

DOI: <https://dx.doi.org/10.18203/2319-2003.ijbcp20232577>

Review Article

Use of liraglutide in the patient with obesity and type 2 diabetes mellitus: a literature review

Jorge A. Diaz Cancino^{1*}, Cristian J. Sosa Álvarez¹, Karen A. Zebadúa Ramírez²

¹Departamento De Medicina Interna, Instituto Mexicano Del Seguro Social, Jesús María, Aguascalientes, Mexico

²Departamento De medicina interna, Instituto Mexicano del Seguro Social, Mérida, Yucatán, Mexico

Received: 18 June 2023

Accepted: 12 July 2023

***Correspondence:**

Dr. Jorge A. Diaz Cancino,

Email: jorge.diaz.cancino@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Obesity and type 2 diabetes mellitus represent two of the most pressing public health challenges globally. In recent decades, an alarming increase in the prevalence of both conditions has been observed, which has led to a significant increase in the burden of disease and an increased search for effective therapeutic strategies. As evidence accumulates on the efficacy and safety of Liraglutide in this patient population, a comprehensive review of the available scientific literature is necessary. The objective of this literature review is to analyze and synthesize relevant studies investigating the use of liraglutide in patients with obesity and type 2 diabetes mellitus, in order to provide a comprehensive view on its effectiveness, indications, complications and management. In conclusion, the use of liraglutide in patients with obesity and type 2 diabetes mellitus has been shown to be an effective therapeutic option to improve glycemic control, promote weight loss and reduce cardiovascular risk. This drug, as a GLP-1 receptor agonist, stimulates insulin secretion, suppresses excessive glucagon release and delays gastric emptying, which contributes to the improvement in glycemic control.

Keywords: Liraglutide, Diabetes mellitus, GLP-1 receptor

INTRODUCTION

Obesity and type 2 diabetes mellitus represent two of the most pressing public health challenges globally. In recent decades, an alarming increase in the prevalence of both conditions has been observed, which has led to a significant increase in the burden of disease and an increased search for effective therapeutic strategies.¹

Obesity, characterized by an excess accumulation of body fat, has reached epidemic proportions worldwide. According to the world health organization (WHO), in 2020 it was estimated that more than 2 billion adults were overweight and more than 700 million were obese. This condition is associated with an increased risk of

developing a wide range of chronic diseases, including type 2 diabetes mellitus.²

On the other hand, type 2 diabetes mellitus, a chronic disease characterized by elevated blood glucose levels due to a combination of insulin resistance and insulin deficiency, has also experienced an alarming increase in its prevalence. According to the international diabetes federation, in 2020 it was estimated that there were around 463 million people living with diabetes worldwide. This figure is projected to rise to 700 million by 2045. Type 2 diabetes not only carries an increased risk of cardiovascular, renal and ocular complications, but also represents a significant economic burden on health systems.^{2,3}

Optimal management of patients with obesity and type 2 diabetes mellitus is crucial to prevent long-term complications and improve quality of life. In this context, the use of liraglutide has emerged as a promising therapeutic option. Liraglutide is a glucagon-like peptide type 1 (GLP-1) analogue approved for the treatment of type 2 diabetes mellitus and obesity. It is administered subcutaneously and has been shown to reduce blood glucose levels, promote weight loss and improve insulin sensitivity.⁴

Definition

Obesity is defined as an excess accumulation of body fat that can have a negative impact on health. It is usually classified using body mass index (BMI), which is calculated by dividing weight in kilograms by the square of height in meters (kg/m^2). According to the WHO, a BMI equal to or greater than $30 \text{ kg}/\text{m}^2$ is considered obese.²

Type 2 diabetes mellitus is a chronic disease characterized by elevated blood glucose levels due to a combination of insulin resistance and insulin deficiency. Insulin resistance refers to a decrease in the ability of the body's cells to respond adequately to insulin, while insulin deficiency involves insufficient production of this hormone by the pancreas.³

Directions

Liraglutide is a glucagon-like peptide type 1 (GLP-1) analogue approved for the treatment of type 2 diabetes mellitus and obesity. It acts as a GLP-1 receptor agonist, meaning it mimics the effects of endogenous GLP-1, a hormone produced in the small intestine in response to food intake.⁵

Against the background of type 2 diabetes mellitus, liraglutide is used as an antidiabetic drug to improve glycemic control. It has been shown to stimulate glucose-dependent insulin secretion, suppress excessive glucagon release, and delay gastric emptying, leading to a decrease in blood glucose levels.⁶

