Spring 5-16-2020

Impact of diet on gallbladder disease in adult women

Raina Weyrauch
raina.weyrauch@und.edu

Impact of Diet on Gallbladder Disease in Adult Women

Raina Weyrauch, FNP Student

NURS997 Independent Study

Jana Zwilling

March 29, 2020

PERMISSION

Title: Impact of Diet on Gallbladder Disease in Adult Women

Department: Nursing

Degree: Master of Science

In presenting this independent study in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the College of Nursing & Professional Disciplines of this University shall make it freely available for inspection. I further agree that permission for extensive copying or electronic access for scholarly purposes may be granted by the professor who supervised my independent study work or, in his/her absence, by the chairperson of the department or the dean of the Graduate School. It is understood that any copying or publication or other use of this independent study or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my independent study.

Signature Raina Weyrauch

Date _____03/16/2020_____

Impact of Diet on Gallbladder Disease in Adult Women

Abstract

Gallbladder disease including gallstones is the most common disease associated with the gastrointestinal system (Zhang et al., 2019). There are more than 700,000 cholecystectomies performed each year in the U.S. which creates an economic burden of approximately $6.5 billion (Figueiredo et al., 2017). Women are twice as likely to develop gallbladder disease, compared to men, in the United States (Lander et al., 2016). Some risk factors associated with gallbladder disease can be modified like diet and weight loss. There are also risk factors that cannot be modified. An example of a non-modifiable risk factor would be the influence of estrogen on cholesterol metabolism (Di Ciaula & Portincasa, 2018). The objective of this paper is to determine if changes in diet can help decrease the frequency of gallstones in adult women.

Background

Women make up 70% of cases of gallbladder and gallstone disease in the U.S. (Lander et al., 2016). Most cases of gallbladder disease are asymptomatic. The cases that are symptomatic usually require surgery, costing patients and the healthcare system a significant amount of money. The predisposition women have to gallbladder disease can be due to hormonal influences and the use of oral contraceptives (Lander et al., 2016). Having three or more children also increase the risk of gallstone by more than 5 times as well a losing weight quickly, being single, having an family history of gallstone and eating a high calorie diet (Jessri & Rashidkhani, 2015).

Healthcare providers must look at modifiable risk factors to educate our patients on, in order to decrease the chances of a women getting gallstones and gallbladder disease. The leading modifiable risk factor for gallbladder disease is diet (Lander et al., 2016). There are many diets

out there such as Keto, Atkin's, vegetarian, and vegan to name few. So, what diet would be best to help prevent or protect against gallbladder disease and gallstones? The research focuses mostly on the difference between diets high in fruits and vegetables and diets high in fat and protein. The patient in the case study below may have benefitted from this research, which may have prevented her cholecystitis.

Modifiable risk factors for cholesterol gallstones include obesity, rapid weight loss and a sedentary lifestyle. Healthy diet and exercise can help lower the chances of obesity, high blood pressure, hyperlipidemia and diabetes all which increase a women's chance of getting gallbladder disease. Biliary sludge is also a risk factor. Pregnancy, cirrhosis, Crohn's disease, and chronic hemolysis and certain medications such as: ceftiaxone, octreotide and thiazide diuretics, and total parenteral nutrition or fasting increase the probability of having biliary sludge (Stinton & Shaffer, 2012). Having very calorie restrictive diet and losing weight very quickly can also increase the rate at which cholesterol gallstones form (Lee et al., 2019). Tobacco and alcohol use are also modifiable risk factors in women's risk of gallbladder disease (Figueiredo et al., 2017).

Non-modifiable risk factors include having more than four children, having a first child before the age of 20, and the use of estrogen only hormones for menopause (Figueiredo et al., 2017). Estrogen can influence the metabolism of cholesterol. Estrogen increases the production of cholesterol and deceases the production of bile acids. The bile salts breakdown the cholesterol normally in humans (Di Ciaula & Portincasa, 2018). Ethnicity, advancing age and genetics are also non-modifiable risks factors (Stinton & Shaffer, 2012).

