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Diabetes and Navajo Nation

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Introduction

Why do I think diabetes is important for young Navajo children to understand? An observation of Native American Indians shopping at our local grocery store is frightening. Most young parents will fill up their shopping carts with sugary foods or foods that are high in carbohydrates. I am guilty of such acts, but by researching the effects of typical foods that we purchase on the Navajo Nation, I believe we can begin to develop better eating habits. The article by Special Diabetes Program for Indian (SDPI) shows data that was astounding.[1] Diabetes hit the Alaskan Natives (AN) and American Indians (AI) twice as much as the total population of United States adults. The diabetic rate for AN and AI is as high as 60% among adults, compared to 8.3% for U.S. adults. [2]

Diabetes is one of the most serious and devastating diseases in the United States, especially for AI/AN people, whom have the highest rates of diabetes in the world.[3] My job is to show our Navajo children that diabetes is becoming a bigger problem among their generation. SDIP shows a dramatic increase of diabetes in young Native American Indians from 1994 to 2009. Data shows increase as much as 110% in AI/AN youth ages 15-19 years and 161% in AI/AN young adults ages 25-34 years.[4] Developing a sound curriculum with good resources is a positive step in the right direction for our young generation's lives.

Rationale

The entire idea of living a healthy and balanced life is a goal of the Public Health Service. Culturally, elders want a healthier generation. So this research will allow young minds to begin thinking about the body and how poor choice of food can change the chemistry and affect the body. I want my students to become curious about the body and health, and also about the cultural teachings of what a healthy body means to our people, the Navajos.

Learning about our past history on social health is an enormous concept that we as elementary teachers cannot even begin to explain and how history's influences have altered society's health and well-being. The

leaders of the Navajo Nation are highly aware of the nutritional shift over the last several decades on the Navajo Nation Reservation. The Navajo Nation has programs such as Walk Across the Navajo Nation, and Just Move It, which help to bring awareness, reduce and prevent diabetes. Another program called Health Is Life in Balance has been implemented, which is a curriculum that is culturally embedded. Local clinic and hospital personnel have changed their perspective about people with Type 2 diabetes. Studies show that the amount of people with Type 2 diabetes has increased. Several questions came up as I looked at this information. How did our Navajo elders navigate their daily health in the past? If we understood this, could it help us today to delay or avoid Type 2 diabetes?

In this unit students will become knowledgeable about how the body processes sugar. Also, they will learn about our nation's diabetic epidemic. The diabetes studies are limited or not sorted by seven major communities on Navajos Reservation for student studies. Most data are clustered. There is abundant data on the Pima tribe from the southern region of Arizona. One article indicated that the Pima Tribe has the largest epidemic of diabetes in the world. The Pima tribe has more data about diabetes than the Navajo Tribe.[5]

In addition this unit will educate my class of young Navajo students about the human body. Our school district has a curriculum guide which includes this huge concept in a 6 week course on the human body. Within this unit, there is a section that covers the endocrine system. It is within this section that I will specifically teach about the functions of the pancreas. Imagine these fourth grade students downloading information from the internet about diabetes. The term diabetes is not foreign to them, but it is puzzling. This hormonal disease has been around our Navajo Nation since the 1950's. Diabetes has been around, but the emphasis of diabetes awareness has been weak. Recently, Navajo Nation Government and Public Indian Health Service have joined together in their efforts to educate the people about the basic facts of diabetes. It is through this initiative that people asking questions. How does one catch the disease? What part of the body stops working? What can be done prior to the disease's onset? What will happen if we don't pay attention to the disease? How can diabetes be conquered? The awareness of this disease is the first step. It's important to teach the functions of the human body and specifically the pancreas is a must. As I was reading about the pancreas, I began to realize that the people of our Navajo Nation need to start speaking and understanding the medical and scientific terminology of the functions of the pancreas. It is crucial to make our young people understand functions of cells, beta cell, alpha cells, f cells, negative feedback, etc.

The unit will increase the student's interest, but the initiative will help our local leaders see that more information on diabetes and terminologies are needed. It is a good start on our student's future of understanding the functions of the pancreas and hormonal disease.

For the most part of my unit, I plan to introduce the topic by going over the human body as a well-oiled working machine. However, as a person ages, the bad choices of not eating healthy foods and lack of exercise creates problems. After introducing a body of a healthy person, my unit will link the ideas and results of good vs bad nutrition to the cell reactions of too much sugar. Our fourth graders need to understand that diabetes does not affect a small section of the human body. It effects every organ system. As an extension, the unit will cover the effects on the liver and kidneys as well.

