KNOWLEDGE AND PERCEPTION OF TYPE 2 DIABETES PREVALENCE AND

TREATMENT AMONG STUDENTS AT EAST CAROLINA UNIVERSITY

by

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Abstract

The present study will investigate the basic understanding of type 2 diabetes treatment and prevalence among college students in Eastern North Carolina. The data gathered could promote programs that more effectively educate college students on the treatments of diabetes. A Qualtrics Survey was used to collect participant's data and statistics were used to assess the participant's knowledge of type 2 diabetes treatment. The researchers proposed that there would be a considerable lack of understanding regarding diabetes prevalence and treatment among students at East Carolina University. The study found that the majority of college students did not have a thorough understanding of type 2 diabetes treatment. The lack of knowledge persisted across different hometown regions, family history, academic status, and diagnosis status. There was a significant difference between the knowledge of treatment plans between science and math-related majors and literature, language, and social science majors ($P < 0.05$). There was also a lack of knowledge of the comorbidities of high insulin levels. This study identifies gaps in knowledge among students at East Carolina University and hopes that future programs could be implemented to increase the public's understanding of type 2 diabetes.

Introduction

Diabetes is a growing epidemic in North Carolina. North Carolina was ranked as the 13th most prevalent state with diabetes, and Eastern North Carolina has the highest prevalence within the state (Young 2011). In 2017, the Centers for Disease Control and Prevention (2017) found that 12.2% of adults in the United States were living with diabetes. In North Carolina, about

10.1% of adults were diagnosed with diabetes, but this number is much higher in Eastern North Carolina (Centers for Disease Control and Prevention 2016). In rural North Carolina, about 18.6% of adults were diagnosed with diabetes (United Health Foundation 2019). With such a high proportion of the population diagnosed with diabetes, it is important to assess the public's understanding of the disease.

Type 2 diabetes is not only highly prevalent in Eastern North Carolina, but the disease has negative health consequences. Individuals diagnosed with type 2 diabetes have increased rates of cardiovascular disease and stroke (Chatterjee et al 2017). In addition, type 2 diabetes can cause an increase in kidney damage, eye damage, hearing impairment, sleep apnea, and Alzheimer's disease (Mayo Clinic Staff 2019). Overall, type 2 diabetes has negative health consequences that appear throughout the entire body and can cause irreversible damage. Therefore, proactive health interventions to decrease an individual's risk of developing type 2 diabetes are important. Specifically, educating the public about the disease increases the public's understanding of the disease and can aid in early detection of the disease.

Previous research has investigated the public's understanding of diabetes in many sample populations but not in Eastern North Carolina. Chinnappan and colleagues (2016) found that diabetes understanding varied between age groups and education levels in Malaysia. Participants that were 12-24 years old and were in college had the best understanding of the causes and treatments of diabetes (Chinnappan et al. 2016). Similarly, in Saudi Arabia, Mohieldein and colleagues (2011) found that individuals currently in college or those who had graduated from college were more likely to have a general understanding of the causes of diabetes. Çaliskan et al (2006) also found educational status to be informative about the individual's understanding of

diabetes. The study was conducted in four medical facilities located in Ankara, Turkey. The study found an overall lack of understanding among the population, but having a college education increased their knowledge of diabetes (Çaliskan et al 2006). This current study will shed light on the basic understanding of college students in Eastern North Carolina regarding type 2 diabetes.

There are two main objectives of this study. The first is to investigate the knowledge of students at ECU regarding the treatment of type 2 diabetes. The second objective is to educate participants on the current research in the field of type 2 diabetes. The researchers presumed that students at East Carolina University would lack a basic understanding of the prevalence and treatment of type 2 diabetes.

Methods

In order to evaluate the knowledge of students at East Carolina University regarding type 2 diabetes, a survey was distributed among students. The results were analyzed in Microsoft Excel with a Student's P-Test.

Survey

A Qualtrics Survey was used to assess the participant's knowledge. The questions assessed the participant's knowledge of type 2 diabetes and the corresponding treatment (see Table 1). After each question, the participant was presented with current research that answers the question correctly. At the end of the survey, the participants were able to respond to the information that was presented. Following IRB approval, the survey was sent to students that attend East Carolina University.

