

CORRELATION BETWEEN TYPE I DIABETES MELLITUS AND ANXIETY IN ADULTS AGED 18-65

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ABSTRACT

The objective of this study was to examine whether there is an increased prevalence of anxiety symptoms among adults with Type 1 Diabetes Mellitus regarding self-care and management. The study seeks to review the correlation among adults who are experiencing diabetes-related factors such as blood glucose levels, anticipation of medication administration, and the complications associated with hypo or hyperglycemia to increase anxiety symptoms. This cross-sectional study will include 100 voluntary participants ranging from ages 18-65 with a Type 1 Diabetes diagnosis. The study will consist of the use of a 50-question anonymous survey which will be distributed electronically and stored in a secure location. From the literature review, the results indicated that there is a close relationship between anxiety symptoms and depressive symptoms which in turn predicted suboptimal diabetes self-care and management. Additionally, glycemic control was found to be poor in individuals with high levels of diabetes-distress. Collectively, the research shows that psychological stressors are more common in patients with diabetes and affects their diabetes-related health outcomes. This research indicates that diabetes management should be tailored to include psychological assessment screenings in patients with Type 1 Diabetes and long-term management should use an integrative approach addressing the biological, psychological, and social aspects of diabetes and any comorbidities.

KEYWORDS: Type 1 diabetes, anxiety symptoms, psychology stressors, diabetic fatigue

INTRODUCTION

Type I diabetes mellitus (T1DM) or insulin-dependent diabetes mellitus (IDDM), is an autoimmune disease defined by dysfunction of the pancreas leading to little or no insulin production and therefore improper glucose regulation in the body. Anxiety is the feeling of intense worry or fear that is a normal human response but may be intensified to the point of affecting daily activities for some individuals. Several external and internal factors may influence the development of anxiety symptoms or anxiety disorders including medical illnesses (van Duinkerken, Snoek, & de Wit, 2020). The following review highlights pertinent findings surrounding previous research on the relation between type 1 diabetes and anxiety. The purpose of this study is to determine whether there is an increased prevalence of anxiety symptoms and/or anxiety disorders among adult patients with type I diabetes mellitus. This study also aims to quantify the type of anxiety individuals with type I diabetes experience, if at all, as well as determine what factors contribute to this.

Research question

Are patients with type I diabetes mellitus more prone to developing anxiety? For patients with type I diabetes that do experience anxiety, is there a correlation between symptoms and diabetes-related factors such as blood glucose levels, anticipation of medication administration/injections, or the potential complications associated with hyperglycemia or hypoglycemia?

Literature Review

Relationships between mental health and glycemic control

Good glycemic control is the cornerstone of diabetes management and a strong predictor of long-term diabetes-related outcomes. A variety of factors influence glycemic control and are thoroughly assessed in encounters with patients with diabetes. Some of these factors include age, sex, body-mass index, age at time of diabetes diagnosis, smoking history, and types of medications. Another perhaps overlooked factor that could be influencing glycemic control is mental health.

In 2021, Schmitt and colleagues used survey analysis aimed to examine whether anxiety or depression symptoms predict glycemic control and diabetes-related complications as well as whether diabetes self-management mediates these factors. The study included 205 adults with type I diabetes and measured baseline depression and anxiety symptoms, glycated

