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Assessing College Students' Perceived Risk for Developing Type 2 Diabetes Mellitus

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Abstract

This study assesses the effectiveness of an evidence-based educational intervention affecting the perception of the risk for developing type 2 diabetes (T2DM) in college students and examined relationships between demographic factors and perception of risk for T2DM. Seventy-seven students from the Georgia College Association of Nursing Students (GCANS) and the Personal Health and Fitness Class participated. Of these, 43 participants completed the post-educational email survey. Instruments measured demographic characteristics, perception of risk for developing diabetes, and diabetes risk. The Risk Perception Survey for Developing Diabetes (RPS-DD) assessed students' perception of risk at baseline and one week post intervention. There was a significant increase for diabetes risk knowledge scores between participants who completed the intervention (M = 6.56, SD = 1.28) and those who did not complete the intervention (M = 7.38, SD = 1.65) t (75) = -2.47, p =.016. There was a significant increase in the worry scores from baseline (M = 2.21, SD = 0.64) to one week (M = 2.44, SD = 0.62), (t [42] = -2.89, p =.006). There was a significant increase in diabetes risk knowledge scores from pre-intervention (M = 6.56, SD = 1.28) to post-intervention (M = 8.35, 1.49) (t [42] = -7.09, p <.001). There was a statistically significant relationship between educational intervention and body mass index (BMI), [F (1, 27) = 3.85, p =.034, η2 =.22] and educational intervention and college level, [F (1, 27) = 3.36, p =.033, η^2 =.027]. Increased knowledge and raised awareness of risk for developing T2DM results supports the use of the T2DM educational intervention with college students.

Keywords: college students, type 2 diabetes mellitus, risk perception

Chapter 1

Background Information

Prediabetes and type two diabetes mellitus (T2DM) are growing epidemics and global health concerns with more than 34.1 million adults in the United States suffering from this disease (Centers for Disease Control and Prevention [CDC], 2020). In addition to the number of people who already had diabetes in 2018, the CDC estimates that 88 million adults had prediabetes with only 15.3 % being aware of the diagnosis (CDC, 2020). The occurrence of T2DM in Americans under 18 years has grown astronomically in the past thirty years and accounts for at least thirty percent of new cases (CDC, 2017). While T2DM and prediabetes can be prevented, the progression from prediabetes to T2DM can be drastically reduced with health-promoting behaviors such as increased exercise, healthy eating, and weight management (CDC, 2017). Diabetes cost the United States approximately $327 billion in 2017 (CDC, 2020). Individuals diagnosed with T2DM have a higher risk of developing complications and other related illnesses such as amputation of the lower extremities, diabetic foot ulcers, heart disease, stroke, and renal disease (American Diabetes Association [ADA], 2017). Therefore, it is essential to identify and prevent diabetes progression.

Since 2001, the SEARCH for Diabetes in Youth (SEARCH) research study has shown an increasing prevalence of T2DM among ages ten to nineteen years (Dabelea et al., 2014). The reasons to raise awareness are growing with more people receiving the diagnosis of T2DM at an early age and the numbers are growing at a considerable rate (CDC, 2017). While T2DM and prediabetes can be prevented, the progression from prediabetes to T2DM can be drastically reduced with health-promoting behaviors such as increased exercise, healthy eating, and weight management (CDC, 2017).

College students are not excluded and should be targeted to increase awareness and prevention through diabetes education. During 2017–2018 the prevalence of diabetes pertaining to the percentage of US adults age 18 or older by education level who had more than a high school educational level was 7.5 % (CDC, 2020). T2DM can have a devastating outcome on public health unless crucial prevention strategies are implemented. Therefore, interventions targeting younger adults are required. This research study aims to determine if a T2DM educational intervention would increase T2DM knowledge and raise awareness about T2DM in college students. Understanding the disease risk factors is essential for the adoption of any useful intervention.

According to the Georgia Department of Public Health (2015), diabetes is the sixth leading cause of death among adults living in Georgia. An estimated 800,000 adults live with diabetes and 450,000 adults suffer from prediabetes (Georgia Department of Public Health, [GDPH], 2017). During 2013–2016, the prevalence of prediabetes was similar among people of all racial/ ethnic groups and education levels (CDC, 2020); hence, there is a need to raise awareness about T2DM.

Problem Statement

Neither Baldwin County, Georgia nor its 23 neighboring counties currently have any diabetes prevention programs (DPP). According to Navient Health Baldwin, Community Health Needs Assessment (2018), 17.5% of adults in Baldwin county have been diagnosed with T2DM and 5.7% have prediabetes. The American College Health Association National College Health Assessment II (ACHA-NCHA II) (2019) reports that 22.6% of Georgia College students are overweight, with 11.9% classified as class I or II obese, and 2.6% classified as morbidly obese. Current data, according to the CDC (2020), depicts an increasing number of American adults

diagnosed with T2DM, with risk factors based on their lifestyles such as obesity, physical inactivity, and diet. The provision of diabetes education on college campuses in central Georgia could significantly decrease the rate of prediabetes and the future development of T2DM in the college population.

Aims and Clinical Questions

The objective of this translational project was to identify adults enrolled in a central Georgia college with risk factors for prediabetes and T2DM and to provide an interventional education program on campus. The overall aim of the research is to determine whether a T2DM educational intervention would increase T2DM knowledge and raise awareness about T2DM in college students. An exhaustive review of the literature and the high incidence of diabetes in Georgia led to the development of this project. Overwhelming evidence exists indicating that raising awareness of the prevalence of prediabetes and T2DM is required.

Participation in diabetes education programs has proved to be an effective intervention technique for delaying or preventing T2DM among overweight adults. Several studies suggest a strong association between T2DM and risk factors such as increased BMI, sedentary lifestyle, obesity, smoking, and family history (Adegoke, Emma-Okon, Fasanya, Salawu, & Tomi-Olugbodi, 2017; Amuta, Barry, & McKyer, 2015; Amuta, Jacobs, Barry, Popoola, & Crosslin, 2016; Gaidhane et al., 2017; Higgs, Gisselman, Hale, & Main, 2017; Khan et al.,2017; Saffari, Karimi, Koenig, & Al-Zaben, 2015; Youngs, Gillibrand, & Phillips, 2016). Having one or more risk factors puts an individual at higher risk for T2DM. Education regarding healthy lifestyle choices can reduce the risk of T2DM.

Clinical Question 1

How does a T2DM educational intervention affect the perception of developing T2DM in college students?

Clinical Question 2

Is there a relationship between demographic factors (i.e., gender, age, BMI, ethnicity, health status, nutrition knowledge, family history of diabetes, history of high blood pressure, and physical activity) and the perception of risk for T2DM pre- and post-intervention?

Supporting Data: Summary of Expert Evidence

According to research, having risk factors for developing T2DM alone predisposes people to diabetes. When risk factors are coupled with an inactive, sedentary lifestyle, unhealthy eating habits, and obesity, people are at a higher risk of developing T2DM.

Several studies in the literature were cross-sectional reviews and suggested a strong association with risk factors such as increased BMI, a sedentary lifestyle, obesity, smoking, and family history (Adegoke et al., 2017; Amuta et al., 2015; Amuta et al., 2016; Gaidhane et al., 2017; Higgs et al., 2017; Khan et al., 2017; Kitchlew et al., 2017; Saffari et al., 2015; Youngs et al., 2016). Living a life that includes physical activity and a nutritious diet helps reduce T2DM risks.

The American Diabetes Association (ADA) (2017) proposed specific lifestyle interventions to reduce the incidence of T2DM. There is convincing evidence from the DPP studies that weight loss, healthy diet, and physical activity can delay or prevent the onset of T2DM. The DPP program emphasizes the following: maintaining a minimum of 7% weight loss, reducing caloric intake by decreasing total dietary fat, and doing 150 minutes of physical activity per week that is similar in intensity to brisk walking. Although T2DM is considered an

adult-onset disease, the SEARCH for Diabetes in Youth multicenter research study showed an increasing prevalence of T2DM among children and adolescents (Dabelea et al., 2014).

According to Amuta et al. (2015) and Amuta et al. (2016), men and women with risk factors for developing diabetes differ in perceived risk, protective behavior, and attitudes toward T2DM. The researchers discovered that female college students had a significant difference in attitudes toward eating a healthy diet compared to males. Females were more aware of the risk perceptions for developing T2DM than males, even though they led sedentary lifestyles, whereas male students were more likely to be involved in vigorous physical activity compared to females (Amuta et al., 2016). Amuta et al. (2015) found that participants based their risk perception on non-modifiable factors such as family history and undervalued the influence of behavioral risk factors such as physical activity and weight management.

Although evidence has shown that modifying health behaviors is known to reduce the incidence of diabetes, it is only one aspect of the issue. Education and awareness about healthy self-care behaviors have been shown to improve health in the prediabetic population (Feldman et al., 2017).

Many scholars have acknowledged the need for raising awareness about diabetes and healthy lifestyle habits in people with risk factors for developing diabetes: identifying people with one or more risk factors for prediabetes is the primary step in preventing T2DM (Tuso, 2014). Raising awareness of the causes of diabetes and adopting the general guidelines on healthy lifestyle behavior changes and eating habits might prevent T2DM onset.

Educational intervention has proven effective in changing college students' perceptions of developing T2DM. This research study addresses the issue of college students' perceptions of developing T2DM on a central Georgia university campus.

Theoretical Model

This project utilizes the health belief model (HBM) as a conceptual model to educate individuals at risk of developing T2DM. The HBM was developed by Kurt Lewin and a group of social psychologists to explain preventative health behavior in asymptomatic people (Rosenstock, 1974). The HBM is widely used to examine the barriers people face when participating in programs that focus on prevention of disease and promotion of a healthy lifestyle (Rosenstock, 1974).

The Health Belief Model

The HBM was selected as the most effective concrete model to encourage health promotion behavior for this project. It integrates six sequential components: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy (Rosenstock, 1979).

Perceived susceptibility refers to one's perception of risk for an illness. The evidence emphasizes the importance of health promotion behaviors in preventing T2DM among prediabetic adults. The HBM model supports that people with prediabetes might not change their behavior to decrease their weight. However, individuals might be more likely to change their behavior if they recognize the risk of developing T2DM. Awareness must be raised before motivation and self-efficacy (Rosenstock, 1979).