Table 1: Qualtrics Survey Questions and Response Options

Number	Question	Response Options
1	To which gender identity do you most identify?	Male, Female, Transgender Female, Transgender Male, Gender Variant/Non-Conforming, Not Listed (Free Response), Prefer Not to Answer
2	Specify your ethnicity/race	White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, Other (Free Response) ,Prefer not to say
3	Enter your hometown zip code	Free Response
4	Choose your academic status	Freshman, Sophomore, Junior, Senior, Graduate Student
5	List your major(s)	Free Response
6	Have you been diagnosed with diabetes?	Yes, Type 1; Yes, Type 2; Yes, Type 1 and 2; No
7	Do you have family history of Type II diabetes?	T2D Diagnosed Family member, T2D Diagnosed, Friend, School, Independent reading or research, Other (Free Response)
8	How would you define the prevalence of T2D in North Carolina compared to the national average?	The prevalence in North Carolina is the SAME as the national average, the prevalence in North Carolina is HIGHER than the national average, the prevalence in North Carolina is LOWER than the national average
9	What is the typical treatment plan for a patient with T2D? Check all that apply	Diet, exercise, secretagogues (Sulfonylureas and Meglitinides), alpha-glucosidase inhibitors, peptide analogues, insulin, gastric bypass surgery, Phenoxybenzamine, radiation therapy, diazepam, cetirizime, DPP-4 inhibitors, Metformin (Glucophage, Glumetza, others), Insulin sensitizers (Thiazolidinediones), GLP-1 receptor agonists, SGLT2 inhibitors
10	High insulin levels are associated with what diseases? Check all that apply	Severe obesity, cancer, Type 2 diabetes, hypertension, dyslipidemias, NASH (nonalcoholic fatty liver disease), sleep apnea, asthma, atherosclerosis, renal failure, polycystic ovary disease, GERD (gastroesophageal reflux disease), Arthritis, melanoma, patent ductus arteriosus
11	When used as treatment for Type II Diabetes, does insulin increase or decrease mortality rates?	Increase, decrease, has no effect
12	Is the gastric bypass surgery an effective treatment for Type II Diabetes?	Yes or No
13	Before this survey, were you aware of the increased mortality	Yes or No

	rates associated with insulin?	
14	Before this survey, were you aware of the benefits associated with the gastric bypass surgery on Type II Diabetes?	Yes or No
15	What information presented in this survey surprised you?	Free Response

Participants

Qualifying individuals were currently enrolled at East Carolina University during October 2018. Demographic information was collected on each participant including age, race/ethnicity, year in college, and family history of type 2 diabetes. The target sample included students from each grade (freshmen, sophomore, junior, and senior) with a variety of majors. Students enrolled in a graduate program also participated in the study. Participants were not compensated for their completion of the survey. After collecting data via the survey, the data was statistically analyzed.

Statistical Analysis

Means were calculated for each question from the survey and categorized as causes, treatment, and perception. The demographic information was analyzed using a t-test. The t-test was then used to compare subsets of the sample.

Results

Demographics

The survey population was 25% (n=26) freshmen, 31% (n=33) sophomores, 18% (n=19) juniors, 23% (n=24) seniors, and 3% (n=3) graduate students. Therefore, the study was evenly represented among the undergraduate years. In our survey population, 57% (n=65) were science

and math-related majors, 34% (n=39) were literature, language, and social sciences majors, 6% (n=7) were business-related majors, and 3% (n=4) were education majors. Although the survey population was not evenly dispersed among majors, the survey population still consisted of a variety of majors. The population self-identified their race/ethnicity and 79% (n=87) identified as white, 9% (n=10) identified as black or African American, 8% (n=9) identified as Asian, 2.7% (n=3) identified with more than one race, and 0.9% (n=1) identified as other. The population was 73.4% (n=80) female, 25.7% (n=28) male, and 0.9% (n=1) nonbinary. The population's diagnosis status was also collected and 98.2% (n=107) were not diagnosed with diabetes, 0.9% (n=1) were diagnosed with type 1 diabetes, and 0.9% (n=1) were diagnosed with type 1 and type 2 diabetes. In addition, 41.6% (n=45) had a family history of diabetes and 58.3% (n=63) did not have a family history of diabetes. Lastly, the researchers analyzed the surveyed population's hometown zip codes. In the surveyed population, 52.9% (n=55) of individuals were from a hometown located in the central or western region of North Carolina, 41.3% (n=43) were from a hometown in Eastern North Carolina, and 5.7% (n=6) were from a hometown located outside of North Carolina (Figure 1).