Background

This unit will discuss the Navajo Nation's epidemic with diabetes. The school district that will be partaking in this unit is my place of employment, Kayenta Unified School District. Most of the classrooms are populated by Native American Indians. The majority of the Native American Indians are Navajos. There are a few who are members of other Native American Tribes in the school district. Some students are descendants and are enrolled with other Native American Indian Tribes such as the Hopi Nation, the Ute Tribe, and other Pueblo Tribes that are adjacent to the Navajo Nation Reservation.

Kayenta is located in the northeastern part of Arizona and on the Navajo Nation Reservation. It is the gateway to one of the most beautiful eight wonders of the world, the land formation called Monument Valley. Film makers and tourists all travel to this location to embrace the beauty of one of Mother Earth's natural creations.

The Kayenta Service Area encompasses 4,500 square miles of beautiful red rock country on the northern portion of the Navajo Reservation.
http://citehealth.com/dialysis-centers/arizona/cities/kayenta/four-corners-dialysis-clinic-kayenta

At the Kayenta Elementary School, there are five grade levels in our school which range from kindergarten to fourth grade. Since our school has adopted Arizona College Career Readiness Standard, the unique design of this curriculum changed our way of selecting resources. The transition of direct instruction to guided and facilitated instruction has awaken our creativity to teach with many questions in mind. This type of teaching requires teachers to revisit their teaching style of delivery. Not only is the style of delivery changed, but the type of strategies used will help students deepen their understanding of diabetes.

Content: Overview of diabetes and the pancreas

How can sugar be so threatening to Native American Indians? The program director from the local community's clinics and the Diabetes Program stated that diabetes was around in the mid 1900's, but it was not a huge problem like it is today. They indicated how diabetes is treated is basically the same as earlier, but how fast the medical facility finds out which patient has diabetes is faster than before.

Anatomy of the Pancreas: Where is the pancreas located in our body? It is important for young children to begin to know the anatomy of a human body. The pancreas is estimated to be around six inches long and lays across the back of the abdomen, towards the rear of the stomach. The head of the pancreas is on the right side of the abdomen and is connected to the duodenum (the first section of the small intestine) through a small tube called the pancreatic duct. The narrow end of the pancreas, called the tail, extends to the left side of the abdomen. [6]

Structures (cells of the pancreas and cell): The pancreas contains clusters of cells called Islets of Langerhans, which include alpha cells and beta cells. There are more beta cells than alpha cells. Sherwood explains this in percentage. "The pancreas is an organ composed of both exocrine and endocrine tissues. The exocrine portion secretes a watery, alkaline solution and digestive enzymes through the pancreatic duct into the digestive tract lumen. Scattered throughout the pancreas between the exocrine cells are about a million clusters, or islands, of endocrine cells known as the islets of Langerhans. … [7]

Beta cells: What is a beta cell? Beta cells produce insulin. According to Sherwood, "…beta cells, which are the site of insulin synthesis and secretion and constitute about 60% of the total islet mass." [8]

Alpha cells: The alpha cells produce the hormone glucagon and make up 25% of the islet mass. The alpha cell is at normal level until the secretion of glucagon is needed. When that happens the liver makes sugar called glycogen. Glycogen then enters the blood stream to balance out the sugar level. Other cells are also present in the Islets of Langerhans:

Less common (making up 10% of islet mass), the delta cells are the pancreatic site of somatostatin synthesis. The least common islet cells (1% of islet mass), the F cells, secrete pancreatic polypeptide, which plays a possible role in reducing appetite and food intake,…(The remaining 4% of islet mass consists of connective tissue, blood vessels, and nerves) [9]

Ducts: The exocrine cells of the pancreas generate enzymes to help process food. These enzymes are secreted through tubes called ducts. The ducts are connected through the length of the pancreas and empty the fluids containing enzymes into the duodenum. The duodenum is the beginning part of the small intestine.

The endocrine part of the pancreas is made up of islets of Langerhans. These cells release hormones. Unlike the exocrine, it does not release anything into the ducts. The products of the islet cells are released into the bloodstream.