Studies have shown that utilizing a theoretical framework such as the HBM in an educational intervention is useful to understand the opinions and attitudes of people. Shao et al. (2018) found that an educational intervention program using HBM increased the perception of disease and lifestyle adherence in asymptomatic hyperuricemia patients. However, college students might not perceive themselves at risk for T2DM because they are young and do not

envision themselves getting T2DM in the future. The premise of the HBM is that healthy behavior is based on one's perception of the disease. The higher the perception of risk, the more likely an individual will act to decrease risk of the disease (Rosenstock, 1979).

Perceived severity refers to the opinion regarding the possibility of suffering harm from the disease. People with risk factors for T2DM must understand the severity of the disease and possible complications that might occur if T2DM develops. These complications include blindness, kidney failure, and loss of limbs. According to the model, college students with risk factors for T2DM may have an increased perceived severity for developing T2DM and may be more likely to adopt health-promoting behaviors such as weight loss, healthy diet, and exercise to prevent or delay T2DM. Providing education regarding the devastating effects of T2DM on individuals at risk for T2DM might encourage them to take a proactive role in the prevention of the disease. College students' perceptions might be different if a family member has T2DM, and if complications developed from the disease process. People who witness the devastating complications of poor T2DM management that can result in kidney failure and/or loss of a limb might be more likely to comprehend the severity of T2DM than individuals who have little or no knowledge of the disease.

Perceived benefits refer to the individual's beliefs that their actions will reduce the threat of the disease and that individuals can effectively implement changes to promote healthy lifestyles (Rosenstock, 1979). The benefits of a healthy lifestyle for college students will be to prevent or delay T2DM. Perceived barriers are the opinions that might prevent the individual from successfully implementing healthy lifestyle behaviors (Rosenstock, 1979). The perceived barriers for college students might include their perception of the financial cost of implementing

changes to their diet and physical activity routines, thus influencing their health behavior and ability to adopt a healthy lifestyle behavior.

Cue to action refers to the external factors in the individuals' environment that influence their ability to make changes (Rosenstock, 1974). College students with family members with T2DM are more likely to institute healthy lifestyle changes such as diet and exercise than someone who is not aware of the severity of T2DM. Encouragement to lead healthy lifestyles might also come from healthcare providers, family, and friends. Finally, self-efficacy refers to an individual's own belief that they can make the necessary changes to live a healthier lifestyle (Rosenstock, 1974). Shao et al. (2018) found that self-efficacy and physical activity were significantly higher in the interventional group due to the researchers offering positive feedback and encouragement. Furthermore, participation in educational intervention encourages college students to become knowledgeable about risk factors for developing T2DM. Demographic variables such as age, sex, ethnicity, and socioeconomic status also affect an individual's perception of the risk of developing T2DM and the benefit of taking action to prevent the disease. If individuals do not consider themselves at risk of T2DM, they might not understand the importance of modifying their lifestyles, especially when they are asymptomatic (Rosenstock, 1973).

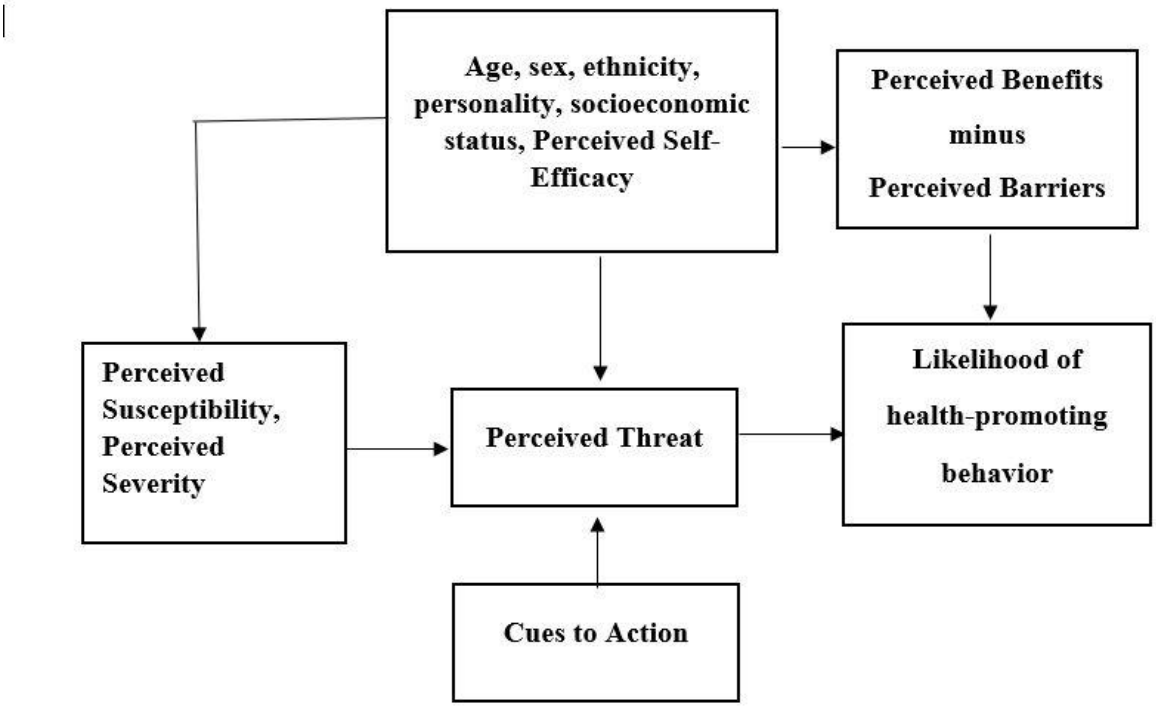


Figure 1. Model of the Health Belief Model

Definitions

Perceived risk is defined as "an individual's perceived susceptibility to a threat" (Ferrer & Klein, 2015). For this research study, perceived risk was operationalized as a proper understanding of identified factors that influence the development of T2DM, such as modifiable factors and non-modifiable factors, and the probability of developing the disease. Attitude can be defined as a "feeling or emotion toward a fact or state" (Merriam-Webster, 2019). For this research study, attitude toward T2DM was operationalized as a person's beliefs, feelings, and opinions about T2DM.

Chapter II

Literature Review

A review of the existing literature regarding risk perception for developing T2DM in college students and effective interventions was conducted using CINAHL, MEDLINE/PubMed, EBSCO, the Cochrane, and secondary references from original articles. These were selected due to their emphasis on nursing research. The searched keywords used were "prediabetes" OR "diabetes," AND "lifestyle modification," AND "diabetes education." The initial search yielded 266 studies. An additional three articles were selected as secondary references of original articles. The search yielded an initial total of 269 studies. A total of 24 duplicates were found, leaving a total of 245 studies to be reviewed initially.

Subsequently, after using keywords, selection inclusion criteria were used to narrow the search to studies published after 2013 that used diabetes education as an intervention. Only studies with adults in college were included. The initial exclusion criteria excluded studies with pregnant women, pediatric participants, and older adults. A total of 179 studies were excluded after an initial review leaving 66 studies to be screened. From these studies, an additional 55 studies were excluded due to other reasons. Furthermore, some of the studies were not exactly related to educational intervention. The final 11 studies were used to answer the research study question.

Relationship Between Risk Factors and T2DM

Several of the studies reviewed suggested that there is a relationship between specific risk factors like such as family history, obesity, and unhealthy eating habits for T2DM in college students (Adegoke Emma-Okon, Fasanya, Salawn, & Tomi-Olugbodi, 2017; Amuta et al., 2015; Amuta et al., 2016; Gaidhane et al., 2017; Higgs et al., 2017; Khan et al., 2017; Kitchlew et al.,

2017; Saffari et al., 2015; Youngs et al., 2016). Obesity and inactivity are risk factors for diabetes. Al-Shudifat et al. (2017) found that risk factors for T2DM were more common in college students who were overweight or obese and had central obesity. These findings indicate the need for T2DM preventative measures in early adulthood.

Lifestyle Intervention

The results from the studies reviewed indicated that lifestyle intervention coupled with healthy eating and weight loss could help reduce diabetes risks (Galaviz, Venkat Narayan, Lobelo, & Weber, 2015). Research from the Diabetes Education Prevention Program indicated that there is enough evidence to show that weight loss can significantly decrease the risk of developing T2DM (Galaviz et al., 2015). Strodel et al. (2019) found the prediabetes diagnosis was associated with higher perceived risk for developing diabetes in a minority Hispanic population but was not associated with preventative lifestyle change. Lifestyle modification has shown to decrease the risk of developing T2DM. Amuta et al. (2016) found that women showed a more positive attitude toward eating healthy foods compared to men. However, men were engaged in more physical activity compared to women. The findings of these studies indicate the need to spread knowledge and awareness of T2DM risk relevant to young adults.

Risk Perception

According to the literature, female college students were more aware of the risk factors for T2DM than male students; female students were more sedentary than males and male students gave more time to exercise than females (Amuta et al., 2015; Amuta et al., 2016). Piccinino, Griffey, Gallivan, Lotenberg, & Tuncer (2015) found that even though people are aware of the risk factors for developing T2DM, they are reluctant to modify their daily lives. On the contrary, other studies report that when people are aware of their risk status for developing

T2DM, they are more encouraged to make changes to improve their health (Al-Shudifat et al., 2017; Amuta et al., 2015; Higgs et al., 2017; Youngs et al., 2016). Even though these studies differ, the findings warrant attention and should be considered when planning an educational intervention for this population of college students. Mongiello, Fredenberg, and Jones (2016) found that approximately 61% of students with three or more risk factors recognized their risk for developingT2DM, while the remaining 39% of participants did not perceive their risk of T2DM. Mongiello et al. (2016) also found that immigrant students are less likely to perceive risk for developing T2DM compared to native students. Mongiello et al. (2016) also found that more than one-third of the participants were at a higher risk for developing T2DM than the participants perceived. Strodel et al. (2019) identified a significantly higher risk perception in women with prediabetes when compared to women without the diagnosis. Strodel et al. (2019) also found that 80.4% of women with prediabetes history worry about getting diabetes compared to 62.0% of women without the diagnosis.

Diabetes Educational Intervention

With the high prevalence of T2DM among ages 10–19 years (Dabelea et al., 2014), it is essential to develop an educational intervention to promote healthy lifestyle behaviors among college students. Studies have shown that 70% of college students gain weight during their freshman year (Reyes-Valazquez & Hoffman, 2011). However, education is only the first step, and people need to actively adopt a healthy lifestyle; they need to exercise and eat healthily. According to the American College Health Association (ACHA, 2018), college students have poor eating habits; they often consume a diet that lacks the recommended daily fruit and vegetable intake. ACHA's 2018 research study also revealed that only 4.2% of students ate five or more servings of fruits and vegetables daily. The results of this study indicated that 24.4% of

the sample did not do moderate-intensity cardio or aerobic exercise for at least 30 minutes a week, and 29.6% exercised only 1–2 days a week for at least 20 minutes. Moreover, 22.7% of the students indicated they were overweight, and 2.5% were morbidly obese. Due to the association between risk factors and diabetes, it was established that college students who are overweight or obese and those with prediabetes could benefit from a T2DM diabetes educational intervention.

