risks, and the financial burden associated with these medications. These concerns are consistent with earlier studies in Saudi Arabia and Europe showing that cost and uncertainty about sustained outcomes shape public hesitation toward GLP-1 use. Given the rapid rise in global demand for these medications, transparent communication regarding safety data, insurance coverage, and cost-effectiveness is crucial for maintaining public trust and equitable access. Knowledge and perceived safety emerged as strong predictors of support for GLP-1 therapy, aligning with regional and international research demonstrating that health literacy plays a central role in shaping attitudes toward emerging medical technologies. Individuals with higher education levels were more likely to express confidence in GLP-1 agents, suggesting that disparities in information access may influence acceptance.[15,16] This highlights the importance of targeted health-education campaigns, especially those integrated within national initiatives such as Saudi Vision 2030, which aim to enhance preventive care, reduce obesity rates, and strengthen chronic-disease management.

Because the study relied on online convenience sampling, selection bias is possible, particularly the overrepresentation of younger, digitally active, and more educated individuals. Information bias may also have occurred due to the self-reported nature of the questionnaire, where respondents may overstate knowledge or underreport concerns due to social desirability. Additionally, recall bias may influence responses regarding prior awareness or exposure to GLP-1 medications. Although these sources of bias do not invalidate the findings, they should be taken into account when interpreting the generalizability of the results.[17–19]

This study represents one of the earliest national assessments of public perceptions regarding GLP-1 therapies in Saudi Arabia, providing timely insights into how these medications are understood by the general population. The large sample size increases the stability of the estimates, and the analysis addresses multiple dimensions of awareness, beliefs, and acceptance. However, several limitations should be acknowledged. The cross-sectional design prevents conclusions about causality, and the use of online recruitment may limit representativeness by favouring younger or more educated respondents. Self-reported data introduces the possibility of information and recall bias. Despite these limitations, the study offers valuable guidance for policymakers, clinicians, and public-health educators seeking to understand emerging attitudes toward obesity medications.

CONCLUSION

This study offers an updated understanding of how adults in Saudi Arabia perceive GLP-1 injections, capturing the mix of enthusiasm, uncertainty, and misconceptions surrounding their use for weight management. The findings show that support for GLP-1 therapies is shaped not only by perceived benefits but also by concerns about safety, potential side effects, and the credibility of available information. Individuals who felt more informed were more likely to view these medications favourably, while those expressing doubts tended to show lower acceptance. Although the sample reflects a digitally engaged population and relies on self-reported responses, the results still highlight important patterns that can guide future awareness efforts. Overall, the study points to the need for clearer communication from healthcare providers, stronger public-health education, and balanced messaging that addresses both the promise and limitations of GLP-1 treatments within Saudi Arabia's broader strategies for obesity care.

ETHICAL STATEMENT

Electronic informed consent was obtained from all participants before study participation. Data were collected anonymously and stored securely on encrypted institutional servers, and no personally identifiable information was retained. Participants were informed of their right to withdraw from the study at any time without penalty. The study received ethical approval from the Ministry of Health Institutional Review Board, Saudi Arabia (Approval No. MOH-IRB-2025-421). Participation was voluntary, and all respondents provided informed consent electronically before completing the questionnaire.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to the design, conduct, or reporting of this study.

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AUTHOR CONTRIBUTIONS

A.A.A. contributed to conceptualisation, methodology development, formal analysis, original draft writing, supervision, and project administration. R.A. was responsible for data collection, literature review, manuscript review and editing. M.A. contributed to data curation, validation, and manuscript review and editing. S.A. contributed to visualisation, data management, and manuscript review and editing. A.M. contributed to the literature review, editing, and interpretation of the findings. N.A. contributed to manuscript review and editing and resource provision. R.A.M. contributed to data collection and data validation. K.N. provided statistical support and reviewed the methodology. K.A.S. contributed to manuscript review and editing, and interpretation of results. A.Z. contributed to data collection. R.A.Q. contributed to data validation and editing. L.A. contributed to the visualisation and preparation of tables and figures. R.Y. contributed to resources, manuscript review and editing. B.A. contributed to the supervision and critical revision of the manuscript. S.A.G. conducted the final manuscript review and ensured quality assurance.

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