The Role of Sudden Weight Loss as an Early Indicator of Diabetes Onset in Prediabetic and Newly Diagnosed Diabetic Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Short Research Article

ABSTRACT

Background and Objective: Sudden weight loss is a potential early indicator of metabolic disorders commonly associated with diabetes, although its role in the early detection of the disease has not been extensively studied. Therefore, further exploration is needed to evaluate whether

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unexplained weight loss can serve as a more significant risk factor or marker for early diabetes detection, as well as to understand the metabolic changes occurring in the body of individuals with diabetes. This study investigates the relationship between unexplained sudden weight loss and early diagnosis of diabetes in prediabetic patients and newly diagnosed diabetic patients.

Methods: This research employed a cross-sectional observational design, analyzing the association between sudden weight loss and a diabetes diagnosis using statistical tools such as SPSS.

Results: The findings revealed a statistically significant relationship, as indicated by a p-value of 0.001 and an odds ratio of 8.39, suggesting that individuals experiencing unexplained weight loss are eight times more likely to be diagnosed with diabetes.

Discussion: These results suggest that sudden weight loss may serve as an important diagnostic clue in identifying individuals at risk for diabetes at an early stage, particularly in high-risk populations.

Conclusion: The findings support the need for healthcare providers to consider unexplained weight loss as a potential warning sign for the onset of diabetes, prompting earlier screening and intervention.

1. INTRODUCTION

Diabetes mellitus is a complex and chronic condition that has become an increasingly prevalent health concern worldwide, posing significant challenges not only to individuals affected by the disease but also to global healthcare systems (Arokiasamy et al. 2021). The rising incidence of diabetes, particularly type 2 diabetes, is closely linked to factors such as urbanization, changes in lifestyle, poor dietary habits, and a lack of physical activity, all of which contribute to the growing burden of this disease (Reed et al. 2021). Diabetes mellitus primarily disrupts the body's ability to regulate blood sugar levels, which is a critical process for maintaining overall metabolic stability (Daryabor et al. 2020). In type 1 diabetes, the immune system attacks and destroys the pancreatic cells that produce insulin, the hormone responsible for helping the body use glucose as a primary energy source. As a result, individuals with type 1 diabetes must rely on external insulin injections to regulate their blood sugar (Owens-Collins 2023). On the other hand, in type 2 diabetes, the body becomes resistant to insulin, and the pancreas is unable to produce enough insulin to overcome this resistance, leading to elevated glucose levels in the blood. Both forms of diabetes, if left untreated or poorly managed, can lead to a range of serious and potentially life-threatening complications, including cardiovascular disease, kidney failure, nerve damage, and vision problems. These complications often result from prolonged periods of elevated blood sugar levels, which cause damage to blood vessels and organs (Galicia-Garcia et al. 2020).

One of the frequently overlooked symptoms in the early stages of diabetes is unexplained or unintentional weight loss. This can occur in individuals newly diagnosed with type 1 diabetes, who may experience a sudden and noticeable reduction in body mass as a result of insulin deficiency (Morris 2021). In type 2 diabetes, although the onset of significant weight loss is less common, it can still occur in individuals with poorly controlled blood sugar. Moreover, unexplained weight loss is also commonly observed in individuals in the prediabetes stage, when the body begins to experience early signs of insulin resistance, yet the person may not yet meet the diagnostic criteria for full-blown diabetes (Galicia-Garcia et al. 2020). The mechanism behind this weight loss is rooted in the body's inability to effectively use glucose as a primary fuel source. When insulin is deficient or ineffective, the body is unable to properly absorb glucose from the bloodstream into cells, leading to elevated blood glucose levels (Nakrani et al. 2020). As a result, the body compensates by shifting to alternative metabolic processes, breaking down fat and muscle tissue to produce energy, ultimately leading to a decrease in body mass (Hargreaves and Spriet 2020).

Though many individuals may dismiss unexplained weight loss as a transient or inconsequential symptom, it can serve as a critical early warning sign of diabetes progression. In those at high risk, such as individuals with a family history of diabetes or those exhibiting early signs of insulin resistance, sudden and unexplained weight loss can be one of the first indicators of changes in glucose

metabolism that signal the potential onset of diabetes. It is important to recognize that in individuals who are already in the prediabetes stage or at high risk for type 2 diabetes, even small changes in weight can reflect significant metabolic shifts. Early recognition of these shifts is crucial because it provides an opportunity for earlier intervention, such as lifestyle changes, dietary modifications, and increased physical activity, which may delay or even prevent the progression to full diabetes (Johannes and Westcott 2023). Medical professionals can play a pivotal role in identifying these early symptoms and providing proactive care to mitigate the risk of further complications. Therefore, understanding the relationship between sudden weight loss and the onset of diabetes is essential for both patients and healthcare providers, as it can lead to earlier diagnosis and treatment, ultimately improving long-term outcomes and quality of life.