hemoglobin (HbA1c) levels, complications at the four-year follow-up, and self-care behaviors. This study concluded that depressive symptoms predicted higher HbA1c levels, suboptimal diabetes self-care at baseline and poorer glycemic outcomes at the four-year follow-up, however anxiety symptoms were not found to be independently associated with HbA1c levels or suboptimal self-care at the four-year follow-up (Schmitt et al., 2021). Another study aimed to examine the association between glycemic control and depression, anxiety, or diabetes-related distress. The study included 313 adults with newly diagnosed diabetes and assessed depression, anxiety, and diabetes-related distress in these individuals at the time of diagnosis and subsequently at one, two, three, four, and five years since diagnosis with annual surveys. The HbA1c levels were monitored, and trajectories were analyzed concluding that average HbA1c levels increased constantly over the years with a mean HbA1c at the five-year follow-up of 6.3% in patients with good control and a HbA1c ranging from 7.9-9.0% in patients with poor control. The results of this study concluded that depression and anxiety were prevalent in patients with type I diabetes, but these factors alone did not predict good or poor glycemic control trajectories (Kamplung et al., 2018). A previous study from 2008 also aimed to examine the effect of anxiety on glycemic control and suggested that proper coping and emotion management may be beneficial for good glycemic control. The study found that anxiety predicted increases in HbA1c with low levels of emotional coping predicting significant increases in HbA1c. This study also mentioned a valuable point in accounting for patients with baseline or trait anxiety, but overall concluded that task-oriented and emotion-oriented coping are important factors for emotional regulation and glycemic control (Sultan et al., 2008).

An additional study aimed to test whether impaired awareness of hypoglycemia, or low blood glucose levels, is associated with symptoms of anxiety and depression in patients with type 1 diabetes. A cross-sectional observational study using 950 adult participants with a diagnosis of type I diabetes was conducted using multiple regression models to examine the associations with adjustments for social, demographic, and clinical features. The results showed a 9.4% prevalence of anxiety, 9.8% prevalence of depression, and 22.6% prevalence of impaired hypoglycemia awareness. The results were interpreted to show that depression and anxiety were independently associated with increased likelihood of impaired awareness of hypoglycemia. Based on this relationship, there seems to be a need for routine psychological assessments and management in patients with type I diabetes and impaired hypoglycemia awareness (Pieri et al., 2022).

In examining the relationship between mental health issues and glycemic control, another important point of study is whether treatment for psychological conditions affects glycemic control. A 2017 study consisting of a systematic review and meta-analysis of randomized controlled trials examined the effectiveness of cognitive-behavioral therapy (CBT) on glycemic control and psychological outcomes in adults with diabetes mellitus. This study consisted of an evaluation of 12 randomized controlled trials that examined the effectiveness of CBT on glycemic control, diabetes-related distress, anxiety, depression, or quality of life in adults with type 1 or type 2 diabetes. The study found that CBT was effective at reducing short-term and intermediate-term glycemic control but not significantly effective for long-term glycemic control. The study also found that CBT improved short-term and intermediate-term anxiety and depression as well as long-term depression. Based on these findings, it can be concluded that CBT is beneficial for potentially improving depression in adults with diabetes, but the data is inconclusive on whether CBT has direct benefits for improved glycemic control (Uchendu & Blake, 2017).

Initiatives and Screening for comorbid diabetes and psychological disorders

There are many types of anxiety disorders generally involving persistent feelings of anxiety for prolonged periods of time. A study by Stahl-Peche and colleagues aimed to screen patients aged 14-30 with early-onset diabetes for generalized anxiety disorder (GAD) utilizing survey questionnaires. Data was collected from 713 participants and found that individuals with GAD symptoms are more likely to experience daily impairments such as poor self-assessed physical performance, difficulty sleeping, poor glycemic control, and poor diabetes treatment satisfaction (Stahl-Peche et al., 2022). An additional study aimed at analyzing the metabolic factors in youth with type I diabetes and anxiety disorders found that patients with a pre-existing anxiety disorder had higher HbA1c levels, higher rates of diabetic ketoacidosis (DKA), and higher rates of hospital admissions compared to youth without anxiety disorders. The results of this study concluded that anxiety disorders may be a predisposing factor for undesirable diabetes-related health outcomes and as such early screening for anxiety disorders should be implemented for patients with type I diabetes (Galler et al., 2021).