Physiology of the Pancreas: When the body is fed a process of storing the useful molecules in food begins. It is regulated by a process called negative feedback. This feedback explains how the blood sugar level is balanced. First, as the food passes through the digestive tract, the exocrine cells do their work. The enzymes of digestion releases glucose/sugar from food, which is absorbed into the blood stream. This increases the blood glucose levels. The islet of Langerhans which has the beta cells is alerted of the excessive sugar in the blood. The beta cell starts to release the hormone insulin. This insulin is released into the blood. Then the insulin targets body cells including the liver. Keep in mind that the liver stores sugar in a form called glycogen. In addition, the muscle cells is another place that glycogen can be stored. Once the sugar is pulled out of the blood, under the control of insulin, a decrease of sugar occurs in the blood. The beta cells then stop making insulin, in response to the negative feedback signal of low glucose.

The second way the pancreas function is when the body is not in taking food. In between meals, a body will sense a low blood glucose level. [10] When sugar from food is not immediately available, the liver will make its own supply of sugar in a process called gluconeogenesis. Since the body has a low level of sugar, it will have low levels of insulin. Low insulin causes an increase in gluconeogenesis in the liver. A second hormone is responsible for the release of glucose from storage. The alpha cells in the islets of Langerhans release glucagon into the blood. Glucagon is another hormone which is antagonistic to insulin. The glucagon triggers neoglucogenesis from liver glycogen storage. As this happens, a release of fresh glucose enters the blood. In this way, the blood glucose levels can rise, even when food is not being digested. The increase of glucose suppresses glucagon function by alpha cells and this process turns off the cycle.

Diabetes: If insulin is released from the pancreas, but does not function as it is supposed to, the sugar in the bloodstream increases to a level that is not healthy. Then it becomes a disease called diabetes. The amount of glucose in the blood sometime rises so that that some of it escapes into the urine. Production of sugary urine is one of the symptoms that tell a person of an onset of diabetes.

There are two types of diabetes. The first is Type I diabetes. "Type 1 diabetes mellitus is an autoimmune

process involving the erroneous, selective destruction of pancreatic beta cells by inappropriately activated T lymphocytes." [11] The reason behind the cell 'self-attacking' is not clear. It might be genetic cause or environmental. Because the beta cells are destroyed, the cell cannot make insulin to balance out glucose. This type of diabetes used to be mostly associated with juveniles and for that reason it used to be called juvenile diabetes. The treatment for this diabetes is insulin shots.

Type 2 diabetes is a hormonal disease in which the cells of the body become resistant to the insulin produced in the pancreas. The cause of type 2 diabetes is also unknown, but it can be related to a person's diet, amount of exercise, and genetics. In Type 2 diabetes the insulin released from the pancreas is not recognized by the body cells, preventing sugar storage. The glucose stays in the blood stream because insulin is not effective at storing sugar. This is called insulin resistance. When glucose concentration in the blood gets high, the kidneys cannot retrieve all the glucose so it is excreted into the urine. When there is such a high level of glucose in urine, the kidneys cannot absorb a lot of water. This leads to excessive urination and causes dehydration. With enough time, high glucose blood level can cause nerve damage to the eyes and outer body tissues, and of course kidney damage. Also, this high glucose level can wear down the cardiovascular system. [12]

Prevention and treatment of diabetes: Treatment and/or prevention for Type 2 diabetes could be better in the future by enforcing a screening and prevention program. [13] It is known through studies and Kayenta clinic presentations that a change of diet and exercise can prevent the onset of prediabetes and control type 2 diabetes. What is prediabetes? It is the malfunctioning of the glucose tolerance that does not quite fit the criteria for diabetes. Exercising and losing a minimal weight of 5% to 7% can make a huge difference in regulating or balancing the sugars in the blood stream.[14]

Other prevention advice that many Navajos hear from the Kayenta Diabetes Project is to reduce and manage your stress. As David Sledge, MD, medical director of diabetes management at The Ochsner Clinic Foundation in Baton Rouge, La indicated, stress makes your glucose levels rises. Then the stress hormones like epinephrine and cortisol enters your blood stream. The example of making energy to survive or fight-or-flight response kicks in. However people with diabetes have to regulate the sugar level because of food. When stress hormones are added on, the cells are working overtime to store sugars. We need to teach 4th grade students that both physical and emotional stress can prompt an increase in these hormones, resulting in an increase in blood sugars. Stress management is a treatment or preventative treatment for type 2 diabetes.