Figure 1: Map of Zip Code Distributions Among Surveyed Population

Knowledge of Treatment and Prevalence

Overall, the study found a lack of knowledge among college students at East Carolina University. As shown in Figure 2, there was a significant difference between the average number of correct versus incorrect answers ($p < 0.05$). Out of ten possible answer choices, the majority of students chose more incorrect answers in regard to the typical treatment of type 2 diabetes. There was also a significant difference ($p < 0.05$) between the correct and incorrect answers for the question assessing the knowledge of comorbidities of high insulin levels (Figure 3). Across the surveyed population, there was a significant finding ($p < 0.05$) that students were not aware of the positive effects of the gastric bypass surgery on type 2 diabetes (Figure 4). After discovering the lack of knowledge in the surveyed population, the researchers analyzed the data based on particular demographic information (year, major, family history, diagnosis status, zip code).

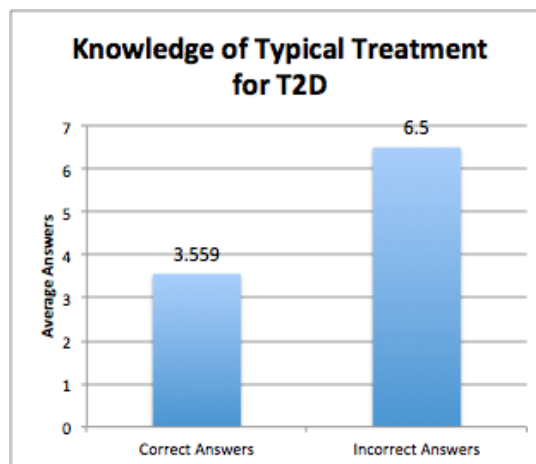Figure 2: Knowledge of T2D Treatment in Population

Knowledge of Typical Treatment for T2D

Figure 3: Lack of Knowledge of Comorbidities of High Insulin Levels

Knowledge of Comorbidities of High Insulin Levels

Figure 4: Knowledge of Gastric Bypass Surgery and Effect on T2D

Is Gastric Bypass Surgery an Effective Treatment for Type II Diabetes?

Yes 42%

No 58%

Across different years, majors, family history, diagnosis status, and zip codes, the lack of knowledge persisted. There was no significant difference (p=0.48) between the upperclassmen (juniors and seniors) and lower classmen (freshmen and sophomores) in regards to their knowledge of type 2 diabetes treatment (Fig 5).

