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The Importance of Staff Education About Implementing Ketogenic Diet in Prediabetic Patients

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Abstract

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MSN, Chamberlain College of Nursing, 2016

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Project Submitted in Partial Fulfillment

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Doctor of Nursing Practice

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Abstract

Diabetes, a chronic disease that can lead to many complications, is one of the leading causes of death. Obesity tends to increase the risk of diabetes. Nutritional therapy can not only control diabetes but also prevent it in some cases by decreasing weight. The ketogenic diet is a low-carbohydrate, high-fat diet that can prevent and control diabetes. The purpose of this study was to examine the recommendations of medical providers before and after the presentation of educational content on the ketogenic diet as nutritional therapy in prediabetic and diabetic patients. The practice-focused question addressed whether educating medical staff at a family practice clinic about the ketogenic diet in prediabetic and diabetic patients would improve knowledge and the likelihood of recommending the ketogenic diet as a form of diabetes control. Three medical doctors, two nurse practitioners, and three medical assistants attended a class and completed pre surveys and postsurveys. A paired t test was performed, and the mean score on the presurvey was 6.25, while the mean score of the postsurvey was 13.00. The mean difference was 6.75, indicating that there was an increase in willingness to initiate the ketogenic diet in prediabetes and diabetes patients. The $p = .001$ demonstrates statistical significance which concludes the attendees' positive intent to recommend the ketogenic diet for diabetic and prediabetic patients. The findings of the doctoral project indicate that when medical staff is adequately educated on the benefits of the ketogenic diet as nutritional therapy in diabetic and prediabetic patients, they are more likely to initiate this therapy. The ketogenic diet has the potential to increase diabetic control and decrease chronic medical complications, which may lead to positive social change.

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Acknowledgments

I am appreciative to everyone who has helped me during this process of achieving my dream of completing my Doctor of Nursing Practice degree. I would like to thank my children for their understanding during this journey. You have made me stronger, better, and more fulfilled than I could have ever imagined. I completed this journey so you can know that anything is possible. One thing I would like for you guys to always remember is that you might not be able to choose where you start, but you can sure choose where you end up. I would also like to thank my mother for being there not only mentally, but also physically. You have instilled a work ethic in me that I will continue to utilize and instill in my children. Your encouragement is much appreciated. Lastly, I would like to thank my committee member, Dr. Cheryl McGinnis; university research reviewer, Dr. Deb Lewis; and chair, Dr. Melissa Rouse. I cannot express enough thanks to you all. I would not have been able to complete this process without your support and guidance.

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Section 1: Nature of the Project

Introduction

Chronic illnesses have decreased the overall health of the United States. Type 2 diabetes is a chronic disease affecting millions of people. Diabetes is the seventh leading cause of death in the United States. Diet control is a major factor in glycemic control in Type 2 diabetes. My Doctor of Nursing Practice (DNP) project focuses on educating staff members on the importance of recommending a ketogenic (keto) diet in Type 2 diabetic patients. Controlling and preventing diabetes can increase the health of the national population and promote positive social change.

Problem Statement

Type 2 diabetes, the most common type of diabetes, is a disease that occurs when blood glucose, also called blood sugar, is too high (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2017). Type 2 diabetes occurs when the body cannot produce enough insulin, or the body does not respond to insulin. Many risk factors contribute to Type 2 diabetes, including age over 45, family history of diabetes, a decrease in physical activity, and race (African, American, Hispanic, American Indian, or Alaskan). A person is more likely to develop Type 2 diabetes if they are not physically active and are overweight or obese (NIDDK, 2016). Obesity and diabetes tend to follow the same trend. Both tend to increase in southern states. Figure 1 is a graphic from the Centers for Disease Control and Prevention (CDC) 2009 *Morbidity and Mortality Weekly Report* showing cases of diabetes and obesity divided by states.