In addition to its use in glycemic control, Liraglutide has shown efficacy in the treatment of obesity. It acts on the hypothalamus to suppress appetite and increase feelings of satiety, resulting in decreased food consumption and promoting weight loss.⁷

COMPLICATIONS AND MANAGEMENT

Use of liraglutide may be associated with side effects, although it is generally considered safe and well tolerated. Some of the most common side effects include nausea, vomiting and diarrhoea, which are usually transient and mild to moderate in intensity. These side effects usually lessen over time as body adjusts to medication.^{6,7}

It is important to note contraindications and adjust the dose of liraglutide in patients with renal impairment or cardiovascular disease, as an increased risk of adverse events has been observed in these populations. In addition, renal function and blood pressure should be evaluated periodically in patients receiving this treatment.⁸

In terms of management, it is recommended to start treatment with liraglutide at low doses and gradually increase the dose according to the individual response of the patient. The usually recommended dose is 0.6 mg once daily, and may be increased to 1.2 mg or 1.8 mg once daily, depending on patient need and tolerance.⁹

Importantly, the use of liraglutide should be supplemented with lifestyle changes, including a healthy diet and regular physical exercise. These measures are critical to maximizing treatment benefits and achieving optimal results in terms of glycemic control and weight loss.¹⁰

DISCUSSION

The use of liraglutide in patients with obesity and type 2 diabetes mellitus has generated increasing interest due to its effectiveness in glycemic control and weight loss. The results of numerous clinical studies have consistently supported the benefits of this drug, which has led to its approval and recommendation in treatment guidelines.¹⁻³

In terms of glycaemic control, liraglutide has been shown to significantly reduce haemoglobin A1c (HbA1c) levels, a key indicator of long-term glycaemic control. Studies such as the lead-3 clinical trial have shown an average reduction of approximately 1% in HbA1c levels in patients treated with liraglutide, compared to the placebo group. This improvement in glycemic control is mainly attributed to the stimulant effects of liraglutide on insulin secretion and suppression of excessive glucagon release.¹¹

In addition to glycemic control, treatment with liraglutide has also been shown to be effective in reducing body weight in patients with obesity and type 2 diabetes mellitus. Studies such as scale obesity and prediabetes have reported significant weight loss in patients treated with liraglutide, with an average decrease of about 5% to 10% of baseline weight. This weight reduction is mainly attributed to the effects of liraglutide on the hypothalamus, which suppresses appetite and increases feelings of satiety.¹²

Importantly, weight loss associated with Liraglutide treatment not only has aesthetic benefits, but is also related to improvements in cardiovascular risk factors. Several studies have shown a reduction in blood pressure, lipid levels, and insulin resistance in patients receiving liraglutide. These findings are especially relevant, as obesity and type 2 diabetes mellitus are closely linked to an increased risk of cardiovascular disease.¹³

In addition to the effects on glycemic control and weight loss, the use of liraglutide has shown benefits in reducing cardiovascular risk in patients with obesity and type 2 diabetes mellitus. The leader clinical trial, which included more than 9,000 patients, demonstrated a significant 13% reduction in the incidence of major cardiovascular events in the liraglutide-treated group compared to the placebo group. These results support the importance of considering the use of liraglutide in patients at elevated cardiovascular risk.¹⁴

Despite the proven clinical benefits, it is important to note that the use of liraglutide is not without side effects. The most common adverse events associated with liraglutide include nausea, vomiting and diarrhoea, which are usually transient and mild to moderate in intensity. However, these side effects usually lessen over time as the body adjusts to the medication. In addition, cases of acute pancreatitis have been reported in patients treated with liraglutide, although the incidence is low. Therefore, it is recommended to closely monitor patients receiving this treatment and be alert to any signs of pancreatic complications.^{6,7}

CONCLUSION

In conclusion, the use of liraglutide in patients with obesity and type 2 diabetes mellitus has been shown to be an effective therapeutic option to improve glycemic control, promote weight loss and reduce cardiovascular risk. This drug, as a GLP-1 receptor agonist, stimulates insulin secretion, suppresses excessive glucagon release and delays gastric emptying, which contributes to the improvement in glycemic control. In addition, treatment with liraglutide has shown promising results in terms of weight loss, which is attributed to its ability to suppress appetite and increase feelings of satiety. Reducing body weight not only has aesthetic benefits, but is also associated with improvements in cardiovascular risk factors, such as blood pressure, lipid levels, and insulin resistance. It is important to be aware of the side effects associated with the use of liraglutide, such as nausea, vomiting and diarrhea, although they are usually transient and of mild to moderate intensity. Contraindications should also be considered and the dose adjusted in patients with renal impairment or cardiovascular disease. In short, the use of liraglutide represents a significant advance in the management of patients with obesity and type 2 diabetes mellitus, since it not only contributes to glycemic control, but also promotes weight loss and reduces cardiovascular risk. However, more research is needed to assess its long-term efficacy and safety, as well as its impact on specific subgroups of patients. Overall, liraglutide offers new therapeutic perspectives to improve quality of life and reduce the burden of disease in this population.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