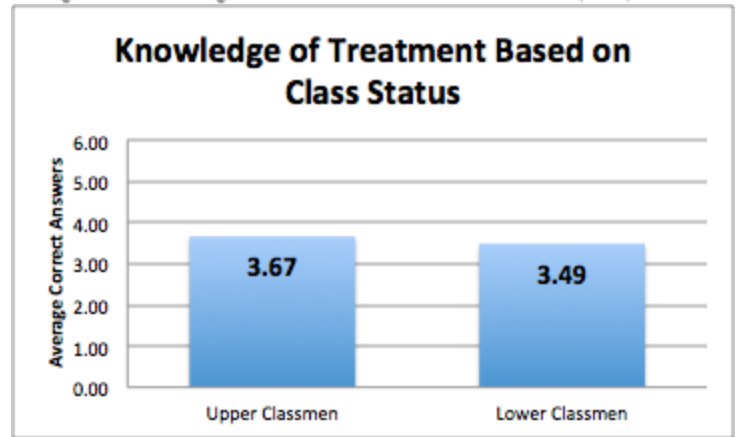Figure 5: Knowledge of Treatment Based on Class Status (Year)
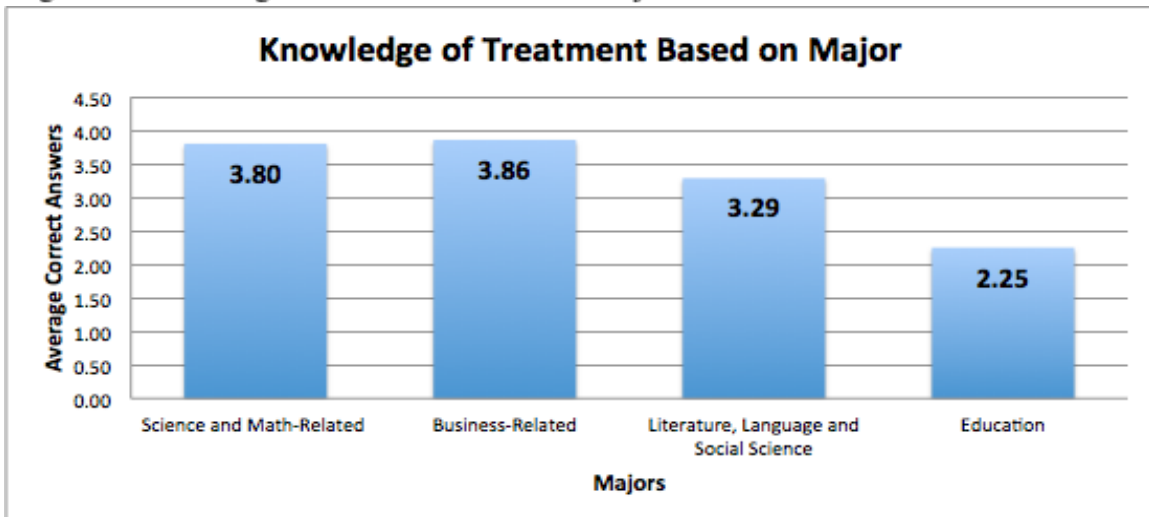
Knowledge of Treatment Based on Class Status

Figure 6: Knowledge of Treatment Based on Majors

Knowledge of Treatment Based on Major

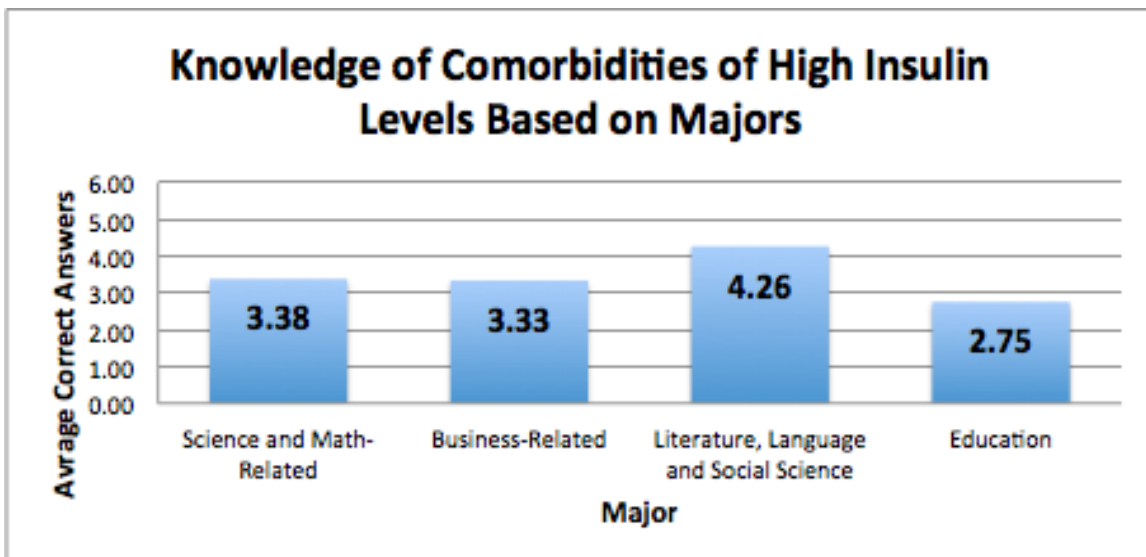Figure 7: Knowledge of Comorbidities of High Insulin Levels Based on Majors