Figure 1

Diabetes and Obesity by County
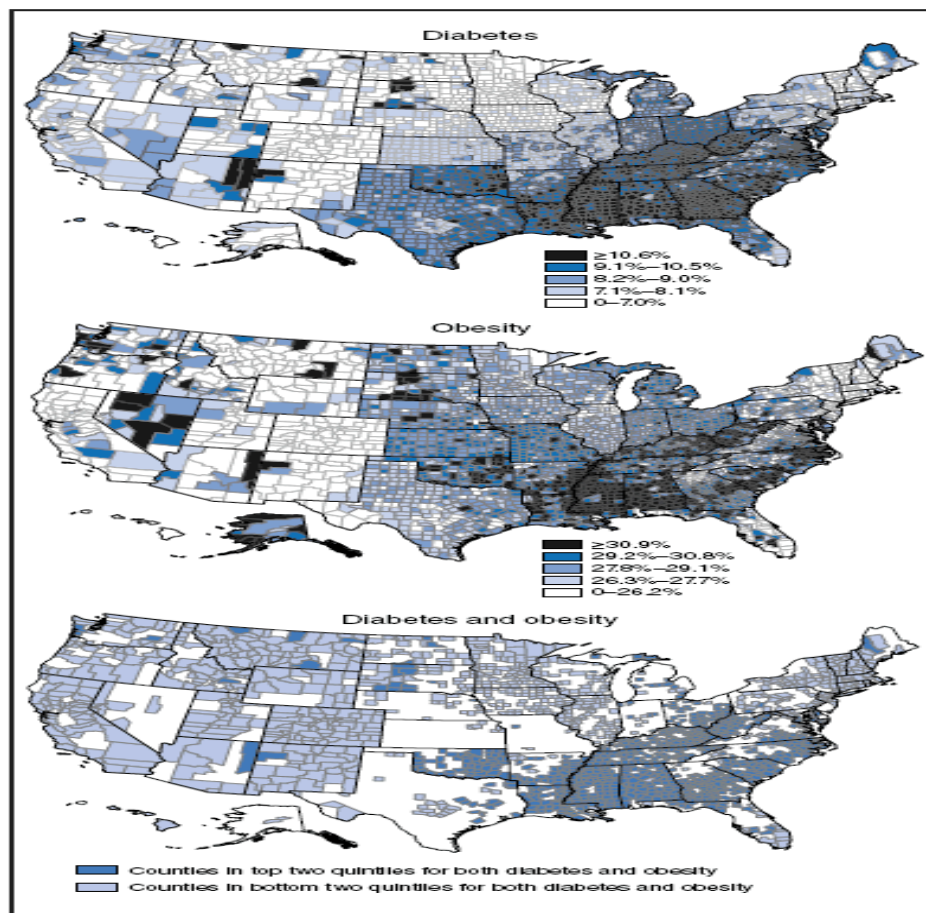
Note. Age-adjusted percentages of persons aged ≥ 20 years with diabetes and obesity, by county—United States, 2007. From "Estimated County-Level Prevalence of Diabetes and Obesity—United States, 2007," by Centers for Disease Control and Prevention, 2009, *Morbidity and Mortality Weekly Report*, *58*(45), p. 1261

https://www.hsdl.org/?view&did=3608. In the public domain.

In 2015, an estimated 30.3 million people of all ages in the United States had diabetes. Of the 30.3 million, 7.2 million were unaware that they had diabetes. The diabetes rate increases with age. Of the 23.1 million diagnosed diabetes cases, only 132,000 individuals are younger than 18 (CDC, 2017).

Diabetes occurs in all races, but it does affect some races more than others. Diabetes occurs in 15.1% of American Indians/Alaska Natives, 12.7% of non-Hispanic Blacks, 12.1% of people of Hispanic ethnicity, 7.4% of non-Hispanic Whites, and 8% of Asians. Among people of Hispanic ethnicity, Mexicans have the highest prevalence of diabetes at 13.8%. Next is Puerto Ricans at 12.0%, and last is Central/South Americans at 8.5%. Among people of Asian ethnicity, Asian Indians have the highest prevalence of diabetes at 11.2%. Chinese have the lowest prevalence of diabetes among people of Asian ethnicity at 4.3%.

The mortality rate is 1.8 times higher for people with diabetes compared to those without diabetes. Complications of diabetes can cause kidney failure, heart disease, extremity amputations, and blindness. In addition to all of the health-related difficulties related to diabetes, the cost of this chronic disease causes a lot of financial strain. According to Healthy People 2020, the cost of diabetes was $245 billion in 2012. This cost included medical care and treatment as well as disabilities and death related to complications from diabetes (Healthy People, 2011).

As Bolla et al. (2019) noted, "reducing carbohydrates intake with a low carbohydrate diet is effective in reducing body weight and, in patients with Type 2 diabetes, improving glycemic control, with a stronger effect with a very low carb diet"

(p. 8). For this DNP staff education project, providers will be educated about the importance of recommending a low-carbohydrate, high-fat, non-calorie-restricted diet in patients with prediabetes and uncontrolled Type 2 diabetes. They will learn that patients should reduce carbohydrate intake to between 20 and 50 grams of carbohydrates a day, and protein content should remain the same as long as it meets minimum recommendations. "As carbohydrates lead to elevated glucose levels in diabetes, fatty acids provide an alternative energy source that can provide adequate fuel without elevating glucose levels in the same way as carbohydrate" (Saslow, 2014, p. 2). With this diet, blood sugar should remain stable, and weight should decrease.

According to the Harvard School of Medicine (2019), unlike other low-carb diets, which focus on protein, a ketogenic plan centers on fat, which supplies as much as 90% of daily calories. Extremely low-carb foods are preferred on the ketogenic diet. Seafood is a low-carb option that is high in omega-3, vitamin B, and potassium. Nonstarchy vegetables such as cauliflower and zucchini are great options for the ketogenic diet and add fiber and vitamin C to the diet. Cheese and avocados are great additions to the ketogenic diet due to taste and low carb count. Cheese increases protein and calcium in the diet, while avocados contain several vitamins improving cholesterol and triglyceride levels. Eggs, meat, and poultry are a big part of the ketogenic diet, as they contain zero carbs while offering a high protein source. Coconut oil and olive oil contain no carbs and could be ideal for a salad. Plain yogurt, berries, and nuts are ideal for snacks. Carb-free drink options include unsweetened coffee and teas (Harvard Medical School, 2019).

Without spikes of glucose from carbohydrates, individuals are at risk for hypoglycemia. Providers must be educated to reiterate to patients the importance of regular blood sugar level monitoring and the risk of hypoglycemia with the ketogenic diet. When blood sugar drops, dangerously low symptoms such as shakiness, dizziness, sweating, and lightheadedness may be experienced. Individuals may also experience mental confusion, headaches, blurred vision, and slurred speech. Those who are on medication to control blood sugar are advised to check blood glucose first thing in the morning while they are fasting, and just before dinner (Saslow et al., 2014).

