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Letter to the Editor

Dual-action hope: DeepSeek responses to Tirzepatide's role in metabolic health

Sir,

DeepSeek is an artificial intelligence (AI) platform introduced on January 2025. It is built on deep learning and natural language processing (NLP) technologies. Its core products include the DeepSeek-R1 and DeepSeek-V3 models.[1] A prominent feature of DeepSeek's framework is its support for offline deployment. This capability may enable healthcare institutions to adapt a local LLM (large language model) and operate the model without an internet connection, thereby enhancing data privacy and security.[2] DeepSeek has set tremendous path by lower computational costs compared to other proprietary LLMs, making AI more accessible to everyone. In medical education, educators can create case simulations for tutoring students. The model's ability to process and generate human-like text enables the development of realistic patient interactions, enhancing the training of future healthcare professionals.[3] Having large updated database, doctors and patients can now use this as new tool to update themselves in new innovations in field of medicine.

Overweight and obesity, defined as abnormal or excessive fat accumulation that significantly increase the risk of diabetes and its complications. A BMI over 25 is classified as overweight, and over 30 as obese—both key contributors to type 2 diabetes. In 2019, elevated BMI was linked to 5 million NCD (non-communicable diseases) deaths, with diabetes playing a major role. Excess weight exacerbates diabetes-related conditions, including cardiovascular diseases, kidney failure requiring dialysis, vision loss, and limb amputations, etc. Global diabetes rates have surged fourfold since 1980, underscoring obesity as a critical driver of this epidemic.[4]

Tirzepatide is a novel medication approved by the US Food and Drug Administration (FDA) for treating obesity and type 2 diabetes mellitus (T2DM). Tirzepatide is a dual agonist for the glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP) receptors.[5]

Table 1: Common questions raised on DeepSeek about the new drug Tirzepatide.

Questions	Response by DeepSeek
What is Tirzepatide, and how does it differ from other GLP-1 agonists?	Tirzepatide is a first-in-class dual agonist targeting both GIP (glucose-dependent insulinotropic polypeptide) and GLP-1 (glucagon-like peptide-1) receptors, distinguishing it from single-receptor GLP-1 agonists like semaglutide. By simultaneously activating GIP and GLP-1 pathways, Tirzepatide enhances insulin secretion, reduces glucagon release, and promotes greater weight loss—demonstrating superior efficacy in clinical trials such as SURPASS-2, where it outperformed semaglutide in HbA1c reduction.
How effective is Tirzepatide for type 2 diabetes and obesity?	In the SURPASS trials, Tirzepatide reduced HbA1c by 1.8–2.4% and body weight by 12–15% (vs. placebo). The SURMOUNT-1 trial for obesity showed 15–20% weight loss in 50% of participants—a result approaching bariatric surgery outcomes. Notably, its dual-receptor action contributes to better glycemic control and sustained weight management compared to GLP-1 monotherapies.
What are Tirzepatide's key mechanisms of action?	Tirzepatide's dual agonism works via: 1. GIP Receptor: Enhances insulin sensitivity in adipose tissue and reduces lipotoxicity. 2. GLP-1 Recepto: Suppresses appetite, slows gastric emptying, and improves pancreatic beta-cell function Together, these mechanisms address insulin resistance, hyperglycemia, and obesity more comprehensively than single-target therapies.
What are the most common side effects?	Gastrointestinal symptoms (nausea, diarrhea, vomiting) occur in ~30% of users but usually subside within weeks. Rare risks include pancreatitis and gallbladder disease. Unlike older GLP-1 agonists, Tirzepatide's GIP modulation may mitigate severe hypoglycemia risk, but caution is advised with insulin co-administration. Tirzepatide is contraindicated in pregnancy, those with a history of medullary thyroid cancer, or severe GI disorders.
Which patients are ideal candidates for Tirzepatide therapy?	Ideal candidates for Tirzepatide include adults with type 2 diabetes (especially those with HbA1c >7.5% despite metformin) and obesity (BMI ≥27 kg/m² with comorbidities or ≥30 kg/m² alone), as it simultaneously improves glycemic control and promotes significant weight loss (12-20%). It may also benefit patients with NAFLD/NASH and those ineligible for bariatric surgery.

Continued.

Questions	Response by DeepSeek
Could Tirzepatide treat non-alcoholic steatohepatitis (NASH)?	Early data suggest Tirzepatide reduced liver fat content by up to 40% in phase 2 trials, with potential anti-fibrotic effects. The SYNERGY-NAS trial (ongoing) is evaluating its impact on NASH resolution. GIP's role in lipid metabolism may offer unique advantages for metabolic liver diseases.
What are the limitations of Tirzepatide therapy?	Key challenges include: Cost: ~$1,000/month in the U.S., limiting accessibility. Administration: Weekly injections may reduce adherence. Long-term safety: Limited data beyond 3 years of use. Equity: Underrepresentation of diverse populations in trials (e.g., Asian, African ancestry)
Should Tirzepatide replace metformin as first-line therapy?	Not yet. Metformin remains the gold standard for initial type 2 diabetes management due to its safety, cost, and cardiovascular benefits. Tirzepatide is better suited for patients with uncontrolled diabetes or obesity requiring significant weight loss. Guidelines recommend individualized treatment based on comorbidities and cost considerations.
What ongoing research or future applications exist for Tirzepatide beyond diabetes and obesity?	1. NASH/NAFLD: The SYNERGY-NASH phase 3 trial (NCT04166773) is evaluating Tirzepatide's ability to resolve NASH without worsening fibrosis, building on phase 2 data showing ~40% liver fat reduction. 2. Cardiovascular Disease: Post-hoc analyses of SURPASS trials suggest improved lipid profiles and blood pressure. A dedicated CVOT (SURPASS-CVOT) is underway to confirm cardioprotective effects. 3. PCOS: Early studies investigate its role in improving insulin resistance and hyperandrogenism in polycystic ovary syndrome. 4. Neurodegenerative Disease: Preclinical research explores GIP/GLP-1 agonism in Alzheimer's and Parkinson's, leveraging neuroprotective and anti-inflammatory properties. 5. Heart Failure: Trials are assessing benefits in HFpEF (heart failure with preserved ejection fraction), linked to obesity/metabolic dysfunction. Future applications may include renal protection, aging-related metabolic decline, and combination therapies (e.g., with SGLT2 inhibitors). Challenges include long-term safety data and cost barriers.

Our analysis states that, DeepSeek has generated detailed, evidenced based responses in clear language about Tirzepatide. Information such as Tirzepatide's dual agonism reduces HbA1c by 2.4% and weight by 15–20%, rivaling bariatric surgery and directs high-risk patients (e.g., pregnancy) to avoid use, aligns with FDA guidelines.[5] It has all the updates about the latest clinical trials such as SYNERGY-NASH trial, SURMOUNT trial.

While DeepSeek offers valuable assistance to healthcare professionals, it also has certain limitations. One key concern is the risk of inheriting biases from its training data, such as irregular data entry and inconsistent collection standards, which may perpetuate disparities in healthcare. Moreover, final decision-making must remain centered on healthcare providers, as AI cannot replace the insights gained from physical examinations of patients. Finally, while DeepSeek's responses can be useful, they should not be considered peer-reviewed medical evidence.

Further, DeepSeek must integrate with professional medical databases such as PubMed, Google Scholar, Cochrane Library, Scopus, Web of Science and incorporate more high-quality cases and information to ensure data diversity and representativeness.

Declaration

During the course of preparing this work, the author used DeepSeek for the purpose of extracting responses related to the article. The author takes full responsibility for all the content of this publication.

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