



A Comprehensive Literature Review of Relationship of Insuline Resistance and Thyroid Cancer

¹ Erick Persson Jeffry, ¹ Charles Sanjaya Seikka

¹ Faculty of Medicine, Veterans National Development University, Special
Region of Jakarta, Indonesia

² Internal Medicine Consultant, Kebonjati General Hospital, Bandung City,
Indonesia

Correspondence : erick.persson86@gmail.com

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ABSTRACT

Background: The relationship between insulin resistance and thyroid cancer has garnered increasing attention in recent years, as emerging evidence suggests a complex interplay between metabolic disorders and cancer risk. **Literature Review:** The study by (Malaguarnera et al., 2012) outlines the role of insulin and IGFs in promoting cell proliferation and migration, implicating these factors in tumorigenesis. This perspective is echoed in the literature review by (Shih et al., 2012), which discusses the rising incidence of thyroid cancer, particularly in small tumors, and emphasizes the need to investigate the role of diabetes and metabolic syndrome further. The meta-analysis conducted by (Yeo et al., 2014) reinforces the association between diabetes and thyroid cancer, suggesting that insulin resistance may be a significant contributor to this risk. Meanwhile, (Chiefari et al., 2021) explores the mechanisms linking chronic hyperinsulinemia to cancer development, emphasizing the importance of inflammatory processes in this relationship. Recent research by (Xu et al., 2022) specifically isolates the effects of insulin resistance in euthyroid patients, further supporting the notion that insulin resistance is a risk factor for differentiated thyroid cancer. Lastly, (Wu et al., 2024) synthesizes the current understanding of diabetes and thyroid cancer, identifying several mechanisms, including oxidative stress and hyperinsulinemia, that may underlie this association. **Conclusion:** In conclusion, the reviewed literature collectively underscores the significance of insulin resistance as a potential risk factor for thyroid cancer. It highlights the need for further studies to elucidate the biological mechanisms involved and to explore the implications for prevention and treatment strategies. The complexity of the relationship between metabolic disorders and cancer risk suggests that a multi-faceted approach is necessary for future research.

Keywords: Relationship, Insuline Resistance, Thyroid Cancer

INTRODUCTION

The relationship between insulin resistance and thyroid cancer has garnered increasing attention in recent years, as emerging evidence suggests a complex interplay between metabolic disorders and cancer risk. The literature reveals a spectrum of insights into how insulin resistance may contribute to thyroid cancer pathogenesis, highlighting both epidemiological observations and potential mechanistic pathways.

In 2012, (Malaguarnera et al., 2012) emphasized the role of insulin and insulin-like growth factors (IGFs) in cancer development, noting that elevated plasma concentrations of IGFs are associated with an increased risk of various malignancies, including thyroid cancer. They pointed out that insulin resistance and hyperinsulinemia are strong candidates for the increased cancer risk linked to obesity and type 2 diabetes mellitus (T2DM). Their findings suggest a potential biological mechanism where insulin promotes cell proliferation and migration,

thereby contributing to tumorigenesis.

Later in 2012, (Shih et al., 2012) conducted a literature review that reinforced the association between diabetes and thyroid cancer risk. They reported a significant increase in thyroid cancer incidence, particularly in small tumors, and discussed the potential role of diabetes, obesity, and metabolic syndrome as contributing factors to this trend. While they acknowledged the established risk factors such as ionizing radiation, they also highlighted the need for further investigation into the role of diabetes in thyroid cancer etiology.

Expanding on these themes, (Yeo et al., 2014) conducted a meta-analysis that examined the correlation between diabetes mellitus and thyroid cancer risk. Their analysis indicated a rising incidence of thyroid cancer that might be linked to insulin resistance, thus supporting the hypothesis that metabolic dysregulation could play a significant role in cancer development.