Diet / Navajo Culture's role in Diabetes*:* Today medical personal and staff that work with diabetes prevention advise that a balance of healthy food and exercise help control diabetes. The belief of balancing food intake and exercise hold true in the Navajo culture. Robert S. Young of Diabetes as a Disease of Civilization: The impact of Culture Change on Indigenous Peoples, explains how the Navajo culture views a healthy body. A healthy body ties nature, spiritual, physical, and mental understanding of existence.[15] In order for a body to be healthy, one practices respect of body. As young Navajo people, parents and elders direct us to choose food that will not harm us. Foods that are naturally grown are best to eat verses food that come in cans or packages are risky because it is not all natural. In addition our elders taught us to be balance spiritually. One has to run to the dawn each day. This allows your mind to intake a new positive beginning. A fresh mind set helps your body replenish itself. By having a new outlook for the day, an individual is balanced and able to make good healthy choices for the entire day. Today's traditional beliefs and attitudes among Navajo are different from long ago. Since the United States government issued commodity foods donated by the Department of Agriculture (USDA), the traditional way of collecting food and storing food changed. The dependence on canned or packaged food causes many Navajos to not plant and find fresh food. Today Navajo

rely on packaged and canned food because it is easier to store for later use. The old way of drying and preserving native food is not practiced in Navajo culture. Local health centers are beginning to share the information that eating high amounts of processed food causes weight gain. The weight gain leads to unhealthy living. Extra calorie intake is not balanced out with regular exercising. This dangerous cycle of eating, weight gain, and lack of exercise is recognized by diabetes prevention team. So teaching children about calorie count is the next best option to healthy living.

Weight loss by calorie count is definitely one effective method of non-drug prevention. Annals of Internal Medicine journal showed that reducing a 15% to 20 % of weight loss through calorie count is a good goal to start with. A manageable goal of 15% to 20% gives one success and endurance to continue a better lifestyle.

A high fat diet interferes with insulin action. “It is biologically plausible that high-fat diets promote weight gain, which then promotes insulin resistance. There is a large body of evidence that supports this view. In addition, there is growing evidence that obesity plays a central pathogenic role in the development of diabetes. This means that any dietary factor that promotes weight gain will likely promote the development of diabetes. The ubiquitous role of fat in fuel metabolism, energy and fat balance, and structure and function of cell membranes and also as a ligand for nuclear receptors that influence gene expression, make it highly plausible that both the total amount and type of dietary fat play an important role in insulin action, weight maintenance, and prevention of diabetes.” [16]

The U.K. Prospective Diabetes Study showed ”that the quality of blood glucose control plays a central role in the development of micro- and macroangiopathy in type 2 diabetes and that improved glycemic control clearly reduces the occurrence of secondary diabetes complications”. [17] There are three findings in this research. Patients increase their self-perception. Food, glucose level and well-being were recorded on a daily basis. Next finding was promotion of self-reflection. Patients had to record what worked well and did not work well with their blood glucose monitoring. What factors cause the levels to change? Imagine the discussion that helps them make better food choice. The last finding was the enhancement of self-regulation. Patients discuss how to use self-monitoring of blood glucose to help with diary entries to improve metabolic control and assess the probabilities of achieving set goals. All three findings assisted patients in having a balanced sugar level.

Choosing complex carbohydrates (whole grain, cereals) verses simple sugars (sweets) can help in control of diabetes. Study shows that a low glycaemic index diet with bigger amounts of fiber and smaller amounts of processed whole grain products seems to improve glycaemic and insulinaemic responses and lower the risk of Type 2 diabetes. The old saying of eating simple or complex carbohydrates is not a good indicator of getting Type 2 diabetes. [18]

Strategies

In this unit, the following strategies will be used to approach this unique topic. Students will make connections using semantic mapping. Semantic mapping is a cooperative learning technique that is group based. There are many reasons to use group based learning. During my informal text reading session, the students will benefit from a specific cooperative learning group. This cooperative learning approach is called ‘group processing. There will be no lectures about the anatomy and physiology of the pancreas. Instead each group will be responsible to read a certain section about the pancreas and be able to share with other groups. The

third strategy is science based but will be meaningful to students. A special science lab out of the classroom will be part of our introductory strategies. A science walk that includes an observation of products in our local grocery store might help students make a drastic change in daily diet. After the science observation of the grocery store, there will be a good amount of reading material that will be divided up among groups. Most of these readings will be about food that contains good and bad carbohydrates. In addition to our science observation on types of food in the grocery store, products from the store will be on display for reference. To keep the theme aligned; reading from our Special Diabetes Program for Indians curriculum will be used. This curriculum was donated by the local Indian Health Services. This unique curriculum is specifically for elementary schools and is called “Balance Life” (a diabetes awareness curriculum). In this resource, students will be able to find additional information about the diabetes that can help them conclude their findings for a report. Report will not be the only thing made by the students. Students will have the option to create a poster or pamphlet to present at a school board meeting or wellness event.