Analysis of the Evidence

The literature review offers much insight into the development of an evidence-based educational intervention in this population of college students to increase T2DM knowledge. The authors bring enough evidence to support the implementation of a T2DM education intervention among college students. Unanimity was found in that there is a need for T2DM health education in college students to provide the opportunity to gain knowledge about lifestyle modification early in their lives. In order to improve health behavior, people need to adopt a healthy lifestyle; they need to exercise and eat healthily. Also, people need to adhere to a program that encourages healthy eating habits and regular exercise. The current study provides specific evidence for T2DM and information regarding lifestyle modification. This review lacks studies dealing with diabetes education in the college population. Adults in college are not receiving diabetes education. Moreover, most studies mentioned in this review did not examine the knowledge about one or more risk factors for diabetes in this population.

Conclusions

The information gained through the literature review indicates that an educational intervention is useful for persons with a pre-diagnosis of diabetes. Since there are no current diabetes educational offerings in place for the college population in this university setting, a program such as this might work. The evidence was able to answer the proposed research question. Therefore, a T2DM educational intervention for university students focusing on the provision of T2DM knowledge can influence self-care behaviors in adults in the university with risk factors for developing T2DM. Diabetes education in this population can influence healthcare behavior. Therefore it will be included in the translational project.

Chapter III

Methodology

The objective of this translational research study is to identify adults enrolled in a central Georgia college with risk factors for prediabetes and T2DM and provide an interventional education program on campus. The overall aim of the research study is to determine whether a T2DM educational intervention will increase T2DM knowledge and raise awareness about it in college students.

The study used a pretest/posttest design to determine the impact of a single-session educational intervention on the perceived risk of developing T2DM among college students. The pretest was administered in person by the researcher immediately before the educational intervention. Posttest was administered one week after the educational intervention via email using the university's survey system, Qualtrics.

Protection of Human Subjects

The protection of human rights was ensured by following the fundamental ethical principles of respect for persons, beneficence, and justice as set forth by the United States Department of Health and Human Services in the Belmont Report (1979). Regarding respect for persons, participants entered the research study voluntarily and with adequate information, and informed consent was obtained. All participants in the research were aged 18–35 and therefore assent was not needed. The data collected were not related to illegal activities.

Regarding beneficence, there was no foreseen physical harm envisioned and participants did not report any emotional stress during the educational intervention or post-intervention survey. The researcher did not have to offer brief counseling or referral to the University

Wellness Center or the participants' primary care provider for follow-up because no distress was reported. Contact information for the researcher was available if participants wished to discuss any concerns or emotional distress after the educational intervention.

Informed consent was obtained and explained to all participants prior to the beginning of the educational intervention (See Appendix E). The informed consent form was available in English. The researcher discussed the research study's aims, emphasizing that participation was strictly voluntary, and consent could be withdrawn at any time with no penalty. All participants were asked to sign two informed consent forms. The participant retained one copy and the researcher kept the second copy.

All participants were protected from future potentially harmful use of the data collected in this research study. The information obtained was kept confidential.

Each data collection document set was coded by number to maintain the confidentiality of participants' information. Data were encrypted and password protected on a computer for security purposes. Hard copies of surveys with participants' identifiers were stored in a locked file cabinet at a secure location in the researcher's office. Electronic post-RPS-DD survey copies were encrypted, and password protected. In three years, the information collected in this research study will be destroyed according to the institutions' records retention policy. The researcher has sole access to the participants' identifiers until they are destroyed. The researcher's name and contact information were provided for the participants in case they wished to ask any questions about the study.

Before conducting the study, approval from the college Institutional Review Board was obtained. The researcher met with Laura Childs, lecturer in the Health and Human Performance

department, and Dr. Catherine Fowler, faculty advisor for GCANS, to explain the aim and process of the research. Permission to recruit students for the research study in the Personal Health and Fitness Class was obtained from Laura Childs. Permission to conduct the research in the GCANS meeting was obtained from Dr. Catherine Fowler. Once Dr. Catherine Fowler and Laura Childs granted the researcher permission, an official date to present information to the students was fixed.

The researcher met with potential participants on the day of the scheduled diabetes educational session. During this initial meeting, the researcher explained the aim and process of the research study, and data was collected directly from the participants' self-reported documents. Participants completed the demographic questionnaire, the RPS-DD survey measuring current perceived risks and attitudes for developing T2DM, and the Diabetes Risk Test. Each data collection document set was coded by number to maintain the confidentiality of participants' information. The demographic questionnaire collected names and email addresses. The diabetes educational intervention was conducted during a scheduled GCANS meeting and included a 15-minute PowerPoint presentation developed by the researcher. The presentation highlighted the risk of developing T2DM while in college and offered general knowledge and facts about the same. The educational intervention concluded with information regarding completing the post-RPS-DD survey one week later. The post-RPS-DD surveys were emailed one week after the educational intervention. Those who did not meet the inclusion criteria were allowed to participate in the educational intervention. One week following the diabetes educational intervention, the researcher emailed the participants the post-RPS-DD survey with their coded number. The participants had five days to complete the post-RPS-DD survey. Email reminders were sent out at three different times on days one, three, and five to remind

participants to complete the survey. If a participant did not complete the post-RPS-DD survey, their data were not used in the statistical analysis. The researcher analyzed the data using Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used to analyze the demographics of the study sample.

Instruments

The data were acquired directly from the participants' three self-reported documents. Participants completed a demographic questionnaire (See Appendix A), a Risk Perception Survey for Developing Diabetes (2003), (See Appendix B), and an ADA Diabetes Risk Test (2014) (See Appendix C).

Demographics

The demographic questionnaire, a document developed by the researcher and reviewed by three content experts, was administered prior to the educational intervention. The questions included gender, age, height, weight, ethnicity, year in college, nutrition quality of diet, servings of fruit per day, health status, and nutrition knowledge. BMI was calculated based on self-reported height and weight. The demographic questionnaire data was used to describe the participants.

The Diabetes Risk Test (DRT) created by the ADA (2014) was administered prior to the educational intervention. The DRT survey identifies individuals with risk factors for developing T2DM. The survey comprises seven questions about age, sex, height, history of gestational diabetes, family history of diabetes, hypertension diagnosis, physical activity, and weight. This survey was used to categorize participants into high- and low-risk groups for developing T2DM.

The DRT calculates risk scores for undiagnosed prediabetes and diabetes. A score of five or more indicates a higher risk of developing T2DM, and a score below five indicates low risk.

Perceived Risk

The Risk Perception Survey for Developing Diabetes (RPS-DD) developed by Walker et al. (2003) was administered prior to the educational intervention and one week after the educational intervention. The 43-question RPS-DD survey assessed the participants' risk perceptions of developing diabetes. The RPS-DD consists of questions about attitudes toward health and health risks, environmental health risks, and the risk of developing diabetes. This tool includes four subscales relating to comparative disease risk, comparative environmental health risks, personal control, and optimistic bias. The first section of the RPS-DD is scored on a 4-point Likert scale from 1–4, with 1 meaning almost no risk and 4 indicating a high risk. The second section is scored on a 4-point Likert scale with 1 meaning strongly agree and 4 meaning strongly disagree. The final section includes questions regarding the participants' perceived risks for developing diabetes. This section was scored using a 4-point Likert scale with 1 meaning "increases the risk," 2 meaning "has no effect on the risk," 3 meaning "decreases the risk," and 4 meaning "the participant does not know." A higher score indicates a higher perceived risk of developing diabetes. The RPS-DD has a Cronbach's alpha coefficient of 0.50–0.84. This instrument has been used in many studies to assess multiple dimensions of personal perceptions of risk for developing diabetes in various populations (Amuta et al., 2015; Amuta et al., 2016). Permission to use the RPS-DD was obtained from Elizabeth Walker (See Appendix G, personal communication, March 23, 2019). The current study had excellent internal consistency and reliability with Cronbach's alpha coefficients of <0.80 (Walker et al., 2003).

Recruitment

Participants were recruited from a Georgia College Association of Nursing Students (GCANS) meeting and the Personal Health and Fitness Class. The researcher obtained permission from Laura Childs, lecturer in the Health and Human Performance department, and Dr. Catherine Fowler, faculty advisor for GCANS to recruit participants for the proposed research study, (see Appendix F, personal communications, October 7, 2019, and October 4, 2019). A flyer provided the advertisement for the educational intervention and contained the researcher's email address for additional information (See Appendix D). Approval to post the flyer was obtained from Christopher Newsome, Administration manager for Campus Life. The researcher posted the flyers on bulletin boards across campus after IRB approval and permission from Mr. Newsome. The inclusion criteria were as follows: college students ages 18–35 years with no prior history of diabetes and not currently pregnant. Exclusion criteria were as follows: ages less than 18 years or older than 35 years, history of diabetes, enrolled in other colleges or universities, currently working in the university but not enrolled, or currently pregnant. The data collection began on February 17, 2020.

Subject Motivation

Participants were not paid for participation in the study. Twenty participants who completed the pre-educational intervention documents and the post-education RPS-DD survey tool one week after the educational intervention had the opportunity to win a $10 Starbucks electronic gift card. The 20 winners were notified by email. The $10 Starbucks gift card were distributed to the winners using the email address provided by the participants on the demographic form.

Benefits

The participants benefited from participation in the research study by gaining knowledge about the risk of developing diabetes. There was also an essential benefit of being aware of risk factors for developing diabetes and prevention of diabetes in the future.

Consent

Informed consent was obtained and explained to all participants prior to the commencement of the educational intervention (see Appendix E). The researcher discussed the project's aims, emphasizing that participation was strictly voluntary and that participants could withdraw at any time with no penalty. All participants in the research study were adults between the ages of 18 and 35. Due to this, assent was not obtained. The informed consent form was available in English. Participants were asked to sign two informed consent forms. The participant retained one copy and the researcher kept the second copy.