In 2021, (Chiefari et al., 2021) provided a comprehensive review of the mechanisms underlying the relationship between insulin resistance and cancer. They suggested that chronic hyperinsulinemia and associated inflammatory processes could be key pathways linking metabolic disorders to cancer risk. Their work underscores the complexity of this relationship, indicating that multiple factors contribute to the cancer pathophysiology, necessitating further research to elucidate these connections.

Recent findings by (Xu et al., 2022) specifically focused on the relationship between insulin resistance and thyroid cancer in euthyroid patients, aiming to isolate the effects of insulin resistance from other metabolic conditions. Their study contributes to the growing body of evidence that insulin resistance is a significant risk factor for differentiated thyroid cancer, emphasizing the need for targeted investigations in this area.

Finally, (Wu et al., 2024) synthesized current knowledge on the correlation between diabetes mellitus and thyroid cancer, exploring underlying mechanisms such as oxidative stress, hyperinsulinemia, and inflammatory responses. Their review highlights the urgent need for a deeper understanding of how diabetes influences thyroid cancer risk, as well as the potential therapeutic roles of hypoglycemic agents in mitigating this risk.

Overall, the literature reflects a burgeoning interest in the nexus between insulin resistance and thyroid cancer, illustrating a multifaceted relationship that warrants further exploration. Each study contributes to a nuanced understanding of how metabolic dysregulation may not only increase cancer risk but also inform prevention and treatment strategies in clinical practice.

LITERATURE REVIEW

The article titled "The Insulin and IGF-I Pathway in Endocrine Glands Carcinogenesis" by (Malaguarnera et al., 2012) provides a

comprehensive examination of the relationship between insulin resistance, insulin-like growth factors (IGFs), and the risk of developing various malignancies, with a particular focus on thyroid cancer. The authors synthesize epidemiological evidence suggesting that elevated plasma concentrations of IGFs correlate with an increased risk of thyroid cancer, highlighting the significant role that these growth factors may play in tumorigenesis.

One of the key insights from the article is the discussion of acromegalic patients, who experience sustained high serum IGF-I levels and exhibit a higher frequency of thyroid cancer. This observation supports the hypothesis that IGF-I may contribute to the development of thyroid malignancies. Furthermore, the article emphasizes the involvement of circulating insulin in cancer progression, positing that insulin resistance and hyperinsulinemia could serve as critical factors in the increased cancer risk associated with metabolic disorders.

The authors reference a range of population studies that demonstrate a strong correlation between insulin resistance, hyperinsulinemia, and the risk of thyroid cancer. They note that overweight and obesity have been consistently associated with increased thyroid cancer risk, although they acknowledge that the data is not entirely uniform across studies. This inconsistency suggests a complex interplay between metabolic factors and cancer risk that warrants further exploration.

Moreover, the article discusses findings from clinical studies involving type 2 diabetes mellitus (T2DM) patients, which indicate that elevated fasting glucose levels are linked to a heightened risk of thyroid cancer. This correlation underscores the potential significance of metabolic dysregulation in the pathogenesis of thyroid malignancies.

In addition to thyroid cancer, the authors briefly explore the relationship between insulin resistance and other endocrine tumors, such as ovarian cancer, noting that women with polycystic ovary

syndrome are at an increased risk. However, they also highlight the mixed findings in this area, indicating that more research is necessary to clarify the relationship between insulin resistance and various cancers.

The article titled "Diabetes and Thyroid Cancer Risk: Literature Review" by (Shih et al., 2012) provides a comprehensive examination of the relationship between diabetes and the risk of developing thyroid cancer. The authors articulate that while diabetes is associated with an increased risk of various cancers, including thyroid cancer, the precise mechanisms behind this association remain unclear.

One of the critical insights from the article is the rising incidence of thyroid cancer, particularly among small tumors. The authors suggest that advancements in early-stage tumor detection methods have significantly contributed to this increase. However, they also acknowledge that other factors may play a role. The article identifies ionizing radiation exposure as a well-

established risk factor for thyroid cancer, alongside benign thyroid conditions and iodine intake variations. Despite this, the authors point out that these factors alone do not fully account for the observed surge in thyroid cancer incidence.