Evidence shows the advantageous effects of a long-term ketogenic diet such as the reduction of body weight and body mass index. Additionally, it increases high-density lipoprotein cholesterol levels and decreases the level of triglycerides, low-density lipoprotein cholesterol, and blood glucose. A ketogenic diet should be considered a lifestyle change. According to recent studies, implementing a ketogenic diet for longer periods of time did not produce any meaningful adverse reactions in patients (Athinarayanan et al., 2020). Studies confirm that it is safe to use a ketogenic diet for a more extended period than previously demonstrated.

Purpose Statement

The practice-focused question for this DNP project is the following: Will educating medical staff at a family practice clinic about a ketogenic diet in prediabetic and diabetic patients improve knowledge and the likelihood of recommending a ketogenic diet as a form of diabetes control for prediabetic and diabetic patients? According to Evert et al. (2019),

Strong evidence supports the efficacy and cost-effectiveness of nutrition therapy

as a component of quality diabetes care, including its integration into the medical

management of diabetes; therefore, it is important that all members of the health

care team know and champion the benefits of nutrition therapy and key nutrition

messages. (p. 731).

This doctoral project has the potential to address a gap in practice by educating providers

so that they can educate their diabetic patients about the benefits of implementing a

ketogenic diet in nutrition therapy as an adjunct treatment for diabetes.

Nature of the Doctoral Project

A literature review of sources from the last 5 years was completed using

databases from the Walden Library. Using key search words related to my subject and

grading evidence was an essential component in this process. Data obtained from this

search were organized and displayed within a PowerPoint presentation. This was used to

educate providers on the benefits of a ketogenic diet in diabetic patients, thus improving

control of diabetes with diet.

Significance

Stakeholders were those who might be impacted by this project. Stakeholders

included staff and patients. Staff was educated on the effects of a ketogenic diet on

diabetes. They would, in turn, recommend a ketogenic diet to diabetic patients. One

major factor in nursing practice is prevention. Controlling diabetes with a ketogenic diet

can prevent many other complications of diabetes. Creating a change in the eating habits

of individuals with diabetes may lead to an increase in societal health that has a positive impact on society.

Summary

In summary, diabetes is a chronic health issue that leads to many other chronic medical issues. One major factor in controlling diabetes is diet. Educating individuals about the ketogenic diet will not only benefit the individuals but also increase the overall health of their community. Section 2 provides a more in-depth description of the project, including background information and relevance to nursing practice.

Section 2: Background and Context

Introduction

Type 2 diabetes occurs when the body cannot produce enough insulin, or the body does not respond to insulin. Obesity increases the risk for diabetes and tends to contribute to decreased control of diabetes. The purpose of this study was to educate staff on specific nutritional therapy for diabetic patients. The practice-focused question was the following: Will educating medical staff at a family practice clinic about a ketogenic diet in prediabetic and diabetic patients improve knowledge and the likelihood of recommending a ketogenic diet as a form of diabetes control for prediabetic and diabetic patients?

Concepts, Models, and Theories

The analysis, design, development, implementation, and evaluation (ADDIE) model of instructional design is a five-step, systematic approach to the development of educational materials. As Aldoobie (2014) explained, "This model is an approach that helps instructional designers, any content's developer, or even teachers to create an efficient, effective teaching design by applying the processes of the ADDIE model on any instructional product" (p. 68). During the analysis stage of the ADDIE approach, the determination of what will be included in the teaching plan occurs. How it is to be learned is determined in the design stage. After the design stage, the process of producing the teaching materials is achieved in the development stage. During the implementation phase, the educational content is delivered to the intended audience. Lastly, the evaluation phase includes assessing the sufficiency of the education. Using this model

provided a template to create efficient and organized learning content; it also allowed for evaluation and feedback to ensure improvement.

Relevance to Nursing Practice

Obesity remains a major nationwide health threat. Many chronic illnesses such as hypertension, diabetes, and heart disease are related to obesity. The obesity epidemic is largely the consequence of an unhealthy lifestyle and poor nutritional habits. For diabetic patients, dietary education has focused for years on limiting sugar intake and adhering to a low-fat diet. One diet regime that has proven to be very efficient for weight loss is a ketogenic diet. Most believe that high-fat diets cause obesity; however, studies are showing the opposite. According to Maswood (2020), animal studies did not show a causal relationship between high-fat diets and obesity. On the contrary, very low carbohydrate and high-fat diets such as the ketogenic diet have shown to be beneficial to weight loss. Controlling obesity will help to decrease and prevent the prevalence of diabetes.

