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Authors' Affiliation:
[1]The University Hospital in Krakow, Poland
[2]Collegium Medicum, Jan Kochanowski University, Kielce, Poland
[3]St. Alexander Hospital in Kielce, Poland

***Corresponding author:**
Filip Maj; Collegium Medicum, Jan Kochanowski University, Kielce, Poland; Email: filip.jacek.maj@gmail.com

Contact List

Anna Klasa:	klasa.annamaria@gmail.com
Filip Maj:	filip.jacek.maj@gmail.com
Justyna Gręda:	justyna.jurek26@gmail.com
Karol Mateusz Wojnarowski:	wojnarowskikarol@gmail.com
Bartosz Zieliński:	bartoszzielinski1912@gmail.com

Orcid List

Anna Klasa	0009-0005-0461-0599
Filip Maj	0009-0009-8448-9467
Justyna Gręda	0009-0006-5072-1035
Karol Mateusz Wojnarowski	0009-0001-7683-7945
Bartosz Zieliński	0009-0005-5954-6037

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The Impact of Tirzepatide on Cancer Development: a literature review

Anna Klasa[1], Filip Maj[2*], Justyna Gręda[3], Karol Mateusz Wojnarowski[3], Bartosz Zieliński[3]

ABSTRACT

Background: Tirzepatide, a dual GIP/GLP-1 receptor agonist, is an effective treatment for type 2 diabetes and obesity. However, concerns persist about its potential association with cancer. This review evaluates the available evidence on tirzepatide's cancer safety profile. *Materials and methods*: On 17th April, 2025, the MEDLINE database was searched. The following search query was used: "tirzepatide and adverse events and cancer" with one filter "free full text". The initial search returned 9 results. After screening of abstracts, 9 results were chosen for full text analysis, of which 5 met inclusion criteria and were included in the study. *Results*: Across all studies, cancer incidence was consistently low (<0,14%) with no dose-dependent relationship. Real-world data confirmed no disproportionate reporting of cancer cases. *Conclusions*: Current evidence suggests tirzepatide does not significantly increase cancer risk compared to other antidiabetic medications. Clinicians should monitor for symptoms but can consider it as safe therapeutic option. Further research with longer follow-up and broader patient populations is needed to confirm these findings.

Keywords: tirzepatide, cancer, gip/glp-1 receptor agonist, type 2 diabetes mellitus, obesity

1. INTRODUCTION

In recent years, there has been a dramatic increase in the prevalence of the disease obesity. One common treatment for diet-resistant obesity is surgery. In contrast, the effectiveness and frequency of pharmacological intervention have been increasing in recent years. Glucagon-like peptide-1 receptor agonists (GLP-1RA), such as semaglutide and tirzepatide are the most promising drugs. They have dual benefits in terms of glucose control and weight loss. GLP-1RAs function by suppressing appetite and by delaying gastric emptying, leading to significant weight loss. However, their increasing use requires careful monitoring for potential side effects. Such as gastrointestinal disorders, pancreatic-biliary disorders, and concerns about the risk of thyroid cancer, particularly medullary thyroid cancer (MTC) (Abi Zeid Daou et al., 2025).

Tirzepatide (TZP) is the first dual glucose-dependent insulinotropic polypeptide (GIP) and GLP-1 receptor agonist and was approved by the FDA for the treatment of type 2 diabetes (T2D) in 2022, followed by the treatment of obesity in 2023. Numerous clinical trials and meta-analyses have demonstrated its effectiveness compared to other incretin-based therapies. It achieves greater reductions in body weight and HbA1c compared to semaglutide. Safety is comparable to GLP-1RAs - characterized mainly by transient gastrointestinal effects. There are concerns about rare but serious adverse events such as pancreatitis, biliary diseases, and thyroid cancer. Real-world pharmacovigilance data, such as those from the FDA Adverse Event Reporting System (FAERS), are crucial to further assess these risks (Caruso et al., 2024).

The global increasing incidence of type 2 diabetes, obesity, and insulin resistance requires medical interventions. The best drugs are those that reduce both glucose and patient weight. Older generations of drugs, such as insulin and GLP-1RA, have limitations, including the risk of hypoglycemia and little weight reduction. Dual tirzepatide receptor agonism increases insulin secretion while suppressing glucagon, offering better glycaemic and weight loss outcomes. Meta-analyses support its efficacy compared with placebo, insulin, and selective GLP-1RAs, although optimal dosing strategies require further study (Yu et al., 2022).