Data Analysis

The results of this correlational research study determined that a T2DM educational intervention increased T2DM knowledge and raised awareness about T2DM in college students. Descriptive statistics were utilized to assess differences in perception of risk for developing T2DM at baseline (pretest) and one week following the educational intervention (posttest). The findings and analysis included descriptive demographics about the sample, ADA risk status, and participants' results from the RPS-DD survey.

Research study data were entered in SPSS version 25. Descriptive statistics were used to analyze the demographic characteristics of the sample. Mean and standard deviations were used

to calculate continuous variability and frequency and percentage statistics were used to represent the occurrence of categorical variables.

To address the first research question, paired sample *t*-test analysis was performed as a repeated measure to determine whether there was a difference in scores before and after completing the RPS-DD survey. To address the second question, mixed model Analysis of Variance (ANOVA) were conducted to analyze the relationship between demographics factors (i.e. gender, age, BMI, ethnicity, health status, nutritional knowledge, family history of diabetes, history of high blood pressure, and physical activity) and college students' perception of risk for developing T2DM. Statistical significance was determined for $p \leq 0.05$.

Curriculum Design

The T2DM educational intervention corresponded to the constructs of the HBM in which the intent to modify life-changing behavior is based on individual perception of risk for developing T2DM. The educational intervention incorporated face-to-face discussion with various groups and included a 15-minute PowerPoint presentation. The presentation highlighted the significance of developing T2DM among college students and offer general knowledge and facts. The researcher, who is a family nurse practitioner, delivered the educational intervention. The discussion was age-appropriate and appealing with visual images and animations. The focus of the education was based on risk factors for developing T2DM, different types of diabetes, glucose intolerance, symptoms of glucose intolerance, and lifestyle modifications to help prevent or delay T2DM. The educational intervention concluded with instructions for filling out the posttest RPS-DD survey and a discussion of the drawing for the Starbuck's gift cards.

Chapter IV

Results

The results of this correlational research study assessing college students' perception of risk for developing T2DM at baseline (pretest) to one week following the educational intervention (posttest) are presented. The findings include descriptive information concerning participants' demographic characteristics. Mean and standard deviations were used to calculate continuous variability and frequency and percentage statistics were used to represent the occurrence of categorical variables. Paired sample *t*-test analysis was utilized as a repeated measure to determine if there was a difference in scores from baseline and one week following completion of the RPS-DD survey. Mixed model ANOVA were conducted to analyze the relationship between demographics factors (i.e., gender, age, BMI, ethnicity, health status, nutritional knowledge, family history of diabetes, history of high blood pressure, and physical activity) and college students' perception of risk for developing T2DM. Statistical significance for the test was determined at the generally accepted level of $p \leq 0.05$.

Description of the Study Sample

A total of 77 participants volunteered for the research study. Self-reported survey responses were collected from all 77 participants prior to the educational intervention. Of these, 43 participants completed the post-educational email survey. The sample was distributed between five men (6.5%) and 72 women (93.5%). To determine if this was a reflective representative sample of the university population, an analysis was conducted to determine whether university data from the 2019 American College Health II National College Health Assessment (ACHA-NCHA). These demographics were similar to those reported by the ACHA-NCHA assessment conducted at the university in 2019 (Caucasian: 87.0%, women: 77.9%,

age:18–25 years: 95.1 %). The age of the study population ranged from 18–25 years. Most participants were Caucasian (*n* = 72, 93.5%), college juniors (*n* = 38, 49.4%) with a BMI of 18–24.9 (*n* = 62, 80.5%). Most of the sample had no history of hypertension, gestational diabetes, or a family history of diabetes. Most of the sample participated in physical activity (*n* = 68, 88.3%), had a good health status (*n* = 39, 50.6%), fair nutrition quality (*n* = 32, 41.6%), good nutrition knowledge (*n* = 31, 40.3%), and consumed one-two servings of fruit daily (*n* = 65, 84.4%). Frequencies and percentages for the demographic characteristics are presented in Table 1.

Table 1

Frequencies and Percentages of the Demographics

Variable	*n*	*%*
Gender		
Male	5	6.5
Female	72	93.5
Age		
18-25 years	77	100.0
Ethnicity		
Caucasian/White	72	93.5
Black/African American	1	1.3
Latino/Hispanic	3	3.9
Other	1	1.3
BMI (kg/m²)		
18-24.9	62	80.5
25.0-29.9	8	10.4
30.0-39.9	7	9.1
College Level		
First-year	2	2.6
Sophomore	12	15.6
Junior	38	49.4
Senior	25	32.5
HX-HTN		
No	75	97.4
Yes	2	2.6

HX- Gestational DM		
No	77	100.0
Family HXDM		
No	62	80.5
Yes	15	19.5
Physical activity		
Yes	68	88.3
No	9	11.7
Health Status		
Poor	2	2.6
Fair	24	31.2
Good	39	50.6
Very good	12	15.6
Nutrition quality of diet		
Poor	15	19.5
Fair	32	41.6
Good	25	32.5
Very good	5	6.5
Nutrition knowledge		
Poor	5	6.5
Fair	28	36.4
Good	31	40.3
Very good	13	16.9
Serving fruit daily		
None	3	3.9
1-2 servings	65	84.4
3-4 servings	7	9.1
5 or more servings	1	1.3

Descriptive statistics were used to examine trends in the RPS-DD survey subscales. A sample of 77 participants who completed the questionnaire during the pretest, and 43 participants completed the questionnaire during the posttest. Of these 77 participants, only 43 completed the post-intervention questionnaire. Table 2 presents the findings of the RPS-DD survey subscales.

Table 2.

Descriptive Statistics for RPS-DD Survey

Variable	*Min*	*Max*	*M*	*SD*
Personal control				
Pretest	2.25	4.00	3.36	0.39
Posttest	2.50	4.00	3.27	0.40
Worry				
Pretest	1.00	4.00	2.18	0.67
Posttest	1.00	4.00	2.44	0.62
Optimistic bias				
Pretest	1.50	4.00	2.66	0.61
Posttest	1.00	4.00	2.60	0.59
Personal disease risk				
Pretest	1.00	2.80	1.56	0.45
Posttest	1.07	2.73	1.57	0.44
Comparative environmental risk				
Pretest	1.00	3.33	1.82	0.61
Posttest	1.00	3.11	1.82	0.56
Composite Risk				
Pretest	1.38	2.88	1.85	0.35
Posttest	1.44	2.75	1.86	0.32
Diabetes Knowledge				
Pretest	4.00	10.00	6.92	1.50
Posttest	5.00	11.00	8.35	1.49

*Pretest (n=77) Posttest (n=43)

A series of independent sample *t*-tests were conducted to examine differences in pretest RPS-DD scores between the participants who completed the educational intervention and participants who did not complete the educational intervention. The findings were statistically significant for diabetes risk knowledge scores, t (75) = -2.47, p =.016. Participants who completed the intervention (M = 6.56) had lower diabetes knowledge scores compared to participants who did not complete the intervention (M = 7.38). This indicates that participants who attended the educational intervention but did not complete the post-education RPS-DD survey had more diabetes risk knowledge than those who completed the post-education survey.

No other significant differences were found in the analysis. The findings of the independent sample *t*-tests are presented in Table 3.

Table 3.

Independent Sample t-tests for RPS-DD Pretest Scores Between Sample That Completed Intervention vs. Sample That Did Not Complete Intervention

Variable	Completed intervention		Did not complete Intervention		*t*(75)	*P*
	M	*SD*	M	SD		
Personal control	3.33	0.39	3.39	0.39	-0.80	.428
Worry	2.21	0.64	2.13	0.71	0.50	.619
Optimistic bias	2.66	0.61	2.66	0.61	0.01	.994
Personal disease risk	1.56	0.43	1.56	0.48	-0.06	.950
Comparative environmental risk	1.85	0.67	1.78	0.54	0.46	.646
Composite risk	1.87	0.36	1.84	0.33	0.33	.744
Diabetes knowledge	6.56	1.28	7.38	1.65	-2.47	.016

*Sample that completed intervention (n=43) Sample that did not completed intervention (n=34)

Clinical Question 1

How does a T2DM educational intervention affect the perception of developing T2DM in college students from baseline to one week post-educational intervention?

To address clinical question one, a series of paired sample *t*-tests were conducted to assess differences in perceptions of developing T2DM before and after the T2DM educational intervention, as measured by the RPS-DD survey. A paired sample *t*-test is appropriate when assessing differences in a continuous level variable between two points in time (Pallant, 2013).

Prior to the analysis, the assumption of normality was tested for each subscale in the RPS-DD survey through the use of Kolmogorov-Smirnov tests. When using a Kolmogorov-Smirnov test, significance ($p < .05$) indicates that the test data significantly differs from a normal distribution. The difference in scores (posttest minus pretest) was utilized to verify the

assumption. The assumption of normality was not supported for the following RPS-DD subscale personal control (p <.001), worry (p <.001), optimistic bias (p <.001), and personal disease risk (p =.004). The assumption of normality was met for comparative environmental risk (p =.139), composite risk (p =.171), and diabetes risk knowledge (p =.059). Stevens (2009) suggests that violations of normality are not problematic when the sample exceeds 30 cases. Table 3 presents the results of the paired sample *t*-tests.

Findings of the paired sample *t*-test were statistically significant for the RPS-DD subscale worry scores from baseline to one week post the educational intervention (t [42] = -2.89, p =.006). Worry scores increased by 0.23 between pretest (M = 2.21) and posttest (M = 2.44), indicating that participants' worry about getting diabetes increased from baseline to one week. Findings of the paired sample *t*-test were also statistically significant for the diabetes risk knowledge scores from baseline to one week post the educational intervention (t[42] = -7.09, p <.001). Diabetes risk knowledge scores increased by 1.79 between pretest (M = 6.56) and posttest (M = 8.35), indicating there was an increase in diabetes risk knowledge from baseline to one week.

Findings from the paired sample *t*-test were not statistically significant from baseline to one week post the educational intervention for personal control (t[42] = 0.66, p =.515), optimistic bias (t[42] = 0.55, p =.585), personal disease risk, (t[42] = -0.13, p =.901), comparative environmental risk (t[42] = 0.28, p =.784), and composite risk (t[42] = 0.01, p =.990). These findings indicate that participants did not perceive any change in their risk for developing diabetes before and after the educational intervention. Table 4 presents the findings of the paired sample *t*-tests.

