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Evaluating the Correlation of Diabetes and Gallbladder Disease

In Native Americans

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## PERMISSION

Title: Diabetes in Native Americans with Gallbladder Disease

Department: Nursing

Degree: Master of Science

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### **Abstract**

This paper reviews information about gallbladder disease, diabetes, and Native Americans to evaluate if such individuals are at increased risk of developing gallbladder disease in comparison to their non-Native American counterparts who do not have diabetes. Gallbladder disease is defined as cholecystitis, cholelithiasis, and cholecystectomy, unless otherwise noted. The case report evaluates a 47-year old obese female who presents with mid-to-right upper quadrant pain radiating to the back with a fever, tachycardia, and nausea after eating a meal the night prior to evaluation. The patient has a history of diabetes and a family history of gallstones. There is a higher incidence of both diabetes and gallbladder disease in the Native American population. However, no direct correlation between the two diagnoses within the Native American population was found in the literature. This paper also reviews the risk factors of developing diabetes, factors which increase the likelihood of developing gallbladder disease, and preventative measures for patient education. The information presented is important for preventative care and education for patients who have the risk factors for gallbladder disease, obesity, and diabetes.

*Keywords:* Gallbladder disease, cholecystitis, diabetes/diabetes type 2, Native Americans, American Indians

## Background

Gallbladder disease is a common occurrence in patients in Western countries. The case report that started this literature review is a middle-aged adult female presenting with acute abdominal pain to the right upper quadrant with fever, nausea, vomiting, and tachycardia. The diagnostic findings of an elevated white blood cell count, elevated liver function tests, positive Murphy's sign, and an ultrasound led to the conclusion of acute cholecystitis.

The literature was reviewed to determine if certain factors increase a patient's risk of developing gallbladder disease, particularly patients who have type 2 diabetes and are of Native American ancestry. According to Dunphy et al., (2015), gallstones were found in 75% of American Indian women over the age of 25. Native Americans are also 2.5 times more likely to develop diabetes in comparison to the non-Hispanic white population of the same age (Fretts et al., 2014). The purpose of this review is to determine if there is an increased risk of gallbladder disease as a result of having diabetes and being of Native American ancestry.

There are many factors that can increase or decrease the risk of certain diseases. Some of these factors cannot be changed, such as age, gender, race, or ethnicity. Other factors can be changed or altered, such as the patient's weight, lifestyle habits (smoking, alcohol use), diet, and activity level. Dunphy et al. (2015) lists risk factors associated with cholelithiasis as being of the female gender, obesity, pregnancy, increased age, rapid weight loss, diabetes mellitus, sickle cell anemia, spinal cord injury, cystic fibrosis, ileal disease, hemolytic diseases, cirrhosis, biliary stasis, and chronic biliary infections. Many of these risk factors can also increase a patient's risk of developing type 2 diabetes. Measures can be taken to prevent both gallbladder disease and diabetes. Healthcare providers have an important role in educating patients to make the best choices to prevent disease, thus optimizing their health.

Gallbladder disease, or cholecystitis, is the inflammation of gallbladder, which is commonly the result of gallstones (cholelithiasis) in the bile duct created over time due to the stasis of cholesterol (Dunphy et al., 2015). Gallstones are commonly made of cholesterol in 75-80% of cases (Di Ciaula, Wang, & Portincasa, 2018). Inflammation of the bile duct due to obstructing gallstones results in gastrointestinal upset, pain to epigastric region or right upper quadrant (RUQ) of the abdomen, nausea, and vomiting (Dunphy et al., 2015). These symptoms occur usually after consuming a high-fat meal. As inflammation worsens, the pain can become localized to the RUQ or can radiate to right flank or shoulder. Ultrasound is the gold standard for imaging and for diagnosis of gallbladder disease (Dunphy et al., 2015).

### **Case Report**

The patient is a 47-year old fair-skinned female, presenting with a complaint of constant pain to the middle and right upper abdomen after eating dinner last night. Pain rated 8-9 out of 10 on the pain scale, lasting for the past 12 hours. She complained of nausea, vomiting, and possible fever. The right upper quadrant pain radiates to right side of back and up to right shoulder; worse with movement or when lying down. Pain is described as dull in nature. Emesis was yellow in color after vomiting up meal. She vomited three times with symptoms starting after she ate dinner the night prior to presenting for evaluation. The patient reports that she has had abdominal pain like this episode before, but the pain had resolved after a couple of hours.

The patient complains of fever, nausea, and vomiting; denies diarrhea or constipation. She denies hematuria, blood in stool, or change in stool pattern. The patient denies any change in appetite, weight loss, or gain. A review of systems was otherwise unremarkable.