Obesity is a leading factor in cardiovascular and metabolic disease worldwide. Tirzepatide's unique mechanism - combining the insulin-sensitizing effects of GIP with the satiety induction of GLP-1 - provides unprecedented weight loss (up to 20% of body weight), outperforming older anti-obesity drugs. Its approval amounts to a change in the treatment schedule for obesity, and emerging evidence also supports cardiovascular benefits (Cai et al., 2024).

In addition, tirzepatide may have a protective effect on the kidney, reducing albuminuria and slowing the decline in estimated glomerular filtration rate (eGFR) in diabetic kidney disease (DKD). However, dedicated studies in populations with chronic kidney disease (CKD) are lacking (Kamrul-Hasan et al., 2025).

2. REVIEW METHOD

2.1. Data collection

The MEDLINE database was searched. The following search query was used: “tirzepatide AND adverse events AND cancer” with one filter “free full text”. Five independent researchers screened the results. The initial search returned 9 results. After screening of abstracts, 9 results were chosen for complete text analysis, of which 5 met inclusion criteria and were included in the study. A flowchart of study inclusion is presented in Figure 1. Inclusion and exclusion criteria Studies were included into the analysis if predefined PICO criteria were met (Table 1).

Table 1. PICO criteria used in the study

PICO	Description
Patients	Adults with type 2 diabetes or obesity receiving antidiabetic treatment
Intervention	Treatment with tirzepatide
Comparisons	Placebo or other interventions not involving tirzepatide
Outcomes	Incidence of cancer

2.2. Quality assessment

This review was performed according to PICO (Patients, Interventions, Comparisons, Outcomes) guidelines.

3. RESULTS AND DISCUSSION

Characteristics of studies

This section provides a detailed overview of the five studies analysed in this review. Each study evaluated the incidence of cancer preceded by the use of tirzepatide treatment. The general consensus across all studies suggests that the use of tirzepatide does not affect the development of cancer more than placebo or other drug groups. However, differences in study design, patient selection, and methodology contribute to the variability in reported results.