Table 4

Paired Sample t-tests for RPS-DD Survey Scales Pretest and Posttest Educational Intervention

Variable	Pretest		Posttest			
	M	*SD*	*M*	*SD*	*t*(42)	*P*
Personal control	3.33	0.39	3.27	0.40	0.66	.515
Worry	2.21	0.64	2.44	0.62	-2.89	.006
Optimistic bias	2.66	0.61	2.60	0.59	0.55	.585
Personal disease risk	1.56	0.43	1.57	0.44	-0.13	.901
Comparative environmental risk	1.85	0.67	1.82	0.56	0.28	.784
Composite risk	1.87	0.36	1.86	0.32	0.01	.990
Diabetes knowledge	6.56	1.28	8.35	1.49	-7.09	<.001

*Pretest (n=43) Posttest (n=43)

Clinical Question 2

Is there a relationship between demographic factors (i.e., gender, age, BMI, ethnicity, health status, nutrition knowledge, family history of diabetes, history of high blood pressure, and physical activity) and perception of risk for T2DM pre- and post-intervention?

To address this clinical question, two mixed model ANOVAs were conducted. One mixed model ANOVA was conducted to analyze the differences in pretest/posttest composite risk scores by gender, ethnicity, college level, family history of diabetes, physical activity, BMI, health status, and nutrition knowledge. A second mixed model ANOVA was conducted to analyze the differences in pretest/posttest diabetes risk knowledge scores by gender, ethnicity, college level, family history of diabetes, physical activity, BMI, health status, and nutrition knowledge. A mixed model ANOVA is appropriate when testing for differences in a continuous level variable over time and between groups (Tabachnick & Fidell, 2013).

Composite Risk Scores

Results of the ANOVAs conducted between variables were not statistically significant, indicating that no significant relationship was found between composite risk scores by any of the

demographic factors alone. There was a statistically significant relationship between the interaction variable, college level, [$F(1, 27) = 3.36$, $p = .033$, $\eta^2 = .027$], indicating there were significant differences in composite risk scores when the educational intervention and college level were combined. In this sample, participants who were at a certain level in college had increased knowledge about diabetes after the educational intervention. There were no other significant relationships found between the educational intervention and other demographics. Results of the mixed model ANOVA are presented in Table 5. Means and standard deviations for composite risk scores are presented in Table 6.

Table 5

Mixed Model ANOVA for Composite Risk Scores by Demographic Factors and Interaction with Educational Intervention

Source	*F*	Num *df*	*p*	η^2
Gender	0.68	1	.417	0.03
Ethnicity	0.28	1	.598	0.01
College level	0.79	3	.512	0.08
Family diagnosis	0.32	1	.574	0.12
Physical activity	0.11	1	.745	0.00
BMI	0.56	2	.581	0.04
Health status	2.13	3	.120	0.19
Nutrition knowledge	0.19	3	.903	0.02
Gender	0.19	1	.664	0.01
Ethnicity	0.61	1	.440	0.02
College level	3.36	3	.033	0.27
Family history	0.08	1	.781	0.00
Physical activity	0.00	1	.965	0.00
BMI	0.31	2	.734	0.02

Health status	2.17	3	.115	0.19
Nutrition knowledge	0.74	3	.538	0.08

Educational intervention (n=27)

Table 6

Means and Standard Deviations for Composite Risk Scores by Demographic Factors

Continuous Variables	Pretest			Posttest		
	n	*M*	*SD*	*n*	*M*	*SD*
Gender						
Male	5	1.88	0.45	5	1.91	0.32
Female	38	1.86	0.36	38	1.86	0.32
Ethnicity						
Caucasian/White	41	1.86	0.37	41	1.88	0.32
Latino/Hispanic	2	1.95	0.33	2	1.56	0.13
College level						
First-year	1	2.38	-	1	1.81	-
Sophomore	7	2.15	0.37	7	1.81	0.21
Junior	19	1.75	0.37	19	1.86	0.32
Senior	16	1.84	0.28	16	1.90	0.37
Family history						
Yes	10	1.98	0.40	10	1.84	0.23
No	33	1.83	0.35	33	1.87	0.34
Physical activity						
Yes	36	1.89	0.39	36	1.87	0.30
No	7	1.72	0.12	7	1.83	0.42
BMI						
18-24.9	34	1.83	0.35	34	1.85	0.33
25.0-29.9	3	1.97	0.22	3	2.01	0.36
30.0-39.9	6	2.04	0.50	6	1.88	0.21
Health status						
Poor	2	2.53	0.22	2	1.91	0.31
Fair	13	1.90	0.40	13	1.82	0.34
Good	24	1.75	0.28	24	1.85	0.31
Very good	4	2.13	0.31	4	2.07	0.33
Nutrition knowledge						
Poor	4	1.70	0.34	4	1.94	0.36
Fair	17	1.90	0.44	17	1.77	0.32
Good	16	1.83	0.32	16	1.94	0.26
Very good	6	1.99	0.22	6	1.88	0.40

Diabetes Risk Knowledge

Results of the ANOVAs conducted between variables were not statistically significant, indicating there were no significant differences in diabetes risk knowledge scores by any of the demographic factors alone. There was a statistically significant relationship between the interaction variable, BMI, [$F(1, 27) = 3.85$, $p = .034$, $\eta^2 = .22$], indicating that there were significant differences in diabetes risk knowledge scores due to the combination of the educational intervention and BMI. None of the other interaction terms between the educational intervention and demographics were statistically significant. Results of the mixed model ANOVA are presented in Table 7. Means and standard deviations for diabetes risk knowledge scores are presented in Table 8.

Table 7

Mixed Model ANOVA for Diabetes Risk Knowledge Scores by Demographic Factors and Interaction with Educational Intervention

Source	*F*	Num *df*	*p*	η^2
Gender	0.16	1	.696	0.01
Ethnicity	0.81	1	.376	0.03
College level	0.39	3	.763	0.04
Family diagnosis	1.52	1	.229	0.05
Physical activity	1.02	1	.322	0.04
BMI	1.43	2	.258	0.10
Health status	0.66	3	.582	0.07
Nutrition knowledge	0.59	3	.625	0.06
Gender	2.43	1	.131	0.08
Ethnicity	0.26	1	.614	0.01
College level	2.26	3	.104	0.20

Family history	3.45	1	.074	0.11
Physical activity	0.57	1	.459	0.02
BMI	3.85	2	.034	0.22
Health status	2.07	3	.128	0.19
Nutrition knowledge	1.17	3	.340	0.12

Educational intervention (n=27)

Table 8

Means and Standard Deviations for Diabetes Risk Knowledge Scores by Demographic Factors

Continuous Variables	Pretest			Posttest		
	n	*M*	*SD*	*n*	*M*	*SD*
Gender						
Male	5	7.40	0.89	5	8.40	1.52
Female	38	6.45	1.29	38	8.34	1.51
Ethnicity						
Caucasian/White	41	6.61	1.28	41	8.39	1.48
Latino/Hispanic	2	5.50	0.71	2	7.50	2.12
College level						
First-year	1	7.00	-	1	10.00	-
Sophomore	7	6.14	1.07	7	8.86	1.35
Junior	19	6.32	1.16	19	8.00	1.56
Senior	16	7.00	1.46	16	8.44	1.46
Family history						
Yes	10	6.61	1.32	10	8.42	1.52
No	33	6.40	1.17	33	8.10	1.45
Physical activity						
Yes	36	6.58	1.30	36	8.53	1.38
No	7	6.43	1.27	7	7.43	1.81
BMI						
18-24.9	34	6.44	1.31	34	8.38	1.41
25.0-29.9	3	7.00	1.00	3	7.33	1.53
30.0-39.9	6	7.00	1.26	6	8.67	1.97
Health status						
Poor	2	6.00	1.41	2	9.00	0.00
Fair	13	6.15	0.99	13	8.23	1.88
Good	24	6.63	1.41	24	8.21	1.41
Very good	4	7.75	0.50	4	9.25	0.50
Nutrition knowledge						
Poor	4	6.25	0.50	4	7.75	0.96

Fair	17	6.29	1.31	17	8.47	1.46
Good	16	6.56	1.31	16	8.13	1.63
Very good	6	7.50	1.22	6	9.00	1.55

Summary

The overall aim of the research was to determine whether a T2DM educational intervention would increase T2DM knowledge and raise awareness about it in college students. In this chapter, the findings of the data collection and analysis have been presented. Frequencies and percentages were utilized to examine the trends of the demographics. Descriptive statistics were utilized to assess the trends in the continuous level variables. Regarding the first clinical question, findings of the paired *t*-test were statistically significant for worry and diabetes knowledge scores before and after the educational intervention. Both scores increased after the intervention. Regarding the second clinical question, there were significant differences in composite risk scores due to the combination of the educational intervention and college level. Moreover, there were significant differences in diabetes risk knowledge scores due to the combination of the educational intervention and BMI. In the next chapter, the findings will continue to be explored in connection with the literature.

Chapter V

Discussion

The objective of this translational research project was to identify adults enrolled in a central Georgia college with risk factors for prediabetes and T2DM and to provide an interventional education program on campus. The overall aim of the research study was to determine whether a T2DM educational intervention would increase T2DM knowledge and raise awareness about it in college students. To determine whether this study sample represented the university's population, the study demographics were compared to the university's demographics where the study was completed. The study outcome was also compared to previous research studies. This chapter will discuss research study limitations, strengths, and implications for future practice in connection with the literature.

Most participants in this study were Caucasian (n = 72, 93.5%), college juniors (n = 38, 49.4%) with a BMI of 18–24.9 (n = 62, 80.5%). These demographics were similar to those reported by the American College Health II National College Health Assessment conducted at the university in 2019 (Caucasian:87.0%, female:77.9%, aged 18–25 years:95.1%). The gender of the demographic of this study represents the university's demographics, which consists of 77.9% females and 19.8% males. Therefore, the current study findings represent the demographics of the university where the study was conducted. The sample was distributed between five men (6.5%) and 72 women (93.5%) with ages ranging from 18–25 years. A majority of the sample participated in physical activity (n = 68, 88.3%), had a good health status (n = 39, 50.6%), fair nutrition quality (n = 32, 41.6%), good nutrition knowledge (n = 31, 40.3%), and consumed one to two servings of fruit daily (n = 65, 84.4%). The results indicate that participants did not meet the recommendation of at least five servings of fruits and vegetables each day.