This study aims to explore the potential of sudden weight loss as an early clinical indicator of diabetes onset, particularly among individuals who are at high risk of developing the disease or who have recently been diagnosed with diabetes. By investigating the connection between unexplained weight loss and the early stages of diabetes, this research seeks to contribute valuable insights into the physiological mechanisms that drive these changes in metabolic processes. Additionally, understanding the role of weight loss in diabetes onset could help improve early detection methods, allowing for more timely and accurate diagnoses. Such knowledge could also facilitate the development of more personalized and effective prevention strategies, focusing on individuals who exhibit early signs of the disease but have not yet reached a point where traditional diagnostic criteria are met. Furthermore, this research may pave the way for the integration of weight loss as a routine part of the screening process for diabetes, ensuring that at-risk individuals are identified before the disease progresses to more severe stages. By addressing the underlying pathophysiological factors that contribute to weight loss in diabetes, this study aims to provide a foundation for further research into early intervention strategies, leading to better management and prevention of the disease. Ultimately, early detection and intervention have the potential to significantly reduce the long-term health impacts of diabetes, improve patient outcomes, and decrease the global burden of this chronic condition.

Introduction to Diabetes and its Early Indicators: Type one and type two diabetes mellitus, is a chronic metabolic disorder marked by disruptions in glucose regulation, leading to hyperglycemia. The progression of diabetes is often insidious, with many patients remaining undiagnosed until they experience severe symptoms or complications Early detection of diabetes is critical to prevent long-term health issues, making the identification of early indicators, such as sudden weight loss, a priority in diabetes research and clinical practice (Mohajan and Mohajan 2023).

Mechanisms of Sudden Weight Loss in Diabetes: Unintentional weight loss is a well-documented symptom in diabetes, especially prevalent in type 1 diabetes and cases of uncontrolled type 2 diabetes. In type 1 diabetes mellitus, the insufficiency of insulin production prevents glucose from entering cells, forcing the body to use fat and muscle as alternative energy sources (Franz 2007). This catabolic process results in noticeable weight loss as muscle protein and fat stores are broken down. In type 2 diabetes, while insulin production is initially preserved, insulin resistance can lead to a similar metabolic response when glucose cannot effectively be utilized, particularly in advanced or poorly managed cases (Ard et al. 2021).

Correlation Between Sudden Weight Loss and Diabetes Onset: Several studies highlight the correlation between unexplained weight loss and diabetes onset. According to the Diabetes Prevention Program (DPP), unintentional weight loss in high-risk individuals was often predictive of diabetes onset within a 2–5 year timeframe (Delahanty et al. 2023). In addition, weight loss in newly diagnosed diabetic patients often aligns with worsening insulin resistance or deficiency. Studies also indicate that patients experiencing significant weight loss in the early stages of diabetes frequently show increased levels of counter-regulatory hormones, such as glucagon and cortisol, which drive the body's use of stored energy, further exacerbating weight loss (Davies et al. 2022).

Sudden Weight Loss as a Biomarker for Prediabetes Progression: Prediabetes, characterized by elevated blood glucose levels that are not yet high enough to meet the criteria for diabetes, is often asymptomatic. However, emerging research suggests that sudden weight loss in prediabetic individuals may signal accelerated progression to diabetes. In a substantial cohort study conducted

by Wang et al. (2020), unexplained weight loss was associated with a 30% higher risk of transitioning from prediabetes to diabetes, especially among individuals with high baseline fasting glucose and HbA1c levels. This finding suggests that sudden weight loss could serve as a clinical marker for clinicians to closely monitor patients at risk (Ortiz-Martínez et al. 2022).

Sudden Weight Loss and Metabolic Changes in Newly Diagnosed Patients: In newly diagnosed diabetes patients, weight loss is often accompanied by shifts in metabolic markers such as increased free fatty acids, elevated HbA1c, and hyperglycemia. Research by McMurray et al. (2019) found that, during the initial phases of diabetes, weight loss is commonly linked to increased gluconeogenesis and lipolysis caused by a lack of. These metabolic shifts contribute to reduced body mass and are often noted in patients at the time of diagnosis, highlighting weight loss as a frequently overlooked yet critical symptom that warrants further investigation in high-risk individuals and newly diagnosed patients (Corsino et al. 2020).

2. METHODOLOGY

This cross-sectional study, the population refers to individuals whose data were included in the Early Stage Diabetes Risk Prediction Datasets, collected from patients at Sylhet Diabetes Hospital in Sylhet, Bangladesh. Participants were selected based on the availability of key data, including age, gender, and diabetes symptoms such as polydipsia (excessive thirst), polyuria (frequent urination), unexplained sudden weight loss, and a confirmed diabetes diagnosis. These data were gathered through self-reported questionnaires by patients and were subsequently published in the UCI Machine Learning Repository in 2019 (Elovainio et al. 2009).

This study population likely consists of individuals with varying levels of diabetes risk, including those showing early-stage diabetes symptoms. The dataset was used to analyze the correlation between unexplained sudden weight loss and diabetes diagnosis using statistical methods, specifically logistic regression analysis, conducted via SPSS software (Dhatariya et al. 2015).