The patient has history of obesity, type 2 diabetes, and hypertension. She has no known allergies. Her current medications are metformin 1000mg daily and lisinopril 20mg daily. This

patient self-reports diet as comfort food, eating food that the children usually like, such as mac and cheese, and spaghetti and meatballs. She has no past surgical history. The patient has a family medical history of stroke, resulting in death of her father; her mother had gallstones. This patient is a nonsmoker, drinks 1-2 glasses of wine most nights, and does not use recreational drugs. She is married and lives with her husband and two children.

### **Assessment**

The physical assessment includes vital signs with a temperature of 99.5 F, pulse 102 bpm, respirations 20 bpm, blood pressure 116/70, and a body mass index (BMI) of 30.2 kg/m<sup>2</sup>. Upon assessment, this patient did appear to be in acute distress and discomfort, guarding abdomen. Bowel sounds were present in all four quadrants, tender to palpation with a positive Murphy's sign. The remainder of physical assessment was within normal limits.

Laboratory tests were conducted, finding an elevated white blood cell count, elevated alkaline phosphatase, and elevated total and direct bilirubin. These abnormal values are consistent with acute gallbladder disease. A comprehensive metabolic panel was ordered with amylase and lipase to rule out pancreatitis and a troponin to rule out myocardial infarction, which were all within normal limits as well. An abdominal ultrasound was ordered, since it is the standard imaging used to diagnose gallbladder disease and can also rule out pancreatitis, appendicitis, and a peptic ulcer (Dunphy et al., 2015).

Treatment of gallbladder disease is dependent on the severity of patient presentation and surgical risk, based on the patient's medical history. Symptomatic treatment includes rehydration with intravenous fluids, antiemetics for nausea, pain management, insertion of a nasogastric tube for persistent vomiting, and ingesting nothing by mouth. An early surgical intervention is the

treatment of choice for acute gallbladder disease to prevent serious complications, such as empyema and perforation (Dunphy et al., 2015).

### **Literature Review**

The patient in the case report meets several of the risk factors for gallbladder disease, being female, having diabetes, being obese, consuming an unhealthy diet, having a sedentary lifestyle, and being older in age. The literature was reviewed to define a possible correlation in a patient's risk of developing gallbladder disease, particularly patients who have type 2 diabetes and are of Native American ancestry.

### **Gallbladder Disease**

Aune and Vatten (2016) found that diabetes increases the likelihood of gallbladder disease by 56%. There is also a strong correlation with dyslipidemia, obesity, metabolic syndrome, and insulin resistance. The study done by Zheng (2018) evaluates the mortality of patients with gallbladder disease. Zheng (2018) found an increased prevalence of gallbladder disease in patients of Native American and Hispanic ancestry. These patients also had an increased mortality of gallbladder disease with cardiovascular disease and cancer.

Women are twice as likely to have gallbladder disease and have a cholecystectomy, which has been attributed to hormonal factors due to the gap between genders as age progresses (Figueiredo, Haiman, Porcel, Buxbaum, Stram, Tambe, & Setiawan, 2017). Figueiredo et al. (2017) believe that hormones in females increase the risk of developing gallbladder disease. Women who become pregnant and develop gallbladder disease, is thought to be due to the insulin resistance and hyperinsulinemia during pregnancy (Figueiredo et al., 2017).

In pregnant patients, it is recommended to initially treat as supportive care with pain control with narcotics because NSAIDS are not recommended during pregnancy due to the

antiplatelet effects. Surgical intervention is reserved for patients with intractable pain or obstruction due to gallstones. Preferred surgery is laparoscopic and has been done successfully in all trimesters of pregnancy (Abraham, Rivero, Erlikh, Griffith, & Kondamudi, 2014). During pregnancy, gallbladder disease can be treated with laparoscopic surgery.

Dyakiv-Koreiba (2018) found a correlation of increased incidence of gallbladder disease in women with combined pathologies, including diabetes. She also found hepatomegaly in 51% of the patients based on their ultrasound, stating that diabetes provokes the development of bile duct disease (Dyakiv-Koreiba, 2018). This information was very intriguing as it suggests that gallbladder disease is a possible consequence of diabetes. Patients with diabetes are more at risk for cardiovascular disease.

### **Native American Population**

Diabetes is prevalent within the Native American population as they are 2.5 times more likely to have diabetes compared to white non-Hispanic people in the same age group (Fretts et al., 2014). This number is astounding in such a small population. In 2009, the prevalence of diabetes was nearly 31% in the Native American population with the median age of onset 39 years of age (Fretts et al., 2014). Diabetes prevalence is increasing, affecting one out of three Native Americans.