Clinical Question 1: Risk Perception

The RPS-DD (Walker et al., 2003) was used in the current study to assess college students' perceptions regarding T2DM risk. Total score ranges from 43 to 172, with higher total scores indicating a higher perception of risk for developing T2DM. Walker et al. (2003) found that participants in the higher risk category showed more significant worry concerning T2DM and greater perceived risk regarding multiple diseases compared to lower-risk participants. The RPS-DD survey was used in the study of Mongiello et al. (2016) to evaluate the difference in college students' perceptions of T2DM risk. Mongiello et al. (2016) found that students with a higher risk for T2DM did not perceive their risk for T2DM, despite having three or more risk factors. The current study found the opposite to be true; results from the paired sample *t*-test were statistically significant for worry. Worry scores increased by 0.23 between pretest (M = 2.21) and posttest (M = 2.44), p =.006, indicating that participants in this study worry about developing T2DM. Strodel et al. (2019) found that women diagnosed with prediabetes had a significantly higher score for worry compared to women without the diagnosis. The results from the current study confirm that knowledge of risk factors for developing T2DM might affect risk perception and increase awareness of T2DM. Studies examining personal risk perception for developing T2DM among college students, physicians, adults with diabetes, and women with history of gestational diabetes have been published (Walker et al., 2003; Walker et al., 2016; Sealy-Potts & Reyes-Velazquez, 2014). However, to the researcher's knowledge, no studies have been published to date to evaluate whether a T2DM educational intervention will increase T2DM knowledge in college students.

Previous research suggests that participants who scored higher for knowledge about risk factors for developing diabetes (Pinelli, Berlie, Slaughter & Jaber, 2009) were more aware of

T2DM risks. The current study findings were also statistically significant for diabetes risk knowledge scores from baseline to one week. Diabetes risk knowledge scores increased by 1.79 between the pretest (M = 6.56) and posttest (M = 8.35), indicating there was an increase in diabetes risk knowledge. In another study, Mongiello et al (2015) found an increase in risk knowledge among college participants about the factors that can lead to developing T2DM, such as inactivity and obesity. College students with significantly lower diabetes knowledge scores lacked sufficient information about T2DM risk factors. The current study will contribute to the literature, which indicates that educational intervention is necessary to increase knowledge about T2DM in college students.

Clinical Question 2: Knowledge About T2DM Risk and Education Demographics

The current findings suggest that there were significant differences in RPS-DD composite risk scores when the educational intervention and college level were combined. Participants who were juniors and seniors in college had increased T2DM risk knowledge from baseline to one week following the educational intervention. Although no study has been published to evaluate whether a T2DM educational intervention will increase T2DM knowledge among college students, people with more education tend to have increased awareness about health risks and might be more receptive to educational intervention (Zimmerman & Woolf, 2014). According to the CDC (2020), adults diagnosed with T2DM with less than high school education level (13%) varied significantly versus those with high school education (9.7%) and those with more than high school education (7.5%). The HBM premise implies that people who had higher risk knowledge tend to be more willing to take action to decrease the risk of the disease (Rosenstock, 1979).

Knowledge about T2DM Risk and BMI Demographic

Additionally, the current study found significant differences in diabetes risk knowledge scores when educational intervention and BMI were combined. Participants who had BMIs of 18.0–24.9 and 25.0–29.9 had increased T2DM risk knowledge from baseline to one week following the educational intervention. Amuta et al. (2015) found that students with higher BMIs had increased perceived risk for developing T2DM over their lifetime. These study findings indicated an association between perception for developing T2DM and BMI. Therefore, there is a need to increase knowledge and raise awareness for T2DM preventative measures in college. Although enough evidence indicates that the onset of T2DM occurs at an earlier age, more work needs to be done to raise awareness and knowledge about risk factors for developing T2DM on the college campus.

Findings

The majority of participants (84.4%) did not meet the daily recommendation of consuming at least five servings of fruits and vegetables. The Amuta et al. (2016) study found a significant difference in attitude between genders toward eating healthy foods such as fruit and vegetables; women were perceived to eat healthier than men. These findings are relevant to highlight the need for T2DM education among college students. Current data, according to the CDC (2020), depicts an increasing number of American adults diagnosed with T2DM with risk factors based on their lifestyles such as obesity, physical inactivity, and diet. It is important to note that nutrition knowledge scores increased between pretest (M = 1.83) and posttest (M = 1.94), indicating an increase in nutrition knowledge from baseline to one week. The reality is significantly different. T2DM onset is occurring at a younger age. College students today have little nutrition knowledge and consume diets high in total calories and saturated fats and

significantly less than the recommended amount of fruits and vegetables. They also do not engage in adequate physical activity.

Strengths and Limitations

The overall aim of the research study was to determine whether a T2DM educational intervention would increase T2DM knowledge and raise awareness about T2DM in college students. Multiple studies have been published to examine college student's risk perception for developing T2DM among their peers, physicians, adults with diabetes, and women with histories of gestational diabetes (Walker et al., 2003; Walker et al., 2016; Sealy-Potts, & Reyes-Velazquez, 2014). However as far as the author knows, no study has been published to evaluate whether a T2DM educational intervention will increase T2DM knowledge in college students. This research study examined a unique population of college students, filling a knowledge gap related to raising awareness of T2DM through educational intervention in college students. Another unique strength of this study was the instrument used to measure constraints of interest as valid and reliable. This study was limited since it was a convenience sample from one university. However, the sample closely matched the university's demographics. A second limitation of the study was that the data was self-reported for height, weight, physical activity, health status, nutrition quality, knowledge, and daily servings of fruit any of which could have skewed the outcome of the research study.

Implication for Practice

This study fills a knowledge gap in educational intervention and T2DM research among college students. The results of this study indicated that T2DM educational intervention could increase T2DM knowledge and raise awareness about T2DM in college students. Therefore, efforts must be made to increase knowledge and awareness of T2DM risk among college students. Another implication is that colleges might consider developing and implementing general nutrition courses as a as a measure to improve awareness and increase risk knowledge about T2DM. It is advisable that colleges incorporate elective courses that focus on educating college students about T2DM risk factors and lifestyle modification to help prevent T2DM. According to ACHA (2018), college students have poor eating habits and consume diets below the recommended daily fruit and vegetable consumption. Moreover, policymakers are encouraged to pass laws requiring colleges to implement stricter guidelines and policies regarding meal planning. Consequently, colleges are encouraged to develop and implement stricter guidelines that target diabetes prevention with a focus on interventions to help college students have appropriate food choices and selection.

Conclusion

In conclusion, the current study found that a single-session T2DM educational intervention was beneficial in increasing T2DM knowledge and increasing awareness about T2DM in college students. The study found that participants worry about developing T2DM; participants who were juniors and seniors in college and those with BMIs 18.0–24.9 and 25.0–29.9 had increased knowledge about T2DM risk after the educational intervention. Future research should aim to determine factors that affect perception of T2DM risks in college students and provide educational interventions that would increase knowledge and raise awareness about

T2DM. Achievement of such an outcome calls for health professionals and policy makers to implement policies to promote educational interventions to raise awareness of T2DM and promote healthy lifestyle in colleges.

Appendix A

Demographic Questionnaire

For the following items, please fill in the blank that best describes you.

Name: _____ #_____

Email:

Gender: Male:_____ Female: _____ Other:_____

Age: 18-25 years_____

Age: 26-35 years_____

Height: _____ft. _____ in.

Weight: _____lbs.

Year in college:

First-year _____Sophomore _____Junior _____Senior _____

Ethnicity:

Black/African American (non-Hispanic) _____ Caucasian/White _____

Latino/Hispanic _____ Other: _____

On average, how many servings of fruits do you eat each day?

None: _____ 1-2: _____ 3-4: _____ 5 or more: _____

Health Status:

Excellent: _____ Very good: _____ Good: _____ Fair: _____ Poor: _____

Nutrition Quality of Diet:

Excellent: _____ Very good: _____ Good: _____ Fair: _____ Poor: _____

Nutrition Knowledge:

Excellent: _____ Very good: _____ Good: _____ Fair: _____ Poor: _____

Appendix B

RPS-DD

ATTITUDES ABOUT HEALTH

This survey will provide important information about how people feel about the risk of getting a chronic disease, like diabetes. There are no right or wrong answers. We are interested in *your* opinions and attitudes. Please answer each question as best as you can.

General Attitudes

For each item, please circle the number below the response that BEST DESCRIBES YOUR OPINION.

	Strongly Agree	**Agree**	**Disagree**	**Strongly disagree**
1. I feel that I have little control over risks to my health.	1	2	3	4
2. If I am going to get diabetes, there is not much I can do about it.	1	2	3	4
3. I think that my personal efforts will help control my risks of getting diabetes.	1	2	3	4
4. People who make a good effort to control the risks of getting diabetes are much less likely to get diabetes.	1	2	3	4
5. I worry about getting diabetes.	1	2	3	4
6. Compared to other people of my same age and sex (gender), I am *less* likely than they are to get diabetes.	1	2	3	4
7. Compared to other people of my same age and sex (gender), I am *less* likely than they are to get a serious disease.	1	2	3	4
8. Worrying about getting diabetes is very upsetting.	1	2	3	4

Your Attitudes about Health Risks

Below is a list of health problems and diseases. For each one, please circle the number below the words to tell us if you think **your own personal health** is at "almost no risk," "slight risk," "moderate risk" or "high risk" from these problems.

If you, or a family member, already have the disease (or had the disease in the past), please *also* check (√) the appropriate line on the right. ⇓

	Almost No Risk	Slight Risk	Moderate Risk	High Risk	Have(or had) this disease: *myself*	*family member*
9. Arthritis	1	2	3	4	_____	_____
10. Heart Disease	1	2	3	4	_____	_____
11. Cancer	1	2	3	4	_____	_____
12. High blood pressure	1	2	3	4	_____	_____
13. Hearing loss	1	2	3	4	_____	_____
14. Asthma	1	2	3	4	_____	_____
15. Diabetes	1	2	3	4	_____	_____
16. Osteoporosis (bone disease)	1	2	3	4	_____	_____
17. Stroke	1	2	3	4	_____	_____
18. Blindness	1	2	3	4	_____	_____
19. Foot amputation	1	2	3	4	_____	_____
20. Infections needing treatment by a doctor	1	2	3	4	_____	_____
21. Impotence (only in men)	1	2	3	4	_____	_____
22. Kidney failure	1	2	3	4	_____	_____
23. AIDS	1	2	3	4	_____	_____

Environmental Health Risks

Below is a list of possible hazards or dangerous conditions in the environment around most of us.

For each one, please circle the number below the words to tell us if your **own personal health** is at "almost no risk," "slight risk," "moderate risk" or "high risk" from each of the following hazards or conditions.