The authors delve into the statistical analyses that indicate diabetes, obesity, and metabolic syndrome as potential risk factors for cancer development. This is particularly relevant in the context of insulin resistance, which is often associated with obesity and metabolic syndrome. However, the article emphasizes that the direct role of diabetes in influencing thyroid cancer risk is not well-defined, leaving a gap in understanding the interplay between insulin resistance and thyroid cancer.

While the literature review effectively summarizes existing epidemiological studies, it also highlights the need for further research to clarify the relationship between diabetes and thyroid cancer risk. The authors suggest that future studies should aim to investigate the

underlying biological mechanisms that may link insulin resistance to thyroid carcinogenesis.

The article titled "Diabetes Mellitus and Risk of Thyroid Cancer: A Meta-Analysis" by (Yeo et al., 2014) provides a comprehensive examination of the relationship between diabetes mellitus, particularly focusing on insulin resistance, and the risk of developing thyroid cancer. This meta-analysis synthesizes findings from various studies to elucidate how metabolic conditions may influence thyroid cancer incidence.

A significant aspect of the article is its exploration of the rising incidence of thyroid cancer globally, which the authors suggest may correlate with increasing rates of insulin resistance and diabetes. This assertion aligns with the hypothesis presented by Gursoy (2010), who posited that the increasing prevalence of thyroid cancer could be linked to insulin resistance mechanisms. The article further references studies indicating that elevated serum thyroid-stimulating hormone (TSH)

levels in patients with thyroid nodules correlate with increased risks of differentiated thyroid cancer and advanced tumor stages (Haymart et al., 2008). This connection underscores the intricate interplay between metabolic dysregulation and thyroid function.

The authors systematically reviewed existing literature, highlighting the complexity of the relationship between diabetes and thyroid cancer risk. They noted that while some studies report a positive association, others yield inconclusive results, suggesting that further research is necessary to clarify these relationships. The review of literature by (Shih et al., 2012) reinforces the notion that diabetes may serve as a contributing factor to thyroid cancer risk, although the exact mechanisms remain to be fully elucidated.

Critically, while the article presents a thorough meta-analysis, it also acknowledges the limitations inherent in the studies reviewed, such as variability in study design, population characteristics, and the definitions of diabetes and insulin

resistance. These factors complicate the establishment of a definitive causal relationship. Moreover, the authors emphasize the need for longitudinal studies to better understand the temporal relationship between diabetes and thyroid cancer development.

The article titled "Insulin Resistance and Cancer: In Search for a Causal Link" by (Chiefari et al., 2021) presents a comprehensive examination of the relationship between insulin resistance and cancer, particularly highlighting the implications of chronic conditions such as obesity and diabetes. The authors effectively synthesize existing literature that illustrates a robust association between these metabolic disorders and an increased risk of cancer development.

A critical evaluation of the material reveals that the authors emphasize insulin resistance as a pivotal factor in cancer pathophysiology. They argue that chronic sustained hyperinsulinemia, which often accompanies insulin resistance, may influence tumor

development through several mechanisms, including the activation of signaling receptors and the promotion of chronic inflammation. This multifaceted approach underscores the complexity of the relationship, as no single mechanism can fully elucidate the connection between insulin resistance and cancer.

The article further highlights the necessity for continued research to unravel the intricate pathways linking insulin resistance to various cancer types. The authors advocate for the development of novel diagnostic and therapeutic strategies aimed at identifying patients who could benefit from personalized treatment approaches. This perspective is particularly relevant given the rising prevalence of obesity and type 2 diabetes, which may exacerbate cancer risk.

Moreover, the authors acknowledge the limitations of current studies, indicating that while there is substantial evidence supporting the association between insulin resistance and cancer, further investigations are essential to

establish causality and explore potential interventions. This critical stance encourages a more nuanced understanding of how metabolic dysregulation may contribute to cancer progression, potentially guiding future research directions.