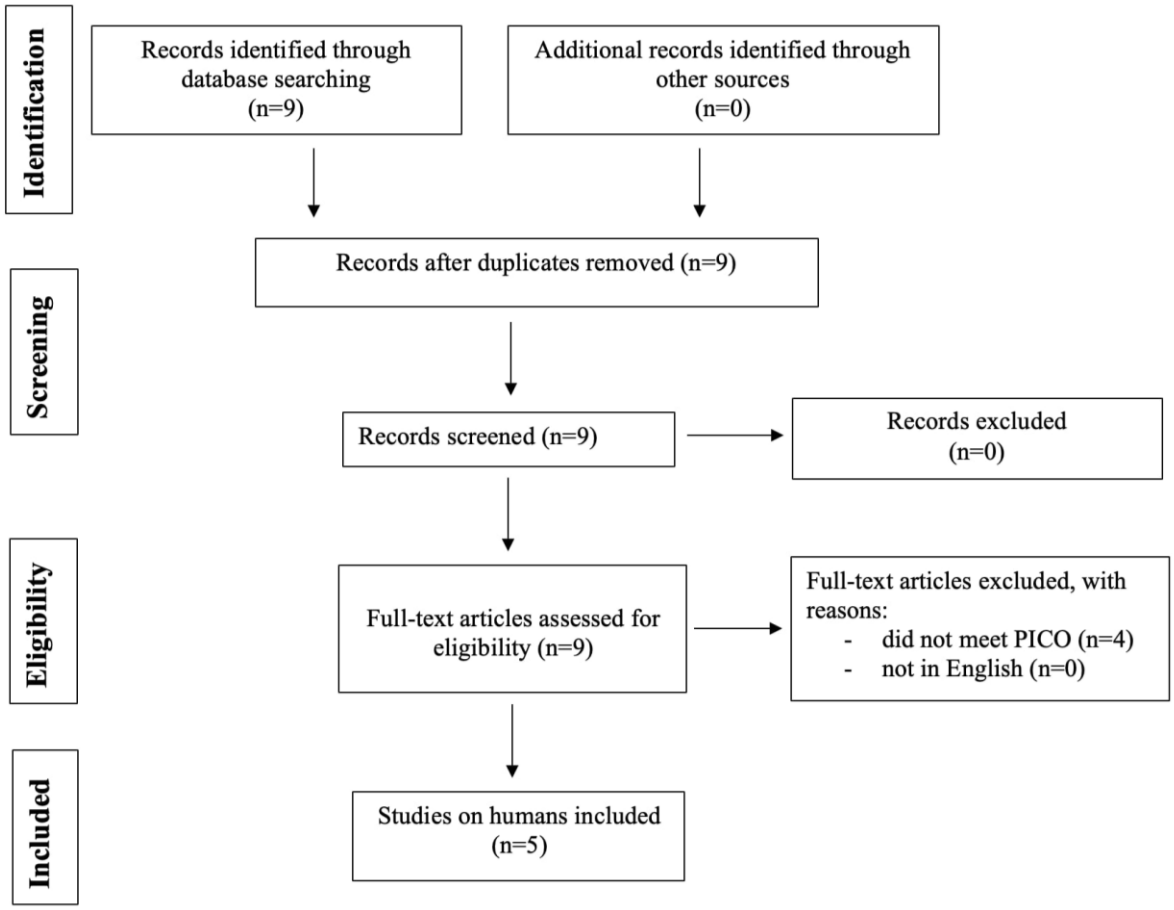

Figure 1. PRISMA protocol for data acquisition.

Study Descriptions

Abi Zeid Daou et al., (2025) Analyzed 31965 patients treated with tirzepatide who had adverse effects. Adverse effects in the form of thyroid cancer were reported in 37 patients. Available data from pharmacovigilance studies suggest the absence of a potential association between tirzepatide and thyroid cancer. The observed risk is lower than for other GLP-1 receptor agonists. In contrast, the data showed a comparable incidence of thyroid cancer to other control trials. The study showed that medullary and papillary cancer occurred less frequently.

The data analyzed came from the large FAERS database, allowing the study to examine actual data in different populations. However, limitations included the observational nature of the data and the lack of control for key associated factors, such as obesity and family history. Additionally, there were potential reporting errors and incomplete case information regarding cancer subtypes. The study also did not consider the impact of treatment duration. These limitations highlight the need for cautious interpretation of the results and highlight gaps that require further investigation in controlled trials.

Caruso et al., (2024) Examined 20409 patients treated with tirzepatide who had adverse effects. Adverse effects in the form of thyroid cancer were reported in 20 patients. Recent analysis of real-world data examined the potential link between tirzepatide and thyroid cancer. There were reports of medullary thyroid cancer and thyroid masses in patients using tirzepatide, although the number of cases was very limited. Compared with other GLP-1 receptor agonists, tirzepatide showed a similar pattern of thyroid-related events, with no evidence of increased risk with this type of drug.

The results of the study have several limitations. The small number of reported cases makes it difficult to reach clear conclusions, and the observational character of the data makes it impossible to determine the cause. In addition, factors such as obesity and diabetes - often found in tirzepatide users - are themselves associated with a higher risk of thyroid cancer, further complicating interpretation. Although these observations warrant attention, particularly in high-risk patients, the current evidence does not suggest a significant

risk of thyroid cancer associated with tirzepatide use. Further studies with longer follow-ups are needed to better assess this potential safety risk.

Kamrul-Hasan et al., (2025) Studied 6126 patients treated with tirzepatide who had adverse effects. Adverse effects in the form of renal cancer were reported in 6 patients. This meta-analysis assessed the renal safety profile of tirzepatide, including its potential association with the development of kidney cancer. The renal cancer risk assessment compared tirzepatide with placebo, insulin and GLP-1 receptor agonists. The results of these comparisons revealed no statistically significant differences in renal cancer risk between tirzepatide and any of the comparison groups.