Educating providers about the ketogenic diet will empower them with information to help them teach their patients and refer their patients to use this diet to help control their prediabetes and diabetes. The educational content explains that the intention of the ketogenic diet is for the body to use a different type of energy. Glucose that comes from carbohydrates is what the body uses for energy; however, when in ketosis, the body is able to use stored fat for energy. This helps in burning fat, increasing weight loss, and stabilizing glucose. Also included in the educational content are the types of food on the ketogenic diet. Including different food options gives providers options to present to

patients during patient education about the ketogenic diet. Some foods allowed on the ketogenic diet are seafood, cheese, avocados, eggs, meats, and carb-free drinks. The ketogenic diet mostly contains fats, which account for about 70% of daily intake. Carbohydrates account for about 20 to 50 grams a day. Additionally, patients should meet minimum protein recommendations of 56 grams/day for men and 46 grams/day for women. High-carb foods and sweets should be avoided; for example, pasta, rice, and cakes are not recommended for this diet. Including the many benefits of the ketogenic diet in the teaching plan gives providers grounds to initiate the ketogenic diet not only in diabetic patients but other patients as well. The educational content includes summaries of recent studies that focused on the ketogenic diet. Displaying the evidence behind the ketogenic diet assures providers that they are recommending a diet that has been researched and has proven beneficial.

Local Background and Context

Diabetes is a nationwide medical issue that is affecting millions. What is true nationwide is also true in Arkansas. According to the Arkansas Diabetes Association, in 2014, 1 out of 9 adults in the state of Arkansas was diagnosed with diabetes, and more than one third had prediabetes. Approximately 75,000 adults in Arkansas had diabetes but were undiagnosed, and 797,000 adults in Arkansas had prediabetes. Medical expenses for individuals with diabetes are nearly 2.3 times more than for those who do not have diabetes.

There are many resources in place in Arkansas to combat the rise of diabetes. Diabetes research projects have been conducted in Arkansas by the NIDDK at the

National Institutes of Health with costs totaling over $1,000,000. Educational programs sponsored by the CDC have also been provided for Arkansas residents.

Role of the DNP Student

I work as a nurse practitioner in the state of Arkansas. Diabetes has affected many of my patients, family members, and friends. I have a vested interest in increasing my knowledge about diabetes and factors that improve and hinder the control of diabetes. My goal is to see my patients, family, and friends live healthy, productive lives. There is a large amount of evidence supporting a ketogenic diet in diabetic patients, and my goal is to share that with as many people as I can.

Summary

Diabetes is not only a nationwide issue; it is also a local and personal health issue, as it affects many of my friends and family members. Obesity is a major risk factor for diabetes. Decreasing weight while controlling diabetes with the ketogenic diet is a proven technique. Benefiting those in need through sharing my knowledge and experience is my motivation.

Section 3: Collection and Analysis of Evidence

Introduction

Obesity has contributed to the rise in diabetes rates. Focusing on nutritional guidance can combat obesity while decreasing the risk for prediabetes and diabetes. A ketogenic diet focuses on increasing fats and eliminating carbohydrates. Initiating this diet will improve diabetic control, thus increasing population health. The following section focuses on evidence obtained and analysis of the evidence.

Practice-Focused Question

Will educating medical staff at a family practice clinic about a ketogenic diet in prediabetic and diabetic patients improve knowledge and the likelihood of recommending a ketogenic diet as a form of diabetes control for prediabetic and diabetic patients?

Sources of Evidence

A literature review of sources from the last 5 years was completed using databases from the Walden Library and search engines. Databases used included but were not limited to CINAHL Plus with Full Text, PubMed, TRIP Database, CINAHL & MEDLINE Combined Search, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), Joanna Briggs Institute EBP Database, Ovid Nursing Journals Full Text, ProQuest Health & Medical Collection, and PsycINFO. My search included Internet Explorer and Google. Key search words included *ketogenic diet* and *ketogenic diet in Type 2 diabetes*. A Walden librarian was consulted for assistance with a literature search. The collected evidence demonstrated the effects of the ketogenic

diet through monitoring diabetic control and weight as well as explaining exactly what

the ketogenic diet consists of, addressing the practice-focused question. The purpose of

the literature review was to establish a positive correlation between the ketogenic diet and

diabetic control. The literature was used to develop the educational content to inform the

learners about the benefits of the ketogenic diet and specifically how it can positively

affect those with prediabetes or diabetes. It is my intention that, after reviewing the

evidence and understanding the impact that this diet can have on their prediabetic and

diabetic patients, the providers will have a good understanding of the ketogenic diet and

will be more likely to recommend the ketogenic diet as a part of a treatment plan to

prevent and control diabetes.

Evidence Generated for the Doctoral Project

Participants

Participants included three medical doctors, two nurse practitioners, and three

medical assistants. They were relevant to the study because they treat patients in the

clinic who could benefit from following the ketogenic diet as a means of preventing

prediabetes or treating diabetes. The practice-focused question was aimed toward an

increase in knowledge and greater likelihood of recommending the ketogenic diet to this

patient population.

Procedures and Protections

The steps for developing a staff education project are planning, implementation,

and evaluation. For planning, I conducted discussions with my committee chair and

office manager exploring various topics. While working at the clinical site where the

education was done, I noticed many diabetic patients with uncontrolled diabetes. Patients understood that diet was a major factor in diabetes, but the education that they were being provided was limited to recommendations about decreasing intake of sweets. There was not any education about types of food to eat or avoid to gain the best possible control of their diabetes. The ketogenic diet provides guidance about what to eat and what to avoid to get the best health benefits.

Evidence was gathered from several search engines and databases about the ketogenic diet and diabetes. A literature review of sources from the last 5 years was completed using CINAHL Plus with Full Text, PubMed, TRIP Database, CINAHL & MEDLINE Combined Search, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), Joanna Briggs Institute EBP Database, Ovid Nursing Journals Full Text, ProQuest Health & Medical Collection, and PsycINFO. Search engines including Google and Yahoo were also used. Key search words included *ketogenic diet*, *Type 2 diabetes*, *obesity*, *nutrition*, and *diabetes risk factors*.