- Ortega MA, Fraile-Martínez O, Naya I, García-Honduvilla N, Álvarez-Mon M, Buján J et al. Type 2 diabetes mellitus associated with obesity (diabesity). The central role of gut microbiota and its translational applications. *Nutrients*. 2020;12(9):2749.
- World Health Organization. The state of food security and nutrition in the world 2020: transforming food systems for affordable healthy diets, Vol 2020. Food Agriculture Org. 2020.
- Xue T, Li Q, Zhang Q, Lin W, Wen J, Li L, Chen G. Blood glucose levels in elderly subjects with type 2 diabetes during COVID-19 outbreak: a retrospective study in a single center. *Medrxiv*. 2020.
- Karavanaki K, Paschou SA, Tentolouris N, Karachaliou F, Soldatou A. Type 2 diabetes in children and adolescents: distinct characteristics and evidence-based management. *Endocrine*. 2022;78(2):280-95.
- Helmstädter J, Frenis K, Filippou K, Grill A, Dib M, Kalinovic S et al. Endothelial GLP-1 (glucagon-like peptide-1) receptor mediates cardiovascular protection by liraglutide in mice with experimental arterial hypertension. *Arteriosclerosis Thrombosis Vascular Biol*. 2020;40(1):145-58.
- Unger J, Allison DC, Kaltoft M, Lakkole K, Panda JK, Ramesh C et al. Maintenance of glycaemic control with liraglutide versus oral antidiabetic drugs as add-on therapies in patients with type 2 diabetes uncontrolled with metformin alone: A randomized clinical trial in primary care (LIRA-PRIME). *Diabetes Obesity Metabolism*. 2022;24(2):204-11.
- Lin CH, Shao L, Zhang YM, Tu YJ, Zhang Y, Tomlinson B et al. An evaluation of liraglutide including its efficacy and safety for the treatment of obesity. *Expert Opinion Pharmacoth*, 2020;21(3):275-85.
- Ebell MH. Liraglutide Is Probably the Best Second Drug to Prevent Cardiovascular Events in Patients with Type 2 Diabetes Mellitus Who Take Metformin. *Am Family Physician*. 2023;107(4):434-4.
- Trenson L, Trenson S, Van Nes F, Moyson C, Lannoo M, Deleus E et al. Liraglutide for weight management in the real world: significant weight loss even if the maximal daily dose is not achieved. *Obesity Facts*, 2022;15(1):83-9.
- Webster CM, Mittal N, Dhurandhar EJ, Dhurandhar NV. Potential contributors to variation in weight-loss response to liraglutide. *Obesity Rev*. 2023;e13568.
- Mirabelli M, Chiefari E, Caroleo P, Arcidiacono B, Corigliano DM, Giuliano S et al. Long-term effectiveness of liraglutide for weight management and glycemic control in type 2 diabetes. *Int J Environmental Res Pub Health*. 2022;17(1):207.
- León-Mimila P, Villamil-Ramírez H, Li XS, Shih DM, Hui ST, Ocampo-Medina E et al. Trimethylamine N-oxide levels are associated with NASH in obese subjects with type 2 diabetes. *Diabetes Metabolism*. 2021;47(2):101183.

13. Shin J, Kim R, Kim HS. Liraglutide, a glucagon-like peptide-1 analog, in individuals with obesity in clinical practice. *Cardiovascular Prevention Pharmacotherapy*, 2023;5(2):49-53.
14. Almutairi M, Al Batran R, Ussher JR. Glucagon-like peptide-1 receptor action in the vasculature. *Peptides*. 2019;11126-32.

Cite this article as: Diaz Cancino JA, Álvarez CJS, Ramírez KAZ. Use of liraglutide in the patient with obesity and type 2 diabetes mellitus: a literature review. *Int J Basic Clin Pharmacol* 2023;12:755-8.