The analysis was limited by the relatively short duration of the included studies and the small number of kidney cancer cases reported. Although these results suggest no increased risk of renal cancer during tirzepatide treatment, longer-term studies would be valuable to further assess this potential association. Especially given the chronic nature of the conditions treated and the usually prolonged development of renal malignancies. The overall safety profile of renal in this analysis appeared safe, with demonstrated benefits in reducing albuminuria and no adverse effect on estimated glomerular filtration rate. These results contribute to the growing body of evidence supporting the safety of tirzepatide in patients with type 2 diabetes and obesity, although continued monitoring in clinical practice and further studies with longer follow-up periods remain important to fully characterize the long-term renal safety profile, including rare outcomes such as renal cell cancer.

Yu et al., (2022) Included 722 patients treated with tirzepatide who had adverse effects. Adverse effects in the form of cancer were reported in 1 patient. This meta-analysis examined the safety profile of tirzepatide at different doses in patients with type 2 diabetes, including cancer risk. The results showed no significant increase in cancer incidence among patients receiving tirzepatide at any dose. When comparing higher doses with the 5 mg dose, there was no evidence of increased cancer risk, and similar results were observed when comparing the highest dose with intermediate doses. The number of cancer cases reported was low in all treatment groups, suggesting that tirzepatide does not appear to be associated with increased cancer development. However, the relatively short duration of the included studies and the limited number of cancer cases mean that these results should be interpreted with caution. The current evidence suggests that tirzepatide has a positive safety profile in terms of cancer risk but long-term studies and larger patient populations would provide more definitive conclusions (figure 2).