	Almost No Risk	**Slight Risk**	**Moderate Risk**	**High Risk**
24. Medical X-rays (radiation)	1	2	3	4
25. Violent crime	1	2	3	4
26. Extreme weather (hot or cold)	1	2	3	4
27. Driving/riding in an automobile	1	2	3	4
28. "Street" drugs (illegal drugs)	1	2	3	4
29. Air pollution	1	2	3	4
30. Pesticides	1	2	3	4
31. Household chemicals	1	2	3	4
32. Cigarette smoke from people smoking around you	1	2	3	4

Risks of Getting Diabetes for People in the General Public

We would like you to **think about people in the general public** and NOT about your own personal risk of getting diabetes.

Circle the number below the words that best describe your opinion about whether each item listed below *increases (or raises) the risk* of someone getting diabetes, *has no effect on the risk*, or *decreases (or lowers) the risk* of someone getting diabetes.

	Increases the risk	**Has NO effect on risk**	**Decreases the risk**	**Don't Know**
33. Being Asian American	1	2	3	0
34. Being Caucasian (White)	1	2	3	0
35. Eating a healthy diet	1	2	3	0
36. Being Black or African-American	1	2	3	0
37. Being Hispanic	1	2	3	0
38. Having had diabetes during pregnancy	1	2	3	0
39. Having a blood relative with diabetes	1	2	3	0
40. Being 65 years of age or older	1	2	3	0
41. Exercising regularly	1	2	3	0
42. Being American Indian	1	2	3	0
43. Controlling weight gain	1	2	3	0

Thanks!

Appendix C

Are you at risk for type 2 diabetes?

ALERT!DAY
TYPE 2 DIABETES AWARENESS

WRITE YOUR SCORE IN THE BOX.

1. **How old are you?** .....
   Less than 40 years (0 points)
   40–49 years (1 point)
   50–59 years (2 points)
   60 years or older (3 points)

2. **Are you a man or a woman?** .....
   Man (1 point) Woman (0 points)

3. **If you are a woman, have you ever been diagnosed with gestational diabetes?** .....
   Yes (1 point) No (0 points)

4. **Do you have a mother, father, sister or brother with diabetes?** .....
   Yes (1 point) No (0 points)

5. **Have you ever been diagnosed with high blood pressure?** .....
   Yes (1 point) No (0 points)

6. **Are you physically active?** .....
   Yes (0 points) No (1 point)

7. **What is your weight category?** .....
   See chart at right.

Height	Weight (lbs.)		
4′ 10″	119–142	143–190	191+
4′ 11″	124–147	148–197	198+
5′ 0″	128–152	153–203	204+
5′ 1″	132–157	158–210	211+
5′ 2″	136–163	164–217	218+
5′ 3″	141–168	169–224	225+
5′ 4″	145–173	174–231	232+
5′ 5″	150–179	180–239	240+
5′ 6″	155–185	186–246	247+
5′ 7″	159–190	191–254	255+
5′ 8″	164–196	197–261	262+
5′ 9″	169–202	203–269	270+
5′ 10″	174–208	209–277	278+
5′ 11″	179–214	215–285	286+
6′ 0″	184–220	221–293	294+
6′ 1″	189–226	227–301	302+
6′ 2″	194–232	233–310	311+
6′ 3″	200–239	240–318	319+
6′ 4″	205–245	246–327	328+
	1 point	2 points	3 points
	If you weigh less than the amount in the left column: 0 points		

Adapted from Bang et al., Ann Intern Med 151:775–783, 2009.
Original algorithm was validated without gestational diabetes as part of the model.

ADD UP YOUR SCORE.

If you scored 5 or higher:

You are at increased risk for having type 2 diabetes. However, only your doctor can tell for sure if you do have type 2 diabetes or prediabetes, a condition in which blood glucose levels are higher than normal but not yet high enough to be diagnosed as diabetes. Talk to your doctor to see if additional testing is needed.

Type 2 diabetes is more common in African Americans, Hispanics/Latinos, Native Americans, Asian Americans, and Native Hawaiians and Pacific Islanders.

Higher body weight increases diabetes risk for everyone. Asian Americans are at increased diabetes risk at lower body weight than the rest of the general public (about 15 pounds lower).

The good news is you can manage your risk for type 2 diabetes. Small steps make a big difference in helping you live a longer, healthier life.

For more information, visit us at **diabetes.org/alertday** or call **1-800-DIABETES (800-342-2383).**

American Diabetes Association.

Appendix D

WHAT IS YOUR RISK SCORE?

ARE YOU A STUDENT WITH RISK FACTORS?

DOES THIS SOUND LIKE YOU?

Scan me

Fast Facts on Diabetes

Estimated 84.1 million (33.9%) American adults have Prediabetes

90% DON'T KNOW IT

30.2 million American adults age 18 years or older have diabetes

Interested in Participating in a research study?
For more information, please contact Student investigator Carletta Weatherspoon DNPs MSN APRN FNP at carletta.weatherspoon@gcsu.edu, or Dr. Carol Sapp, PhD at carol.sapp@gcsu.edu

Appendix E

Informed Consent Form and HIPAA Authorization

Title: Assessing College Students' Perceived Risk for Developing Type 2 Diabetes

Principal Investigator: Carletta Weatherspoon, DNP Student, APRN FNP Part-time Faculty School of Nursing, Georgia College, and State University.

Dear Students:

You are invited to participate in a research study titled "Assessing College Students' Perceived Risk for Developing Type 2 Diabetes". The present research available indicates that the prevalence of type two diabetes mellitus (T2DM) in American adults has grown astronomically. This research study aims to determine if a T2DM educational intervention will raise awareness of T2DM in college students with one or more risk factors for developing T2DM. This information will aid in determining appropriate educational interventions to improve knowledge and attitudes toward developing diabetes.

In this research study, you will be asked to complete three documents: a demographic questionnaire, the Risk Perception Survey for Developing Diabetes (RPS-DD) and, the American Diabetes Association (ADA) Diabetes Risk Test. One week following the diabetes educational intervention, the researcher will email you the RPS-DD survey with your assigned number to complete again. You will have five days to complete the RPS-DD survey. Email reminders will be sent out at three different times on days one, three, and five to remind you to complete the RPS-DD survey. If you do not complete the RPS-DD survey, your data will not be used in the statistical analysis of the research study. The documents should take approximately 10 minutes to complete and will be followed by a 15-minute PowerPoint educational presentation for T2DM.

Your participation in this research study is voluntary, and you are free to withdraw your participation at any time.

The Institutional Review Board of Georgia College and State University has approved this research study. There will be minimal risk associated with participating in this research study. The research study collects demographic information, including the name and the Bobcats email address of all participants.

All participants will be protected from future potentially harmful use of the data collected in this research study. The information in this research study will be kept confidential. Each data collection documents will be coded by number to maintain the confidentiality of participants' information. Data will be encrypted, and password protected on a computer for security purposes. Hard copies surveys with participant's identifiers will be stored in a locked file cabinet

in a secure location in the researcher's office. Electronic post-survey copies will be encrypted and password protected. In three years, the information collected in this research study will be destroyed according to the Georgia College records retention policy. The researcher will have sole access to the participant's identifiers until they are destroyed.

By participating in this translational research study, you may obtain benefits such as gaining a better understanding of lifestyle interventions that can reduce diabetes risk and steps to take to live healthier lives. Further benefits may include the future impact of helping to create a college campus that is aware of and intends to practice healthy lifestyles.

You may keep a copy of this document for your records.

If you have any questions or concerns regarding this translational research study, please contact Carletta Weatherspoon at carletta.weatherspoon@bobcats.gcsu.edu. Research at Georgia College involving human participants is carried out under the oversight of the Institutional Review Board. If you have any questions concerning your rights as a research participant, please contact the IRB of Georgia College and State University at 478-445-2123. The United States Department of Health and Human Services' Office for Human Research Protections provides information regarding informed consent. By completing and submitting this survey, you are indicating your consent to participate in the research study.

Your participation is appreciated.

Sincerely,

Carletta Weatherspoon, APRN, FNP-C

carletta.weatherspoon@bobcats.gcsu.edu

Georgia College and State University

Dr. Carol J. Sapp, RN, MSN, PhD, CNE

carol.sapp@gcsu.edu

School of Nursing

Georgia College and State University

……

Printed Name: _____

Signature of Participant: _____ Date: _____

Appendix F

Gmail by Google **carletta weatherspoon <carletta.weatherspoon@bobcats.gcsu.edu>**

Carletta Weatherspoon DNP Research Project

laura childs <laura.childs@gcsu.edu> Mon, Oct 7, 2019 at 10:48 AM
To: carletta weatherspoon <carletta.weatherspoon@bobcats.gcsu.edu>

Carletta,

Thank you for contacting me regarding your research project. I teach two sections of Personal Health and Fitness on MWF mornings at 8 and 9 a.m. The classes both have Ex. Science, Public Health, and Nursing majors. Would you like to come to speak to the classes about your research and see if you can recruit some participants? Next Wed. morning, 10/16, would work for me.