As Meader (2014) explained, "The grading of recommendation, assessment, development, and evaluation (GRADE) approach provides guidance on rating the quality of research evidence in health care". (p. 1) The GRADE approach is used by hundreds of organizations worldwide to evaluate the quality of evidence and endorse recommendations. It consists of five steps. Each step helps in determining that the evidence behind using the ketogenic diet is consistent and result in benefits for prediabetic and diabetic patients.

Step 1 is based on ranking evidence based on study type (randomized controlled trials [RCTs] or observational studies). During Step 2, the evidence rankings are downgraded or upgraded based on numerous factors such as risk of bias, sample size and consistency, and treatment effect. In Step 3 of the GRADE approach, a final grade of high, moderate, low, or very low is assigned based on the upgrading and downgrading in Step 2. Step 4 is where other factors that impact recommendations are considered, such as cost of the recommendation, side effects, and patient preference. Lastly, in Step 5, recommendations are graded as strong or weak, based on the treatment's overall benefit. This takes into consideration the quality of evidence and other factors outside the quality of evidence. After Institutional Review Board (IRB) approval, (04-16-21-0743371) the literature was synthesized to create content for a PowerPoint that was used to teach the providers about the health benefits of the ketogenic diet.

An expert panel was used to review the educational materials including pre- and post-education surveys to validate content or indicate any needed revision with recommendations to ensure usability (Polit & Beck, 2008). After using an expert panel that included a senior medical doctor and the office manager to review the educational content and rate its validity, the next step was implementation.

During implementation, education was provided to three medical doctors, two nurse practitioners, and three medical assistants. The evaluation of the teaching project included having participants complete a pre-survey and post-survey rating. Before the class, learners were surveyed to collect data to show their understanding of the benefits of the keto diet and how often they recommended the keto diet. After the class, a post-

survey was used to measure improvement in knowledge about the keto diet, and

participants were asked how likely they were to recommend the keto diet. The objective

of the class was for medical professionals to have an increase in knowledge about the

ketogenic diet in prediabetic and Type 2 diabetic patients and for them to report the

likelihood to recommend it to their patients.

Demographic information was collected from the class participants with the pre-

and post-surveys in order to describe the sample and distinguish whether demographics

contributed to the willingness to initiate the ketogenic diet. No identifying information

was collected from the class participants. The goal was to show improvement in

knowledge and intent to recommend the ketogenic diet to prediabetic patients after

attending the class and learning how it could positively impact patients' health.

Analysis and Synthesis

The intended outcome of this DNP project was to determine whether an

educational intervention to teach providers about the benefits of the ketogenic diet to help

prevent and control diabetes is effective. Responses from a pre and post-class survey

were evaluated to determine whether there was an increase in knowledge and intent to

recommend the ketogenic diet. Descriptive statistics were used to describe the sample

and were presented in the aggregate. Inferential statistics were used to determine whether

there was an increase in knowledge and likelihood to recommend the diet.

Ethical Issues

There were no potential ethical issues noted in this staff education project. The

process of obtaining IRB approval aligned with Walden requirements. Participants were

asked to include a unique identifier on their pre and post-surveys to protect their

identity. All data were kept in a password-protected computer accessible only by me.

Per the Staff Education Manual from Walden University's Center for Research

Quality (2019), the site approval form was signed by the site representative for the staff

education doctoral project and prior to the dissemination of the project in ProQuest as a

doctoral capstone. The project proposal was submitted to the Walden IRB after chair and

committee approval.

Alignment

There is an overwhelming need for the prevention and control of diabetes

(Healthy People 2020, 2011). Aligning a need with steps to consider all implications of a

decision is a prodigious way to resolve the need. This project aligns with Walden's

mission of positive social change. Walden University concentrates on motivating and

celebrating the extraordinary achievements of community members whose goals are to

make a difference by addressing challenges in their everyday lives, in their careers, and in

the world around them (Walden University, 2017). This has inspired me to educate others

by giving them the tools needed to address and manage the challenges of life.

Summary

In Section 3, I defined the practice-focused question, presented sources of

evidence, and outlined the steps for implementing this staff education project. In Section

4, the results and implications of the education are presented, along with

recommendations based on the results.

Section 4: Findings and Recommendations

Introduction

The practice-focused question for this project was the following: Will educating medical staff at a family practice clinic about a ketogenic diet in prediabetic and diabetic patients improve knowledge and the likelihood of recommending a ketogenic diet as a form of diabetes control for prediabetic and diabetic patients?

The goal was to increase medical providers' knowledge and the likelihood of recommending the ketogenic diet to the prediabetic and diabetic patient population within a family practice setting. Educational content was presented to three medical doctors (MDs), two family nurse practitioners (FNPs), and three medical assistants (MAs). They provided direct patient care to many patients with diabetes and prediabetes. These patients would benefit from following the ketogenic diet as a form of diabetic and prediabetic control.