In conjunction with the science information, the teacher will present the history of Navajo diet and lifestyle. Examining the past can help students compare and debate the type of diet and lifestyle our ancestors had. By comparing and contrasting the concept, students will develop their own findings. The findings will help them discuss, debate, create their conclusions on their action towards Type 2 diabetes. A semantic mapping will imprint student’s mind of what percentage of the Navajo people have diabetes. Not only will the students read informational text but some short stories that relate to our Native culture. Possible literature to read and cover is available through Kayenta Public Health Service. This resource can be found on web site under Indian Health Service, Special Diabetes Programs for Indians.

Rationale of Strategies

Input chart: At the beginning of each main topic a sematic mapping will take place. One mapping will help them envision and interpret the data on percent of Native American and Alaskan Indian who are diabetic. Children will see what a 68% increase of Type 2 diabetes means by looking at the map of the Navajo Nation. To make it more relevant, students will take the total population of their local town and find 68% of the population. This activity will have a visual imprint of what Indian Health Service is conveying to Native American Indian.

The second sematic mapping will be about human anatomy and location of the pancreas. This input chart will be used as a resource to connect the idea of storing energy from sugars in the liver, fat and muscles.

The third sematic mapping will be the most important one. This map would display the pancreas and the cells. Within this illustration, an explanation of the negative feedback of glucose and glucagon will be drawn out for imprint the process of balance out the sugar in our blood stream.

Jig Saw reading will help students engage in discussion and developing questions pertain to their article or reading passages. The types of reading that students will be responsible for are topics about beta cells, alpha cells, negative feedback, functions of the pancreas, energy storage, etc. This concept will be challenging to learn. However, with teacher guidance and student driven question, the students will know what to research for clarity.

Poster presentation will be a summative assessment that will convey two messages: how does diabetes work in our human body system and how is sugar processed? Using classroom readings and group discussions, students will explain their learnings by drawing, writing small captions, graphing data, and short passages to magnify main ideas.

Creating a pamphlet and showing it to families sharing it at a school board meeting can be s cumulative assignment as well. Bracher, Cantrell and Wilke of Medical teaching have stated that assigning such a task can involve individual to hands-on learning, promotes problem-focused thinking, and encourages a great depth of knowledge about the topic. If questions were to arise the students will be confident and can demonstrate comprehension skills. [19]

Activities

Activity One: Student and teacher discussion on history of Navajo diet and lifestyle. The second part of this activity is to capture the student thoughts on Past lifestyle of Navajo diet. Once the timeline has been developed, students will concentrate on the event that relates to the

Students will use internet to research. For students to be successful, teacher will direct students to use google kids. Topics to assign to students are diabetes, pancreas, cells, glucose, glucagon, liver, kidney, insulin, and sugar storage. By assigning different topics, students begin to understand a specific information and can play the ‘expert’ and do a report back to the entire class. This cooperative learning strategy makes each group responsible for finding accurate information.

Activity two: During this activity, teachers will introduce terms that relate to endocrine system. Along with learning the terminology, students will create a booklet that illustrates the system. By creating a visual representation students can begin to learn the functions of a pancreas to the liver and kidney.

Activity Three: Creating speeches to persuade a family member or educators

The final activity will require students to create a speech that will persuade. In this speech students will share their findings about diabetes and prevention.

Teacher will work with students by reading their speech. After reading, each student will give their opinion of which part of the speech needs extra attention.

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Appendix

Standards

Fourth grade reading literature standards will help students understand the concepts of all the readings that relate to Type 2 diabetes. By comparing texts form literature and informational readings, students will get adequate exposure to understand the human body and the endocrine system.

Fourth grade informational text standards will assist students in the visual, oral, or quantitative presentations. Input chart will help students the functions of a pancreas and the physiology of the pancreas. In addition, any information gathered will be accumulated in charts, graphs, diagrams, time lines, and interactive elements on Web pages.

Fourth grade speaking and listening standards will give each collaborative group to present their research finding to an audience. An audience can be a small class or our community level event. Each presentation can focus and elaborate on concerns of how Type 2 diabetes can be regulated by our cultural and basic understanding of living a balance life. Students can monitor discussions within small groups by asking questions that are helpful in changing and improving diet on the Navajo Reservation. By posing and responding to specific questions, students can follow up on information, and make comments that contribute to the discussion and link to the remarks of others.

Notes

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