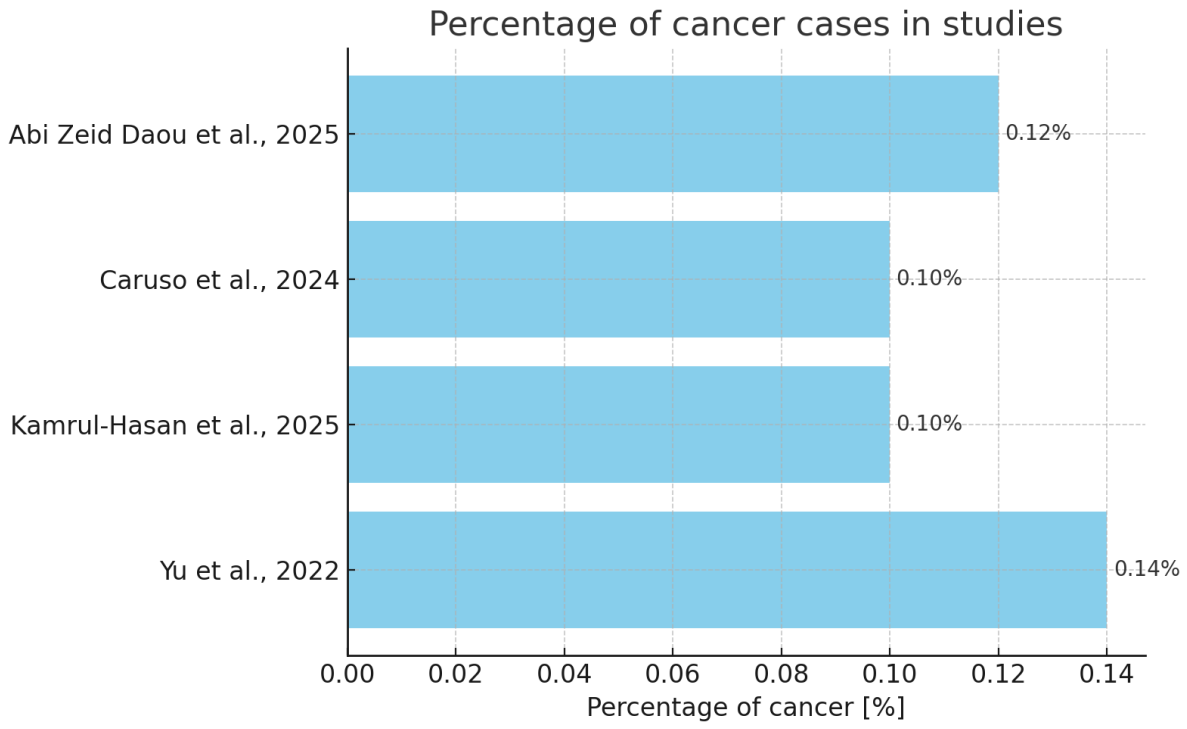

Figure 2. Percentage of cancer cases in studies

Current evidence from multiple studies suggests that tirzepatide does not significantly increase cancer risk compared to placebo or other antidiabetic drugs. Thyroid cancer and renal cancer risk analyses based on pharmacovigilance data, real-world studies, and meta-analyses consistently show low incidence rates with no clear dose- or drug-dependent association. For thyroid cancer, reported incidences were rare (e.g. 37 out of 31,965 patients in one study), and the risk appeared comparable or lower than with other GLP-1 receptor agonists. Similarly, incidences of renal cell carcinoma were minimal (e.g. 6 out of 6,126 patients), with no statistically significant differences compared with control groups.

However, limitations such as the short duration of the study, the small number of events and confounding factors (e.g. obesity, diabetes) make it difficult to draw definitive conclusions. Although existing data support the overall safety of tirzepatide with reference to cancer risk, long-term controlled trials are needed to fully assess the potential oncological effects, especially in high-risk populations. Until then, the consensus indicates that there is no increased risk of cancer during tirzepatide use.

The analysis of current studies on the association between tirzepatide use and cancer risk identifies several important limitations. The main problem is the relatively short follow-up time in most of the studies analyzed, typically ranging from a few months to two years. This length of time may not be sufficient to detect a potential effect of the drug on the development of cancers, which are often characterized by a long duration of latency. In addition, study designs generally excluded patients at high oncological risk, including those with a history of cancer or a genetic background (e.g. multiple endocrine adenoma syndrome), which significantly limits the transferability of results to this specific population.

Another important limitation is that some studies use data from systems like FAERS, which are based on voluntary reports and often lack full clinical details. This can make it challenging to accurately measure the frequency of side effects. Methodological heterogeneity between studies, including different cancer diagnostic criteria, monitoring protocols, and comparison groups, further complicates the comparison of results and the drawing of clear conclusions.

It is also worth noting the limited number of reported cancer cases in the studies analysed, which reduces the statistical power of the analyses. In addition, most of the studies did not take into account potential confounders such as obesity or type 2 diabetes, which are themselves associated with an increased risk of developing certain cancers. The lack of standardization in the assessment of tumor markers and the diagnostic methods used is another major limitation in the interpretation of the available data (Abi Zeid Daou et al., 2025; Caruso et al., 2024; Yu et al., 2022; Cai et al., 2024; Kamrul-Hasan et al., 2025).

4. CONCLUSION

Studies to date indicate that the use of tirzepatide is not associated with an increased risk of cancer compared with other drugs used to treat type 2 diabetes and obesity. The clinical data analyzed show a low incidence of cancer, which in none of the studies was higher than 0.14% of treated patients.

However, it should be emphasized that the available results have some limitations. The short follow-up time in most studies, usually ranging from a few months to two years, may not be sufficient to fully assess the potential effect of the drug on tumor progression. Additionally, the excluding of patients at high oncological risk from the studies makes it difficult to transfer these results to all patient groups.

In the context of therapy safety, clinical vigilance is important, especially in patients with a family history of endocrine neoplasia. Physicians should take individual risk factors into account when making therapeutic decisions while being aware of the documented metabolic benefits of thiothrombotics.

Further studies should focus on the long-term follow-up of patients and the inclusion of people with different oncological risk factors in the analyses. It will also be important to monitor data from clinical practice, which may complete the results achieved in controlled trial settings.

The current state of knowledge allows tirzepatide to be considered a safe therapeutic option in terms of oncological risk, but this needs to be confirmed in further observations. Therapeutic decisions should be based on an individual assessment of benefits and potential risks, taking into consideration current guidelines and the patient's clinical condition.

Author's Contributions
Anna Klasa (A-F)
Filip Maj (A-F)
Justyna Gręda (B, F)

Karol Mateusz Wojnarowski (B, F)
Bartosz Zieliński (B, F)
A – study design, B – data collection, C – statistical analysis, D – interpretation of data, E – manuscript preparation, F – literature review

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Conflict of interest
The authors declare that there is no conflict of interest.

Data and materials availability
All data associated with this work are present in the paper.

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