Findings and Implications

Eight staff members (MDs, NPs, MAs) participated in the educational intervention ($n = 8$). Originally, this teaching was designed for providers; however, there were medical assistants present for the education session. The majority of the participants were female (n = 6), at 75%. Among participants, 37.5% reported being 50 years of age and over. Less than half, 37.5%, of the participants were medical doctors (n = 3), while 25% (n = 2) were nurse practitioners. Medical assistants represented 37.5% (n = 3) of participants. More than half, 62.5%, of the participants had 6 or more years of experience.

Table 1 includes demographic information for individuals present at teaching; 75% were female, and 25% were male. Ages ranged from the early 20s to the 60s. This teaching was designed for providers; however, there were medical assistants present.

The scale content validity index (S-CVI) and content validity index (CVI) were used to evaluate the educational material, presurvey, and post-survey. As Yusoff (2019) explained, "Content validity is defined as the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose". (p. 49) Three experts (a registered nurse and two nurse practitioners) accepted the invitation to participate in establishing the relevance of the materials to be used for this staff education. The experts were asked to review the PowerPoint presentation and presurvey/post-survey and rank each question for relevance from 1 to 4, with 1 being *not relevant* and 4 being *highly relevant*. Table 2 lists the individual ratings that experts gave for each question. Questions on the presurvey and post-survey were ranked as *highly relevant*, *quite relevant*, and *somewhat relevant* by experts. Based on this information, the item-level content validity index (I-CVI) for each question and the mean I-CVI score of 0.93 are also displayed in Table 2. Table 3 demonstrates the number of questions that each expert rated 1 or 2 (*not relevant* or *somewhat relevant*) and 3 or 4 (*quite relevant* or *highly relevant*). Based on this information, the S-CVI is 0.875, which is displayed in Table 3. Based on calculations, it was concluded that the presurvey and post-surveys achieved a satisfactory level of content validity.

Table 1

Demographic Information

	Total number	Percentage
Gender		
Female	6	75%
Male	2	25%
Age range		
20-29	1	12.5%
30-49	4	50%
50-60	2	25%
Over 60	1	12.5%
Professional role		
Medical doctor (MD)	3	37.5%
Doctor of Osteopathic Medicine (OD)	0	
Nurse practitioner (NP)	2	25%
Medical assistant (MA)	3	37.5%
Years of experience		
0 to 2 years	0	
3 to 5 years	3	37.5%
6 to 8 years	2	25%
9 to 10 years	2	25%
More than 10 years	1	12.5%

Table 2

Ratings on a Four-Question Survey: Items Rated on a 4-Point Relevance Scale

Questions	Rater 1	Rater 2	Rater 3	# in agreement	Item CVI
1	4	4	4	3	1
2	2	4	4	2	0.75
3	4	4	3	3	1
4	3	3	3	3	1
Mean I-CVI					0.93

Note. 1 = *not relevant*; 2 = *somewhat relevant*; 3 = *quite relevant*; 4 = *highly relevant*.

CVI = content validity index; I-CVI = item-level content validity index.

Table 3

Computation of Scale Content Validity Index: Items Rated on a 4-Point Relevance Scale

	Rater 1	Rater 2	Rater 3
Questions rated 1 or 2	1	0	0
Questions rated 3 or 4	3	4	4
Total	4	4	4
S-CVI = 7/8 = 0.875			

Note. 1 = *not relevant*; 2 = *somewhat relevant*; 3 = *quite relevant*; 4 = *highly relevant*.

S-CVI = scale content validity index.

Participant Results

The presurvey and post-survey consisted of demographic questions and four questions focused on the educational content. Those four questions were the following:

1. Rate your knowledge of the benefits of the ketogenic diet.

2. Rate your understanding of the benefits of the ketogenic diet.

3. How confident are you with the implementation of the ketogenic diet?

4. How likely are you to recommend the ketogenic diet?

There were a total of eight participants who were asked to complete these four questions on the presurvey and post-survey. Each participant completed each question, giving a numerical answer of 1-5, with 1 being *not at all likely* and 5 being *very likely*. Questions that were outside of the participant's scope of practice were scored 0. These questions and scores can be found in Table 4.

Those scores were evaluated for the mean score, and the paired *t* test was completed. The mean of the presurvey was 6.25 with a range of 0 to 14, while the mean score of the post-survey was 13.00, with a range between 4 and 18 (Table 5). The paired *t* test revealed that there was a significant difference between the presurvey and post-survey with the mean difference of 6.75, thus indicating that there was an increase in the willingness to initiate a ketogenic diet in prediabetes and diabetes patients as presented in Table 6. The paired *t* test also demonstrated a *p* value of 0.001, which indicates a statistically significant study. Additionally, all of the participants expressed a new level of understanding of the ketogenic diet and were prepared to initiate and educate patients about the benefits of the ketogenic diet.