Further investigation into comorbidities of diabetes and psychological disorders revealed a correlation between the symptoms of the two. A study in 2019 aimed to examine the prevalence of comorbid elevated anxiety and depression symptoms in adult patients with type I and type II diabetes. The results of this study found that one in ten respondents were affected by comorbid anxiety and depression and found to have suboptimal diabetes self-

management. Interestingly, this study also demonstrated an increased risk of comorbid anxiety or depression in patients with newly diagnosed type I diabetes or a shorter duration of type I diabetes (Nefs et al., 2019). Similarly, a narrative analysis of current literature pertaining to cognitive and psychological comorbidities in type I diabetes across the lifespan with discussion of the links between the two and suggestions to guide clinical practice was published and highlighted the neuropsychological impact of type I diabetes. This study offered a broad overview of different psychological symptom manifestations in patients of different ages and proposed guidance for further questions regarding childhood coping and adjusting with type I diabetes and the possible interference of diabetes management with daily activities of adulthood (van Duinkerken, Snoek, & de Wit, 2020).

Special Considerations

While many of the above-mentioned studies document the prevalence of anxiety and depression in patients with type I diabetes, an important confounding factor of different cultures and social environments must be considered. In a 2003 study, cross-cultural differences in prevalence and symptoms of patients with type I diabetes in the United States and the United Kingdom were examined. The results of the study concluded that there are cultural and gender differences in the manifestation of anxiety and depression symptoms as well as differences in psychological understanding and diabetes management (Lloyd et al., 2003). Another study aimed to explore the prevalence of anxiety and depression symptoms in patients with type I diabetes through self-report questionnaires and found differences in results among female and male participants. The study concluded that in patients with type I diabetes, there was an increase in anxiety symptoms among females and an increase in depression among males (Shaban et al., 2006).

Additional studies exist surrounding the association between diabetes and other mental health illnesses, namely substance abuse. While many studies have demonstrated increased alcohol consumption in patients with diabetes, particularly type II, the following study aimed to assess the association between high alcohol consumption with the presence of anxiety or depression in patients with type I diabetes. This study concluded that there was a high association between alcohol use and anxiety and depression symptoms and poor glycemic control. An important note is that for many of the participants of this study, glycemic control was poor to begin with and further studies may be needed to analyze whether alcohol consumption, anxiety, and/or depression can be cited as the sources of poor glycemic control in uncontrolled diabetes (Knychala et al., 2015).

MATERIALS AND METHODS

Methods

This is a cross-sectional correlational deductive quantitative research study that will collect data through surveys. The surveys will be issued and conducted via email. This method is cost-effective and allows for an organized collection of information from a potentially large sample size. The survey will include 50 questions requiring responses via the Likert scale, verbal frequency scale, and item rating (Figure 1). Information about this study will be made available online and at local academic institutions, public hospitals, and clinics. Prospective participants can volunteer to enroll in the study and 100 subjects will be randomly selected to participate after meeting eligibility criteria. The eligibility criteria include being an adult aged 18-65 years old and having a pre-existing diagnosis of type I diabetes mellitus. Participants will be required to report their age, sex/gender, race, ethnicity, and most recent HbA1c before submitting their surveys.

Study subjects

Adults aged 18-65 years with a diagnosis of type I diabetes mellitus.

Data Collection Instruments

Electronic documentation of participants answers to the email survey questions as well as records of how participants learned about the survey.

Data Analysis

Inferential statistical techniques; regression analysis and descriptive statistics. Demographic percentages compared to known population data. Cross tabulation to filter results. Chi-squared test for association to examine the frequency relationship of the two variables. ANOVA and ANCOVA.

Survey Sample

PA 624 Masters Project Proposal: Correlation Between Type I Diabetes Mellitus and Anxiety in Adults Aged 18-65

Email *

Valid email

This form is collecting emails. [Change settings](#)

Age *

Short answer text

Figure 1: Sample Survey.

Note: The above link leads to a sample of the survey that would be administered to participants for this study.