The article titled "Relationship between insulin resistance and thyroid cancer in Chinese euthyroid subjects without conditions affecting insulin resistance" by (Xu et al., 2022) provides a focused examination of the association between insulin resistance and differentiated thyroid cancer (DTC) in a specific population. The authors aim to clarify the relationship by studying euthyroid individuals while excluding those with metabolic abnormalities that could confound results.

The study is significant in light of the growing body of literature suggesting a link between insulin resistance and various malignancies, including thyroid cancer. By concentrating on euthyroid subjects, the authors effectively isolate the effects of insulin resistance from

other thyroid dysfunctions, thereby enhancing the reliability of their findings. This methodological rigor is commendable, as it addresses potential biases that could arise from including populations with metabolic disorders.

The authors employ a robust analytical framework to assess insulin resistance, utilizing established metrics to evaluate its prevalence among the study participants. Their results indicate a noteworthy correlation between insulin resistance and the incidence of thyroid cancer, suggesting that insulin resistance may indeed play a role in the pathogenesis of DTC. This contribution is particularly relevant in the context of rising obesity rates and metabolic syndrome, which have been implicated in various cancers.

However, while the study's findings are compelling, the authors acknowledge certain limitations, such as the cross-sectional design, which restricts causal inferences. Future longitudinal studies would be beneficial to establish a clearer temporal relationship between insulin

resistance and thyroid cancer development. Additionally, the study's focus on a specific demographic—Chinese euthyroid subjects—may limit the generalizability of the results to broader populations.

The article titled "Diabetes Mellitus and Thyroid Cancers: Risky Correlation, Underlying Mechanisms and Clinical Prevention" by (Wu et al., 2024) presents a comprehensive examination of the intricate relationship between diabetes mellitus and thyroid cancer. The authors effectively synthesize current research to highlight the increasing recognition of diabetes as a significant risk factor for the development of thyroid cancer.

One of the article's key insights is the identification of several underlying mechanisms that may explain this correlation. The authors articulate that genetic predispositions, abnormal thyroid-stimulating hormone (TSH) secretion, oxidative stress, hyperinsulinemia, and elevated insulin-like growth factor-1 (IGF-1) levels all contribute to the heightened

risk of thyroid cancer in diabetic patients. This multifactorial approach is particularly valuable as it underscores the complexity of the interaction between metabolic disorders and malignancies, suggesting that a singular focus on insulin resistance may be insufficient to fully understand the relationship.

Furthermore, the article discusses the role of adipocytokines and inflammatory factors in this context. The authors argue that abnormal secretion of these substances in diabetic patients can lead to an environment conducive to cancer development, thereby reinforcing the need for a broader perspective on how metabolic dysregulation can influence cancer biology. The mention of potential anti-thyroid cancer effects of hypoglycemic drugs adds a clinical dimension to the discussion, suggesting avenues for therapeutic intervention that could mitigate risk factors associated with both diabetes and thyroid cancer.

The authors also emphasize the global increase in the incidence of

concurrent diabetes and malignant tumors, which raises important public health concerns. Their call for further research into the correlation between diabetes and thyroid cancer is well-founded, as understanding these relationships could lead to improved prevention strategies and patient outcomes.

CONCLUSION

The literature on the relationship between insulin resistance and thyroid cancer reveals a multifaceted and complex interplay that warrants further investigation. The introduction highlights the increasing recognition of how metabolic disorders, particularly insulin resistance, may contribute to the pathogenesis of thyroid cancer. Several studies provide evidence supporting this connection, with a focus on insulin and insulin-like growth factors (IGFs) as potential mediators of cancer risk.

The study by (Malaguarnera et al., 2012) outlines the role of insulin and IGFs in promoting cell proliferation and migration, implicating these factors in tumorigenesis. This perspective is

echoed in the literature review by (Shih et al., 2012), which discusses the rising incidence of thyroid cancer, particularly in small tumors, and emphasizes the need to investigate the role of diabetes and metabolic syndrome further.

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