Knowledge of Comorbidities of High Insulin Levels Based on Majors

Interestingly, this trend is slightly different in regards to different majors. When assessing the knowledge about T2D treatment, there was a significant difference between science and math-related majors and education majors (p<0.05). Between all other majors, the difference was insignificant (p>0.05, Fig 6). Figure 7 demonstrates the lack of knowledge in the comorbidities associated with high insulin levels which persisted across all majors and was not significantly different between majors. Therefore, the researchers concluded that the lack of knowledge exists among all majors.

Next, the researchers investigated the knowledge of type 2 diabetes treatment and comorbidities of high insulin levels based on family history. In both questions, treatment and comorbidities of high insulin levels, there was no significant difference between

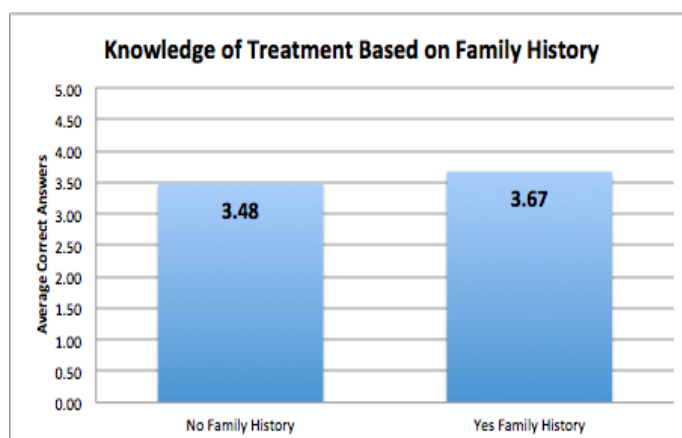Figure 8: Knowledge of Treatment Based on Family History

Figure 9: Knowledge of Comorbidities of High Insulin Levels Based on Family History
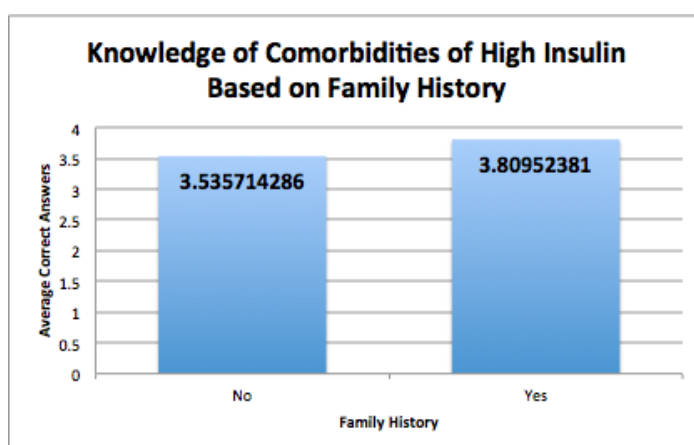

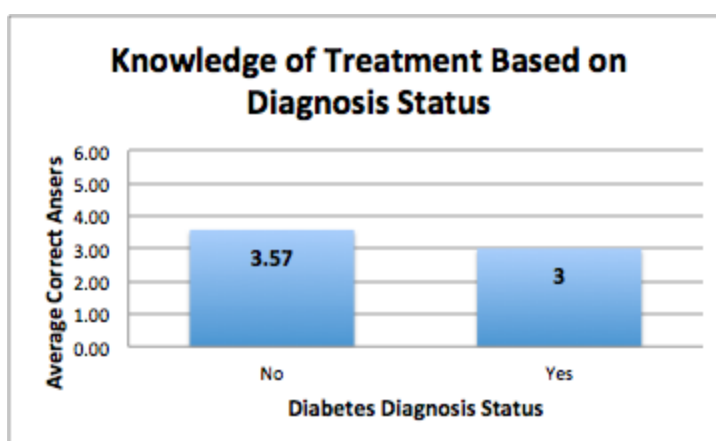Figure 10: Knowledge of Treatment Based on Diagnosis Status