RESULTS & DISCUSSION

Results

Results of this experiment are pending as this research experiment is in the proposal phase and surveys have not been made available yet. Institutional Review Board (IRB) form has been filed (Figure 2). However, the hypothesis is that individuals with type I diabetes are likely to experience higher levels of anxiety particularly surrounding their diabetes management.



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APPLICATION FOR EXEMPTION FROM IRB REVIEW

Please complete this form if one of the exempt research categories (see pgs. 2 - 4 of this document) applies to your study. The completed Application for Exemption may be submitted electronically to the Chair of the WCU Institutional Research Board, at IRB@westcoastuniversity.edu

Project Study Title: Correlation Between Type I Diabetes Mellitus and Anxiety in Adults Aged 18-65

Proposed Start Date for Study: January 2024

Principal Investigator: Nesreen Kailani **Full-Time:** Yes No

Organization or Department: WCU MPA Program

Phone Number: 469-999-6858 **Email Address:** nesreenkailani@gmail.com

Co-Investigator/Student Investigator(s) (list all):

Institution, Organization, or Department: **Email Address:**

Phone Number:

- Are any of your research participants prisoners? Yes **No**
(If your answer is "yes," your research is **not** eligible for an exemption from IRB review.)
- Are any of your participants children (under the age of 18)? Yes **No**
(If you answer is "yes" your research is **not** eligible for an exemption from IRB review)
- Referring to the explanations on the next page, please check the category (or categories) of exemption that describe(s) your research: 1 2 3 4 5 6 7 8
- Please provide a rationale for the category or categories you have selected. (*Note: If you selected category 2, please be sure to indicate whether the data you collect is linked to participant names or other identifying information. Will unique identification codes be created? Who has access to information linking unique identifiers to actual participants' names? Where will such information be stored?*)

My research meets criteria for exemption category 2. Data will be collected only from electronic surveys. Surveys are made via Google Forms and are available to willing participants via email. Although participants will enter their email address to access the survey, the email addresses will be accessed by the principal investigator however will not be stored or made available for viewing by others. Additionally, participants are not required to report any identifying information including names, date of birth, phone numbers, home addresses, or medical record numbers. Survey questions are related to diabetes and anxiety with participants reports personal rating of different factors related to these topics. Any disclosure of responses would not put the participants at risk of criminal civil liability or be damaging to their financial standing, employability, educational advancement, or reputation. The identity of participants cannot be easily obtained based on their survey responses.
- Please describe your research project. Include information on research participants/human subjects, recruitment, data collection procedures, and data storage.

This research project is a study on whether there is a correlation between type I diabetes mellitus and anxiety in adults aged 18-65. The experiment will be conducted through surveys sent to volunteer participants through email. Recruitment will be through local academic institutions, hospitals, and clinics willing to post a brief overview of the study with inclusion criteria and participants can follow instructions for taking the survey. Data will be collected from electronically submitted surveys through Google Forms. The results will be stored on a computer monitored and controlled by the principal investigator. Once the survey is closed, all results will be reviewed, analyzed, and published.

Figure 2: IRB Form.

Note: The above is a copy of the IRB form submitted for this study.

Results of pre-existing studies included in the above literature review

Study 1: *Symptoms of depression and anxiety in adults with type 1 diabetes: Associations with self-care behavior, glycaemia and incident complications over four years - Results from diabetes MILES-Australia.*

This study included data from 205 adult participants with type I and type II diabetes. Forty-two participants reported incident diabetes complications. Higher HbA1c was predicted by baseline depressive symptoms at follow-up. Baseline anxiety was not independently associated with HbA1c or self-care at follow-up. Incident complications were not predicted by either depressive or anxiety symptoms. Depressive symptoms were associated with baseline less optimal self-care which predicted microvascular complications (Schmitt et al., 2021).