Although high mortality rates for patients with gallbladder disease are low, the rates are increased within Native American patients. A group of surgeons in New Mexico evaluated a sample of patients of Native American ancestry that had less than optimal post-surgical results due to an increased risk of bile duct injury during laparoscopic cholecystectomies (Greenbaum, Alkahalili, Li Luo, Rajput, Nir, Luo, 2017). This condition is hypothesized to be resulted from genetics affecting biliary anatomy, late access to care due to cultural norms, and the rurality of

the state and Native American communities (Greenbaum, Alkhalili, Li Luo, Rajput, Nir, & Luo, (2017). This common occurrence for increased complications of health conditions does not normally have high mortality rates in populations of lower socioeconomic status, leading to late care or absence of follow up after hospitalization.

### **Diabetes and Gallbladder Disease**

Diabetes is one of the most important risk factors related to the development of gallstones, which is the most important risk factor for gallbladder cancer. Gallstone formation is similar to the metabolic abnormalities seen with obesity, metabolic syndrome, insulin resistance, and type 2 diabetes (Di Ciaula, 2018). With the rates of diabetes in the Native American population, the number of expected patients with gallbladder disease is shocking.

In the literature, it was found that diabetes alone is associated with 75% increased risk of gallstone cancer (Gu, Yan, Wang, Shen, Cao, Fan, & Wang, 2016). Gu et. al. also report that having gallstone disease may predict the development of diabetes. With the close correlation between the two, it is suggested that patients with either diabetes or gallbladder disease be monitored for gallbladder cancer as well. More research is needed to clarify the correlation (Gu et. al., 2016).

Due to the high incidence of gallbladder disease in patients with diabetes, it is imperative to know if medications can have a causative effect also. This conclusion was, in fact, proven in a study that correlates an increased risk of gallbladder disease when using incretin-based drugs, specifically the GLP-1 analogues (exenatide and liraglutide) in the management of diabetes. The rapid weight loss effect of this class of medications is thought to be the correlation to the increased risk of gallbladder disease. Rapid weight loss causes supersaturation of cholesterol in the bile duct, leading to the formation of gallstones (Faillie, Yu, Hui Yin, Hillaire-Buys, Barkun,

Azoulay, & Yin, 2016). Patients having a diagnosis of diabetes increases the risk of the development of gallbladder disease. Managing patients' medication and the possible side effects is imperative and should be monitored closely to prevent further complications or development of other comorbidities.

### **Treatment**

Current guidelines for care of patients with diabetes include a regimen of a statin, beta blocker, and aspirin for cardiovascular protective effects due to the comorbidities (American Diabetes Association, 2018). Diabetes is commonly seen with hypertension and increased cholesterol, which can lead to cardiovascular disease. These guidelines are cardiovascular protective and will promote better outcomes for patients.

Implementation of two or three of the American Heart Association's Life Simple 7 (a physically active lifestyle; healthy diet; healthy BMI; avoiding smoking; and lower blood pressure, fasting glucose, and low total cholesterol) was found successful in its study of a group of American Indians. It was positively associated with a decrease in diabetes (Fretts et al., 2014). As healthcare providers, it is imperative to educate patients about the risk of being overweight, living a sedentary lifestyle, using alcohol and tobacco, and consuming an unhealthy diet to prevent diabetes and decrease the chance of developing gallbladder disease.

### **Conclusion: Learning Points**

Despite being unable to come to an absolute conclusion to determine a cause and effect relationship between diabetes and gallbladder disease in patients of Native American ancestry, it is clear that the risk factors for both gallbladder disease and diabetes are the same. It is also clear that the correlation between diabetes and gallbladder disease cannot be ignored. With this, it is important to aim at prevention, both primary and secondary.

The application of prevention strategies will help families develop and live healthier lifestyles for parents and children alike. Implementing at least two of the seven American Heart Association's Life's Simple 7 will also prevent diabetes and a healthy lifestyle (Fretts et al., 2014). In educating patients on preventative care, healthcare providers can aim to prevent the development of both diabetes and gallbladder disease in all patients.

Although the following strategies are already known for the prevention of diabetes, these can be applied to prevent gallbladder disease as well.

- Dietary changes: Curb caloric intake, healthy food choices, limit sweetened beverages, decrease portion sizes, eat breakfast everyday
- Limit the amount of times eating takeout food
- Activity: Increase exercise to at least three times per week
- Limit screen time
- Lower/maintain normal glucose and cholesterol/lipid levels

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