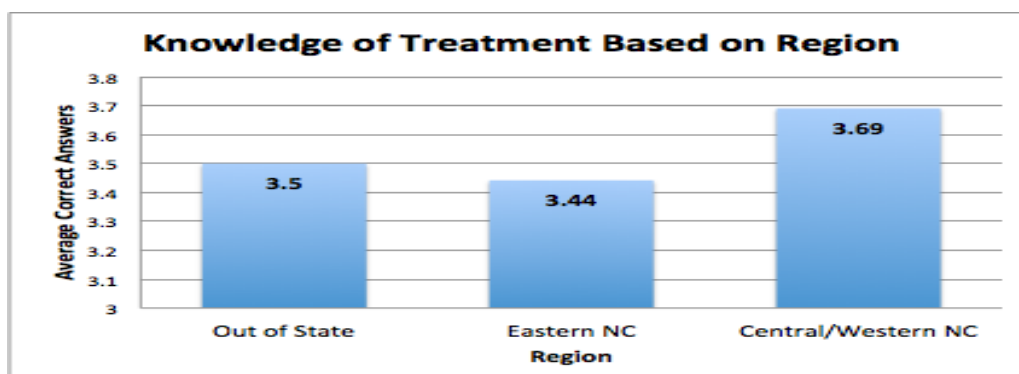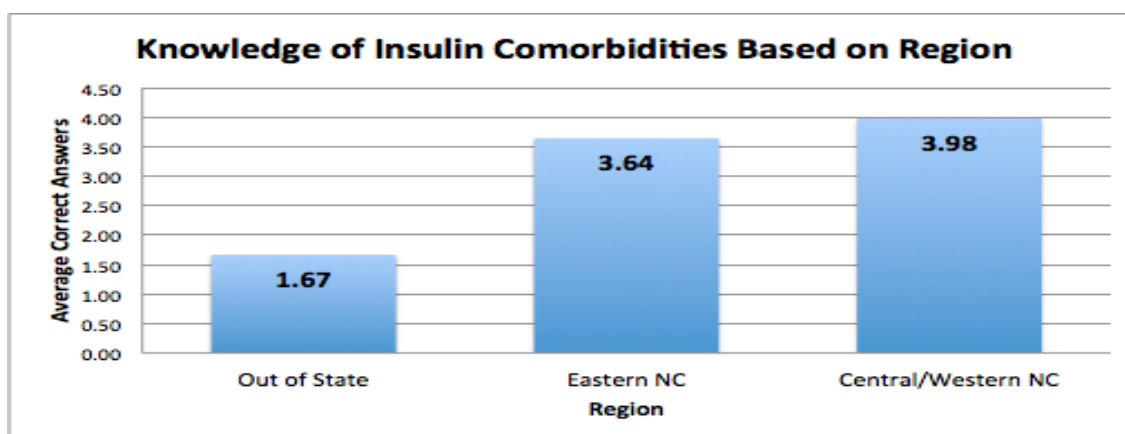Figure 11: Knowledge of Treatment Based on Region

Figure 12: Knowledge of Comorbidities of High Insulin Levels Based on Region

individuals with family history of diabetes and individuals with no family history (Fig 8 and 9).

The researchers were also interested in how the individual's diagnosis status impacted their

knowledge of type 2 diabetes treatment. It was found that the individual's diagnosis status did

not impact their knowledge (Fig 10). In addition, the researchers investigated how the

participant's hometown zip code affected their knowledge. The researchers had hypothesized

that individuals from Eastern North Carolina would have more knowledge about the treatment of