Thanks,

Laura

[Quoted text hidden]

Gmail by Google **carletta weatherspoon <carletta.weatherspoon@bobcats.gcsu.edu>**

Carletta Weatherspoon DNP Project

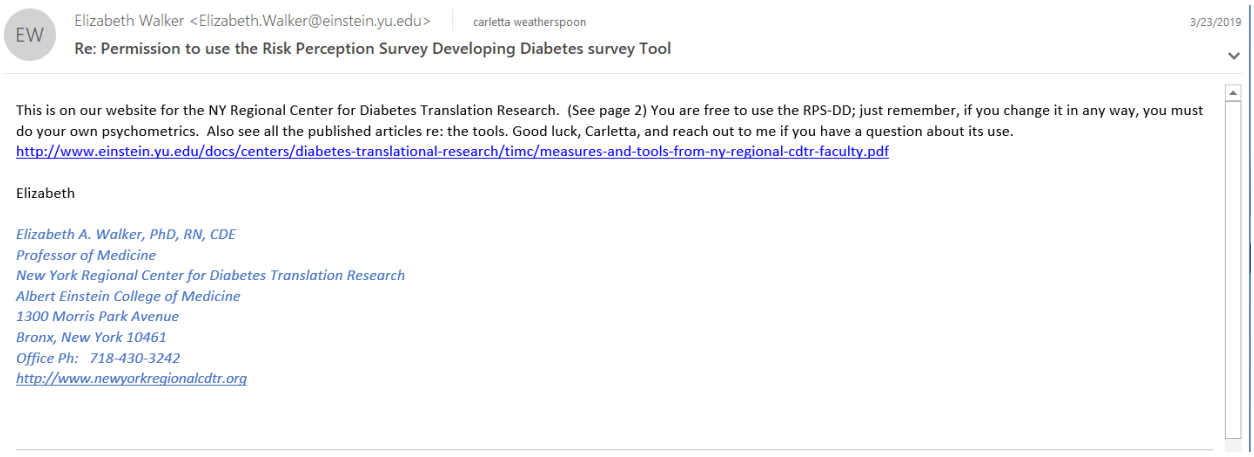
catherine fowler <catherine.fowler@gcsu.edu> Fri, Oct 4, 2019 at 8:37 PM
To: carletta weatherspoon <carletta.weatherspoon@bobcats.gcsu.edu>
Cc: carol sapp <carol.sapp@gcsu.edu>, ariana braner <ariana.braner@bobcats.gcsu.edu>

Hi Carletta
that sounds fine...
Nani and Travis...do we have a guest next month?
Carletta, please e mail me, Ariana Braner, and Travis Aultman to give us an idea about your time requirements and topic content
Thanks
Dr. Fowler mobile 912 856 1612

Catherine Fowler, DHSc, RN, CNE
Assistant Professor

Nursing
Georgia College and State University
Milledgeville, Georgia 31061
CBX 063
Parks Memorial 206
T 912-856-1612
E catherine.fowler@gcsu.edu

Appendix G



EW

Elizabeth Walker <Elizabeth.Walker@einstein.yu.edu> carletta weatherspoon 3/23/2019

Re: Permission to use the Risk Perception Survey Developing Diabetes survey Tool

This is on our website for the NY Regional Center for Diabetes Translation Research. (See page 2) You are free to use the RPS-DD; just remember, if you change it in any way, you must do your own psychometrics. Also see all the published articles re: the tools. Good luck, Carletta, and reach out to me if you have a question about its use.
http://www.einstein.yu.edu/docs/centers/diabetes-translational-research/timc/measures-and-tools-from-ny-regional-cdtr-faculty.pdf

Elizabeth

Elizabeth A. Walker, PhD, RN, CDE
Professor of Medicine
New York Regional Center for Diabetes Translation Research
Albert Einstein College of Medicine
1300 Morris Park Avenue
Bronx, New York 10461
Office Ph: 718-430-3242
http://www.newyorkregionalcdtr.org

References

Al-Shudifat, A., Al-Shdaifat, A., Al-Abdouh, A, A., Aburoman, M, I., Otoum, M, S., Sweedan, A, G., … Johannessen, A. (2017). Diabetes risk score in a young student population in Jordan: A cross-sectional study. *Journal of Diabetes Research, 5*. doi:10.1155/2017/8290710

Adegoke, O. A., Emma-Okon, B. B., Fasanya, K. M., Salawu, O. A., & Tomi-Olugbodi, A. A. (2017). Behavioral and anthropometric risk factors for diabetes mellitus among newly admitted undergraduates in a Nigerian University. *Nigerian Journal of Clinical Practice, 20*, 1246–1249.

Amuta, A. O., Barry, A. E., & McKyer, E. L. (2015). Risk perceptions for developing type 2 diabetes among overweight and obese adolescents with and without a family history of type 2 diabetes. *American Journal of Health Behavior, 39(6*), 786–793. doi.org/10.5993/AJHB.39.6.6

Amuta, A. O., Jacobs, W., Barry, A. E., Popoola, O. A., & Crosslin, K. (2016). Gender differences in type 2 diabetes risk perception, attitude, and protective health behaviors: A research study of overweight and obese college students. *American Journal of Health Education, 47(5)*, 315–323. doi: 10.1080/19325037.2016.1203836

American College Health Association. (2019). *American college health association-national college health assessment II: Georgia college executive summary, spring 2019*. Silver Spring, MD: American College Health Association.

American Diabetes Association (ADA), 2017. Are you at risk for type 2 diabetes? Retrieved from https://www.diabetes.org/risk-test?language_content_entity=en

Attitude. 2019. In *Merriam Webster*. Retrieved from https://www.merriam-webster.com/dictionary/attitude

Centers for Disease Control and Prevention (CDC). (2017). *Diabetes report card 2017*. Retrieved from https://www.cdc.gov/diabetes/pdfs/library/diabetesreportcard2017-508.pdf

Centers for Disease Control and Prevention (CDC). (2020). National Diabetes Statistics Report, 2020. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services.

Dabelea, D., Mayer-Davis, E.J., Saydah, S., Imperatore, G., L., Linder, B., Divers, J., Bell, R., … & Hamman, R. F. (2014). Prevalence of type I and type 2 diabetes among children and adolescents from 2001 to 2019. *Journal of American Medical Association, 311*(17): 1778–1786.

Feldman, A. L., Griffin, S. J., Ahern, A. L., Long, G. H., Weinehall, L., Fharm, E., …Wennberg, P. (2017). Impact of weight maintenance and loss on diabetes risk and burden: a population-based study in 33,184 participants. *BioMed Central Public Health 17*(170). doi:10.1186/s12889-017-4081-6

Ferrer, R., & Klein, W. M. (2015). Risk perceptions and health behavior. *Current opinion in psychology*, *5*, 85–89. doi: 10.1016/j.copsyc.2015.03.012

Gaidhane, S., Mittal, W., Khatib, N., Zahiruddin, Q. S., Muntode, P. A., & Gaidhane, A. (2017). The risk factor of type 2 diabetes mellitus among adolescents from rural area of India. *Journal of Family Medicine & Primary Care*, *6(3*), 600. doi: 10.4103/2249-4863.222025

Galaviz, K., Narayan, K., Lobelo, F., & Weber, M. (2015). Lifestyle and the prevention of type 2 diabetes: A status report. *American Journal of Lifestyle Medicine*, 4–20. doi:10.1177/1559827615619159

Georgia College. (n.d.). Retrieved from https://www.gcsu.edu/

Georgia Department of Public Health (GDPH). (2017). Prediabetes data summary. Retrieved from https://dph.georgia.gov/sites/dph.georgia.gov/files/PrediabetesFact%20Sheet_final_website.pdf

Higgs, C., Gisselman, A. S., Hale, L., & Mani, R. (2017). Health outcome of the Dunedin community exercise programme for people with type 2 diabetes and prediabetes: a single-group research study. *European Journal of Physiotherapy*, *19*, 64–65. doi:10.1080/21679169.2017.1381316

Khan, R., Khan, S., Gul, S., Kanwal, S., Samin, A., & Ahmed, A. (2017). Prediabetes: Prevalence in students of Ayub medical college, Abbottabad. *Professional Medical Journal*, *24(8*), 1190–1194. doi:10.17957/TPMJ/17.4310

Kithchlew, R., Chachar, K., Haider, M., Saleem, A., Mirza, M., Latif, S., & Afzal, U. (2017). Pre-diabetes: Prevalence of pre-diabetes in our local population. *Professional Medicine Journal*, *24*(12), 1860–1866.doi:10.17957/TPMJ/17.4310

Mongiello, L., Freudenberg, N., & Jones, H. (2016). Diabetes risk factor knowledge varies among multiracial college students. *Journal Immigrant Minority Health*, *18*, 971–978.

Navicent Health (2018). *Community Health Needs Assessment Report*. Retrieved from https://6e4e5253c366be07fb2705a8d4e28b318db45e55745aeda40acc.ssl.cf5.rackcdn.com/2018_PRC_CHNA_Report_Central_Georgia_Navicent_Health.pdf

Perceived Risk. 2019. In Merriam Webster. Retrieved from https://www.merriam-webster.com/dictionary/attitude

Pallant, J. (2013). *SPSS survival manual* (5th ed.). New York, New York: McGraw-Hill.

Piccinino, L., Griffey, S., Gallivan, J., Lotenberg, L. D., & Tuncer, D. (2015). Recent trends in diabetes knowledge, perceptions, and behaviors: Implications for national diabetes education. *Health Education & Behavior*, *42*(5), 687–696.

Pinelli, N. R., Berlie, H. D., Slaughter, R. L., & Jaber, L. A. (2009). Risk perception for developing diabetes among pharmacists. The Annals of pharmacotherapy, 43(6), 1050–1056. https://doi.org/10.1345/aph.1L692

Reyes-Velazquez, W., & Hoffman, E. (2011). Toward reducing the diabetes pandemic: College students' perspectives of types 2 diabetes. *Diabetes Spectrum, 24*(3).

Rosenstock, I. (1974). Historical origins of the health belief model. *Health Education Monographs, 2*(4), 328–335.

Saffari, M., Karimi, T., Koenig, H. G., & Al-Zaben, F. (2015). Psychometric evaluation of the Persian version of the Type 2 Diabetes and Health Promotion Scale (T2DHPS): A diabetes-specific measure of lifestyle. *Scandinavian Journal of Caring Sciences, 29*(3), 603–612. doi:10.1111/scs.12181

Sealy-Potts, C., & Reyes-Velazquez, W. (2014). Perceived and Actual risks of college students for developing type 2 diabetes. Austin Journal of Nutrition & Metabolism, 1(2): 5.

Stevens, J. P. (2009). Applied multivariate statistics for the social sciences (5th ed.). Mahwah, NJ: Routledge Academic.

Strodel, R., Chang, C., Khurana, S., Camp, A., Magenheimer, E., & Hawley, N. Increased awareness, unchanged behavior: Prediabetes diagnosis in a low-income, minority population. The Diabetes educator, 45(2), 203–213. https://doi.org/10.1177/0145721719826578

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston: Allyn and Bacon.

Tuso, P. (2014). Prediabetes and lifestyle modification: Time to prevent a preventable disease. *The Permanente Journal, 18*(3), 88–93.

Young, W., Gillibrand, W., & Phillips, S. (2016). The impact of pre-diabetes diagnosis on behavior change: An integrative literature review. *Practical Diabetes*, *33*(5), 171–175.

U.S. Department of Health and Human Services. (1979). *The Belmont report.* Retrieved from http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Walker, E, A., Kalten, M, R., Mertz, C, K., & Flynn, J. (2003). Risk perception for developing diabetes: Comparative risk judgments of physicians. *Diabetes Care*, *26*(9), 2543–2548.

Zimmerman, E. & Woolf, S, H. (2014). Understanding the Relationship Between Education and Health. *National Academy Medicine Perspectives.* Discussion Paper, National Academy of Medicine, Washington, DC. https://doi.org/10.31478/201406a