Table 4

Pre- and Postsurvey Questions and Ratings

Questions	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8
Presurvey 1	4	3	3	2	3	1	0	1
Presurvey 2	4	1	4	1	1	0	0	1
Presurvey 3	3	2	2	2	3	0	0	0
Presurvey 4	3	1	3	1	1	0	0	0
Postsurvey 1	5	5	4	4	4	3	2	4
Postsurvey 2	5	5	5	5	5	3	2	3
Postsurvey 3	4	5	4	4	4	0	0	0
Postsurvey 4	4	5	4	3	3	0	0	0

Table 5

Paired Samples Statistics

	Mean	N	Std. deviation	Std. error mean
Presurvey	6.25	8	5.092	1.800
Postsurvey	13.00	8	6.256	0.009

Table 6

Paired Samples t Test (Paired Differences): Pre- and Postsurvey

	Mean	Std. deviation	Std. error mean	95% CI of the difference Lower	95% CI of the difference Upper	T	*df*	Sig
Presurvey-postsurvey	6.750	3.284	1.161	-9.496	-4.004	-5.183	7	0.001

Recommendations

The purpose of this study was to determine whether, with adequate education, providers will recommend the ketogenic diet to their patients with prediabetes and diabetes. The data demonstrate that providers will recommend the ketogenic diet to patients once educated about the ketogenic diet and its benefits. Medical assistants also reported feeling comfortable talking with patients about the types of food recommended on the ketogenic diet.

Strengths and Limitations of the Project

This educational content was created for medical doctors and nurse practitioners. However, medical assistants were in attendance and were welcome to attend the educational session. Unfortunately, some questions on the survey were unable to be answered due to their professional level, which was one limitation noted. The medical assistants expressed understanding of the information and reported that the information was easy to understand. This demonstrated that the information was delivered so that everyone could understand, which was a strength of the study. A recommendation for future projects is to include handouts for the audience to follow and use after the class as a resource for educating their patients. This would keep the audience more engaged and would be a great resource for them as they teach patients about the ketogenic diet. Another recommendation is to include a more diverse population of medical professionals, such as endocrinologists and nutritionists, to help ensure that the entire care team is sharing the same information about the benefits of the ketogenic diet.

Section 5: Dissemination Plan

Creating a dissemination plan for an institution that is a bustling family practice clinic with multiple providers can be challenging. Providers treat a wide variety of patients and have varied schedules and locations of practice. Teaching had to be in a form that was quick and efficient. This project was accomplished by offering a class that included a PowerPoint presentation. PowerPoint not only made it possible to educate multiple providers at a time it was also ideal for repeat education for new providers joining the clinic. Handouts of the PowerPoint were disseminated among the clinical leadership. Handouts were also given to the medical assistants to aid in reinforcement of patient education provided by the clinician.

The findings from the project will be shared with the facility leadership. A summary of results will also be shared with the staff. I would like to publish this work in addition to submitting it for publication to the ProQuest database with the intent of reaching more medical providers. The more providers who have this education, the more likely it is that the ketogenic diet will be recommended to patients, thus improving the health of the diabetic population and impacting positive social change. The findings will also be shared with the Arkansas Nurse Practitioner Association in an upcoming meeting.

Analysis of Self

In my role as a scholar, I found that this educational presentation was accompanied by many challenges. My initial DNP project was a systematic review, and when I initially submitted my prospectus, I learned that this type of project was no longer accepted. Starting over from the beginning with a new topic after just getting into the

flow of things will deter the best of scholars. However, I continued on my scholarly journey, and I am pleased that I did. This instilled a level of endurance and dedication. I had to be flexible and persistent in my quest to complete this degree. The COVID-19 pandemic also caused some hindrance to this DNP project. The recommendation of social distancing guidelines prevented the congregating of crowds, making the delivery of an educational presentation difficult. Fortunately, I was able to keep the number of attendees low and was able to complete the presentation in an area that allowed for social distancing. As a practitioner, I found that continuing this project after challenges took motivation and revealed my passion for my craft. During the beginning of this staff education project, the end seemed so far away. However, nearing its completion, I am so proud of the work completed.

This project contributed to my personal and professional knowledge of diabetic management and the ketogenic diet. During this project, I had the opportunity as an educator and project manager to design and implement a staff educational program for medical providers that allowed me to gain experience translating evidence into practice. This experience will be beneficial, as one of my long-term goals is to own and operate a family practice clinic. Completing this staff education project has shown that I can review the literature, design education, present it to staff, and analyze results. Hard work does pay off, and with hard work comes great reward.

Summary

In summary, diabetes and obesity are chronic conditions that contribute to many other chronic medical conditions. Educational content presented to different healthcare

disciplines addressed the ketogenic diet as nutritional therapy for diabetic and prediabetic patients. This staff education project showed that if providers are well informed about the ketogenic diet and what it does for prediabetic patients, they will recommend it to patients.

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Appendix A: Presurvey

Please fill out this survey before education presentation.

Gender?

Female ☐

Male ☐

Age range?

☐ 20-29 ☐ 30-49 ☐ 50-60 ☐ over 60

Professional Role

☐ MD ☐ OD ☐ FNP ☐ AGNP ☐ ACNP

Please rate your knowledge of the benefits of the ketogenic diet.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not at all   Very

Rate your understanding of the benefits of the ketogenic diet with diabetic patients?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not at all   Very

How confident are you with implementing ketogenic diet with diabetic patients?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not at all   Very

After attending this class how likely are you to recommend the ketogenic diet to your diabetic patients?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not at all   Very

Appendix B: Postsurvey

Gender?

Female   ☐

Male   ☐

Age range?

     ☐ 20-29   ☐ 30-49   ☐ 50-60   ☐ over 60

Professional Role

     ☐ MD ☐ OD ☐ FNP☐ AGNP   ☐ ACNP

Was the information presented new to you?

A lot?   ☐ Yes

A few things?   ☐ Yes

None?   ☐ Yes

After attending this class, please rate your improvement in knowledge of the benefits of the ketogenic diet.

     ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

     Not at all   Very

Rate your understanding of the benefits of the ketogenic diet with diabetic patients?

     ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

     Not at all   Very

How confident are you with implementing ketogenic diet with diabetic patients?

     ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

     Not at all   Very

After attending this class how likely are you to recommend the ketogenic diet to your diabetic patients?

     ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

     Not at all   Very

Ketogenic Diet for Prediabetic & Diabetic Patients

What is diabetes?

- Type II diabetes is when the body cannot produce enough insulin, or the body lacks to respond to insulin.

- Overweight and obesity is a risk factor for diabetes.

- The correct dietary management can lead to better control of diabetes and the withdrawal of diabetic medications.

The Purpose of the Ketogenic Diet

The intention of the ketogenic diet is for the body to use a different type of energy. Glucose that comes from carbohydrates is what the body uses for energy. When in ketosis, the body is able to use stored fat for energy. This helps burn fat and results in weight loss.
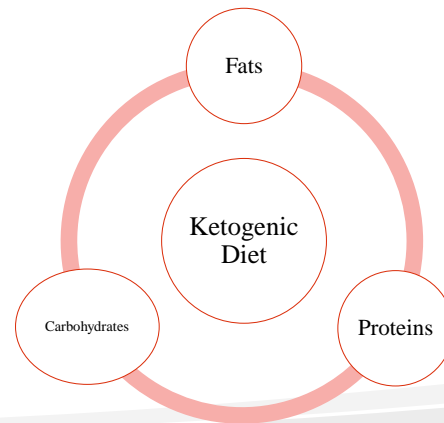
What is the ketogenic diet

- Eating high fat foods and limiting carbohydrates
    - Fat, which supplies as much as 70% of daily calories
    - Carbohydrate intake to between 20–50 grams a day

- Protein content should remain the same as long as it meets minimum recommendation (56 grams per day for men. 46 grams per day for women).

Foods included on the Ketogenic diet

- Seafood

- Non-starchy vegetables such as cauliflower and zucchini

- Cheese and avocados

- Eggs, meat, and poultry

- Coconut oil and olive oil

- Plain yogurt, berries, and nuts

- Carb-free drink

Fats

Ketogenic Diet

Carbohydrates

Proteins

Benefits of Ketogenic Diet

The ketogenic diet has many benefits. While this education focuses on the benefits of the ketogenic diet on diabetes and obesity, they do not stop there.

Ketogenic Diet effect on Diabetes

Conditions

- Endocrine Diabetes, type 1 Diabetes, type 2 Diabetes

- Obesity, weight loss

Proposed Mechanisms

- Reduced postprandial glycemic excursions, lower insulin requirement

- Reduced anabolic stimulation of adipose; partitioning of metabolic fuels

Benefits of Ketogenic Diet

Condition

- Cancer: (ancillary treatment), Brain, Breast, Colon, Endometrial Lymphoma Pancreaticobiliary Prostate

- Cardiovascular: Chronic inflammation, Dyslipidemia, Endothelial dysfunction, Insulin resistance

- Gastrointestinal: Fatty liver, Irritable bowel syndrome

Proposed Mechanisms

- Warburg effect; reduced concentration of insulin and other growth-stimulating hormones and factors; immune modulation; reduced side effects of chemotherapy, radiation

- Weight loss; reduced postprandial glycemia, insulinemia; anti-inflammatory effects of ketones

- Reduced postprandial glycemia, insulinemia; enhanced fat oxidation Microbiome; carbohydrate fermentation

Benefits of Ketogenic Diet

Conditions

- Neurological: Epilepsy, Mild cognitive impairment, Multiple sclerosis, Oxygen toxicity (underwater diving), Traumatic brain injury, Spinal cord injury

- Miscellaneous: Exercise tolerance, physical performance, Gangliosidoses, Infectious endocarditis, Lymphedema, Obstructive sleep apnea

- Psychological/psychiatric: Alcoholism, Autism spectrum disorder, Bipolar disorder, Mood disorders, Schizophrenia, Well-being/quality of life

Proposed Mechanisms

- Neuroprotective effects of ketones through reduced inflammation, edema oxidative damage, apoptosis, amyloid deposition; neural energy metabolism; epigenetic effects; microbiome

- Improved access to metabolic fuels, Increased efficacy, reduced side effects of primary treatment, Enhanced signal-to-noise ratio with 18F-FDG PET scan, Endothelial cell function; lymphatic transport, Weight loss; decreased visceral fat

- Reduced withdrawal symptoms; reduced craving and reward, mediated by nucleus accumbens; reduced neuroinflammation; neuronal metabolism; microbiome

Research studies showing ketogenic benefits

- The Frontiers in endocrinology published a study reporting the efficiency of a novel continuous care intervention including nutritional ketosis over 2-year period.

- The Women's Health Initiative dietary modification trial sponsored by the US NIH focused on the prevention of diabetes

- In the Clinical Cardiology journal, a study was published to determine the effects of a 24-week ketogenic diet showing the benefits of the ketogenic diet long term.

Ketogenic diet for the prediabetic and diabetic patient

- In summary the ketogenic diet allows the body to use fat instead of carbs as an energy source thus leading to weight loss. Also, this diet prevents spikes in blood glucose leading to control of diabetes.

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