T2D and comorbidities of high insulin levels. In contrast to the initial hypothesis, participants
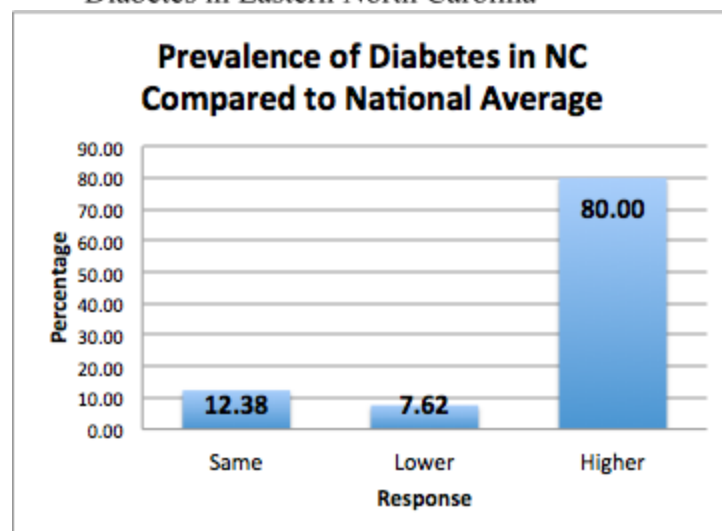
from Eastern North Carolina responded similarly to those from other regions of North Carolina and out of state (Fig 11 and Fig 12). The only significant difference (p<0.05) was between the knowledge of comorbidities of high insulin levels among participants from central/western North Carolina and participants from outside North Carolina (Figure 12).

Lastly, data were collected on the participants' knowledge of the prevalence of type 2 diabetes in North Carolina. It was found that participants had basic knowledge regarding the prevalence of type 2 diabetes in North Carolina

Figure 13: Knowledge of Prevalence of Type 2 Diabetes in Eastern North Carolina

(Figure 13). On average, the majority of participants knew that the prevalence of type 2 diabetes was higher in North Carolina compared to the national average.

After relevant research findings were presented to participants, the participants were asked to respond. Previously published research findings found that taking insulin was associated with high mortality levels (Currie et al 2010) and that the gastric bypass surgery cured the patient's type 2 diabetes (Buchwald et al 2009, Ikramuddin et al 2015, and Pories et al 2011). The fact that insulin caused an increase in mortality was surprising to 84.4% (n=92) of participants. Sixty-six percent of participants were not aware that the gastric bypass surgery had positive effects on type 2 diabetes.

Discussion

This study found that college students at East Carolina University had low knowledge of the treatment of type 2 diabetes and the other illnesses associated with high insulin levels. No significant difference was found between the knowledge of treatment and prevalence between students with varying majors, years, medical history, family history, or region. The only exception is the difference between science and math-related majors and education majors on the knowledge of type 2 diabetes treatment. It was found that students at East Carolina University had basic knowledge of the prevalence of type 2 diabetes in North Carolina. The majority of students knew that the prevalence of type 2 diabetes was higher in North Carolina compared to the national average. In addition, the majority of participants were surprised to learn that insulin has negative effects and that the gastric bypass surgery has positive effects on type 2 diabetes.

Due to the research by Chinnappan and colleagues (2017), Mohieldein et al (2011), and Çaliskan et al (2006), it was expected that college students would have a basic knowledge of type 2 diabetes. The findings of this study are most similar to Çaliskan et al (2006), which found a significant lack of knowledge among the surveyed population in Turkey. Although they concluded that individuals with a college education have the best knowledge of diabetes, even college-educated individuals did not have a thorough understanding of the disease. The current study presents similar findings as the lack of knowledge persisted among all surveyed college students at East Carolina University.

Although this study clearly demonstrates the lack of knowledge regarding type 2 diabetes among students at East Carolina University, it has a few limitations. First, this study is limited in size and scope. In an effort to ensure maximum participation, the number and length of questions

was minimized. Due to this fact, the exact knowledge of each participant could be misrepresented. Ideally, individual interviews would have been completed with each participant, but that would have decreased the sample size for the population. In addition, the questions for the Qualtrics survey did not come from a standardized questionnaire. Therefore, the questions have not been verified in another study.

Due to these results from this study, programs should be implemented to improve the knowledge of students at East Carolina University. Since type 2 diabetes is incredibly prevalent in Eastern North Carolina and East Carolina University's students are the future's doctors, lawyers, nurses, teachers, etc., it is imperative that the knowledge of the treatment of type 2 diabetes increases significantly. These results also demonstrate that recent diabetes research is not becoming public knowledge. Public health interventions should aim to inform the public about the breakthroughs in diabetes research to improve the public's health.

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