Study 2: *Can trajectories of glycemic control be predicted by depression, anxiety, or diabetes-related distress in a prospective cohort of adults with newly diagnosed type 1 diabetes? Results of a five-year follow-up from the German multicenter diabetes cohort study (GMDC-Study).*

This study included 313 participants newly diagnosed with type I diabetes. Average HbA1c was found to increase constantly at follow-ups with average HbA1c of 6.5% at 1-year follow-up, 6.9% at 2-year follow-up, 7.1% at 3-year follow-up, 7.1% at 4-year follow-up, and 7.4% at 5-year follow-up. At the 5-year follow-up mean HbA1c was 6.3% in the good control group and ranged from 7.9% to 9.0% in the poor control group. The groups were not predictable or differentiated by depression, anxiety, or diabetes-related distress (Kamplung et al., 2018).

Study 3: *Symptoms of Anxiety and Depression Are Independently Associated with Impaired Awareness of Hypoglycemia in Type 1 Diabetes.*

This study included 950 adults with type I diabetes. The prevalence of impaired awareness of hypoglycemia, anxiety, and depression in these participants was 22.6%, 9.4%, and 9.8% respectively. Depression and anxiety were independently associated with increased chances of impaired awareness of hypoglycemia. There was a dose-response relationship between increased severity of mental disorder and increased likelihood of having impaired awareness of hypoglycemia (Pieri et al., 2022).

Study 4: *Screening for generalized anxiety disorder (GAD) and associated factors in adolescents and young adults with type 1 diabetes: Cross-sectional results of a Germany-wide population-based study.*

This study included data from 713 participants aged 14-30 with early-onset type I diabetes. The mean score of the generalized-anxiety disorder questionnaire (GAD-7) in the 713 participants was 4.32. Twelve percent of the participants screened positive for GAD. Impairment in self-assessed physical performance, difficulty falling asleep, glycemic control, and diabetes treatment satisfaction were associated with positive screening results (Stahl-Pehe et al., 2022).

DISCUSSION

The studies included in this research analyzed whether there seems to be an increased prevalence of anxiety symptoms and/or anxiety disorders among adult patients with type I diabetes mellitus. The goal of the proposal for continuing this research is to quantify the type of anxiety individuals with type I diabetes experience and determine what the contributing factors are. Additionally, this proposal seeks to analyze whether there is a correlation between anxiety symptoms and diabetes-related factors such as blood glucose levels, anticipation of medication administration/injections, or the potential complications associated with hyperglycemia or hypoglycemia. The results of the selected studies mentioned above are discussed below.

Study 1: *Symptoms of depression and anxiety in adults with type 1 diabetes: Associations with self-care behavior, glycaemia and incident complications over four years - Results from diabetes MILES-Australia.*

This study examined the association between depressive and anxiety symptoms and diabetes self-care, glycemia, and complications in adults with type 1 diabetes. Depressive symptoms were found to be associated with suboptimal self-care which in-turn predicted suboptimal glycemic control. Self-care was seen to be the most important factor and mediator of the relationship between glycemic outcomes and depressive symptoms. Anxiety symptoms were also found to be correlated with suboptimal self-care; however, these symptoms were not found to be independently associated with suboptimal glycemic control or unfavorable HbA1c levels. An important note is that depressive and anxiety symptoms were found to be very closely related and often co-occurring in many of the sample participants. The evidence of this study suggested that individuals with type 1 diabetes and comorbid depressive

symptoms are at a higher risk of having suboptimal glycemic control due to suboptimal self-care. Behavior modification holds promise to combat suboptimal diabetes self-care in young individuals with type 1 diabetes and comorbid depressive and anxiety symptoms.