3. RESULTS AND DISCUSSION

This study provides substantial evidence supporting sudden weight loss as a critical early indicator for diabetes diagnosis. The strong statistical significance, demonstrated by a p-value of 0.001, indicates a very low probability that the observed association between sudden weight loss and early diabetes onset is due to random variation. The odds ratio (OR) of 8.39 further emphasizes the increased likelihood that individuals experiencing sudden weight loss will be diagnosed with diabetes, suggesting a strong predictive relationship between these variables.

The OR value of 8.39 is particularly noteworthy, indicating that individuals who experience unexpected weight loss are over eight times more likely to be diagnosed with diabetes compared to those without such weight changes. This finding aligns with the metabolic processes that commonly characterize the onset of diabetes, particularly in cases where insulin deficiency or resistance forces the body to break down fat and muscle to meet energy demands. This catabolic state leads to rapid weight loss, an effect often seen in early stages of type 1 diabetes and in unmanaged type 2 diabetes cases (Riddell et al. 2020).

The study's findings suggest that unexplained weight loss might be an indicator of underlying metabolic changes even before other common diabetes symptoms, like excessive thirst, frequent urination, and fatigue, become evident. In patients with risk factors like a family history of diabetes or high blood glucose levels, sudden weight loss may serve as an early clinical indicator, warranting closer observation or additional diagnostic testing. This insight could help healthcare professionals prioritize intervention efforts, potentially reducing the duration in which diabetes progresses undetected (Powers 2021).

The association between sudden weight loss and the early diagnosis of diabetes is a complex yet important area of study, given its potential to improve early detection and intervention strategies. Diabetes mellitus is characterized by abnormal glucose metabolism, and when left untreated, it can lead to serious complications. However, diabetes can be asymptomatic in its initial stages, especially in type 2 diabetes, which often progresses quietly until more overt symptoms arise. Sudden, unexplained weight loss has emerged as a potentially significant indicator of diabetes onset, suggesting that careful attention to weight changes could play a pivotal role in identifying at-risk individuals earlier

than current symptom-based screenings. allow the findings of this study highlight a strong association between sudden weight loss and early diabetes diagnosis, shown by a statistically significant p-value of 0.001 and a high odds ratio of 8.39. The data indicate that individuals with unexpected weight loss are considerably more likely to receive a diabetes diagnosis compared to those who do not exhibit this symptom. This weight loss is often linked to metabolic dysregulation, where the body, unable to properly use glucose for energy due to insulin insufficiency or resistance, begins to break down fat and muscle tissue to meet its energy needs. This process is particularly pronounced in type 1 diabetes, where insulin deficiency is severe, but it can also be present in cases of advanced or poorly managed type 2 diabetes. As such, sudden weight loss could serve as a critical warning sign, especially in patients with risk factors like family history, obesity, or elevated blood sugar levels (Serbis et al. 2021).

In clinical practice, these findings suggest a need to view unexplained weight loss as a potential red flag for diabetes, particularly in prediabetic patients or those presenting with subtle symptoms. Early detection is essential, as it allows for prompt intervention, which may include lifestyle modifications, medication, or other therapeutic approaches to manage blood glucose levels and prevent further complications. By integrating weight change monitoring into routine evaluations for high-risk individuals, healthcare providers could identify at-risk patients earlier, potentially reducing the likelihood of diabetes-related complications (Kawa 2023).

Future research should seek to expand on these findings by examining the molecular mechanisms underlying this weight loss in newly diagnosed diabetic patients. Studies that include diverse populations and long-term follow-up could provide insights into how sudden weight loss correlates with specific metabolic shifts and whether these shifts could serve as biomarkers for disease progression (Wanri et al. 2018). Additionally, investigating whether certain interventions, such as dietary changes or pharmacologic treatments, could stabilize weight and mitigate diabetes risk would be valuable in developing comprehensive diabetes prevention and early intervention strategies. This area of study holds promise for refining early diagnostic practices and helping to curb the rising prevalence of diabetes worldwide (Haddad et al. 2023).

4. CONCLUSION

In conclusion, this study underscores the significance of sudden, unexplained weight loss as a strong early indicator of diabetes onset. With a statistically significant p-value of 0.001 and an odds ratio of 8.39, the findings suggest that individuals experiencing unexpected weight loss are substantially more likely to be diagnosed with diabetes compared to those who do not exhibit this symptom. This correlation supports the view that weight loss, particularly in at-risk individuals, can signal critical underlying metabolic changes associated with diabetes, often preceding more commonly recognized symptoms.

These insights highlight the importance of incorporating weight monitoring into diabetes risk assessments and underscore the potential for earlier diagnostic testing when unexplained weight loss is observed. By recognizing sudden weight loss as an important early warning sign, healthcare providers may be able to improve timely diagnosis and intervention strategies, reducing the risk of complications associated with delayed diabetes detection.

DATA AVAILABILITY

All relevant data are included in the paper and its supporting information files. This study aims to help researchers identify critical areas related to The Role of Sudden Weight Loss as an Early Indicator of Diabetes Onset in Prediabetic and Newly Diagnosed Diabetic Patients.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The authors hereby state that NO generative AI tools such as large language models (ChatGPT, COPILOT, etc.) or text-to-image generators were utilized in the creation or editing of this work.

CONSENT

As per international standards or university standards, participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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