Study 2: *Can trajectories of glycemic control be predicted by depression, anxiety, or diabetes-related distress in a prospective cohort of adults with newly diagnosed type 1 diabetes? Results of a five-year follow-up from the German multicenter diabetes cohort study (GMDC-Study).*

This study observed patients newly diagnosed with type 1 diabetes over the first five years after their diagnoses and aimed to predict trajectories of glycemic control based on depression, anxiety, and diabetes-distress. Glycemic control was relatively poor to start with given these patients were newly diagnosed. Among these patients, psychological impairment in the form of depressive and anxiety symptoms increased over the five-year period. However, these factors could not predict good or poor glycemic control. The evidence suggested that there was an association between poor glycemic control and increased diabetes-distress in patients with type 1 diabetes however the evidence did not suggest a predictive association. Glycemic control is not expected to improve by only focusing on targeting depression and anxiety symptoms, however an integrated approach should be considered to address the biological, psychological, and social aspects of diabetes and any comorbidities.

Study 3: *Symptoms of Anxiety and Depression Are Independently Associated With Impaired Awareness of Hypoglycemia in Type 1 Diabetes.*

This study examined the association between anxiety and depressive symptoms and impaired awareness of hypoglycemia. The evidence suggested that there was an independent association between having anxiety and depression and developing impaired hypoglycemia awareness. The evidence encourages further research to examine whether impaired hypoglycemia awareness leads to heightened anxiety given the state of having untreated hypoglycemia and the associated complications if it is not treated in a timely manner. This data also supports the need to include psychological assessments in patients with type 1 diabetes and reported impaired hypoglycemia awareness.

Study 4: *Screening for generalized anxiety disorder (GAD) and associated factors in adolescents and young adults with type 1 diabetes: Cross-sectional results of a Germany-wide population-based study.*

This study examined the use of screening for GAD in adolescents and young adults with early-onset and long-standing type 1 diabetes. Impairment in self-assessed physical performance, difficulty falling asleep, glycemic control, and diabetes treatment satisfaction was associated with positive screening results. This evidence supports the need to address the prevalence of GAD and other mental health disorders among adolescents and optimize its control as this can have long-term consequences on overall health and diabetes outcomes. Standardized screenings, especially for patients newly diagnosed with type 1 diabetes are a good starting point to know a patient's baseline mental status and monitor any changes throughout their life living with diabetes.

Overall, the data presented suggests poor glycemic control in type 1 diabetes patients who have suboptimal self-care and suboptimal self-care was found to be associated with having higher levels of anxiety and/or depression. This association was also found to be higher in patients newly diagnosed with type 1 diabetes. The management and monitoring of type 1 diabetes is multidimensional, and new diagnoses should include screening for pre-existing mental illnesses and assessing likelihood of developing anxiety based on a patient's understanding of diabetes diagnosis and treatment as well as risk factors.

LIMITATIONS

Only a select number of studies were included in this review and therefore the results may not represent all type 1 diabetes. Data was collected on a self-report basis which leaves room for potential bias. In the studies that looked at participants' HbA1c values, some only included the most recent level or the current level at the time of study and therefore could not factor in or adjust for baseline glycemic levels. Some of the studies assessing anxiety symptoms in patients with type 1 diabetes did not make the distinction between this and diabetes distress, an important phenomenon that may change some outcomes. Further research that avoids these limitations should be considered for a better understanding of the association between anxiety symptoms and type 1 diabetes.

CONCLUSION

Type 1 diabetes, like many other chronic illnesses, impacts all aspects of a patient's life including biological, psychological, and social. As a result, it is important to consider the

internal and external factors that contribute to diabetes management and long-term outcomes. A particularly important factor is mental health, specifically anxiety and whether it has an increased prevalence in patients with type 1 diabetes. The evidence collected in this research supports that psychological stressors are more common in patients with diabetes and affect diabetes-related outcomes. Further research should be considered including an evaluation of the increased comorbidity of type 1 diabetes and depression including a look at a potential biological link. Further research should also explore the presence of any causal relationships between depression and anxiety together or if they just co-occur. It is suggested that diabetes care be tailored to include psychological screening for newly diagnosed patients with type 1 diabetes and incorporate psychological treatment for patients with comorbid or pre-existing mental health disorders including anxiety and depression to help patients optimize their diabetes management and improve health outcomes.

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