Case Report

A 47-year-old female presented to the clinic with complaint of right sided abdominal pain.

History of present illness: Pain started four days ago to the right upper quadrant she had this pain for the past several days with increasing intensity and rated the pain at an 8 out of 10. She described the pain as being dull which had become more constant and more painful in the last twelve hours. The patient had some stomach pains after meals previously but those resolved after a few hours. She stated she had never had pain like this before. The pain began radiating around the right side of her abdomen to her back. Moving and lying on her back made the pain worse and sitting hunched over or lying on her side seems to help a little bit but nothing made the pain go completely away. She also complained of nausea but no emesis. Patient denied chills or night sweats or out of the ordinary fatigue, changes in stool. No recent weight loss or weight gain.

Review of Systems: A complete Review of Systems was obtained and is negative except as stated in HPI.

Physical examination:

Vital signs: Temp: 99.5°F, BP: 116/70, HR: 102, Resp: 20, BMI: 30 kg/m2.

General appearance: Well developed, obese female who appears her stated age. She appears to be in mild distress.

Skin: No pallor or jaundice, no rashes, edema or cyanosis.

Lungs: Lung sounds clear bilaterally not wheezes, rubs or crackles.

Cardiac: RRR, no murmurs, S1 and S2 auscultated

Abdomen: Soft, round, very tender to right upper quadrant and epigastric area, positive Murphy sign. Bowel sounds active x 4.

Assessment and Plan:

Diagnosis was Cholecystitis. The pain associated with cholecystitis is usually constant and lasts longer than 6 hours. This fits with her pain lasting at least 12 hours. It is also typically worse after meals and associated with nausea and vomiting. Even though this patient does not have jaundice and only has a low-grade fever, a positive Murphy sign is characteristic of cholecystitis, making this the most likely differential diagnosis as compared to biliary pancreatitis, and choledocholithiasis.

Diagnostic studies to be completed should include complete blood count and a comprehensive metabolic panel to check the liver enzymes such as Alkaline phosphatase, GGT, total and direct bilirubin, AST and ALT: Laboratory signs of cholestasis are possible leukocytosis, increased alkaline phosphatase, increased GGT, increased total and direct bilirubin. AST, ALT: used to assess for possible liver cell damage. Amylase and lipase should also be measured to rule out pancreatitis, as well as calcium since it is an important predictive marker in pancreatitis. An ultrasound would also be ordered. It is the best imaging to show gallstones and pancreatitis.

The ultrasound showed gallstones and the patient was referred to general surgery for cholecystectomy since she was symptomatic. She was also educated of the risks and benefits of the surgery and all her questions were answered.

Literature Review

Gallbladder disease is one of the most common problems seen the in the ER with patients presenting with symptoms including abdominal pain, nausea, vomiting and decrease in appetite (Jessri & Rashidkhani, 2015). This can be a burden on hospital resources and patients' pocketbooks. There has not been much research into specific diets (such as Keto, Atkins etc.) and how they relate to gallbladder disease and the formation of gallstones but it is known that the types of foods we consume in general can be a modifiable factor that can decrease the rates of gallbladder disease in women. The question then is what types of diets increase and decrease the chances of getting gallbladder disease?

Following a healthy diet seems to be a modifiable risk factor that can decrease the risk of gallbladder disease in adult women. A healthy diet would include higher servings of fruits and vegetables, eating whole grains instead of bleached and processed breads and pastas, low-fat dairy products, vegetable oils instead of animal fats, 100% real fruit juices, fish, and a decreased intake of salt (Jessri & Rashidkhani, 2015). An unhealthy diet consists of high consumption of refined grain, sugar, red meats, sodas, starches, eggs, salt, animal fats and pickled foods (Jessri & Rashidkhani, 2015, p. 41). This effect is believed to occur because the healthy diet is high in antioxidants, fiber, vitamin C, folate, and magnesium (Jessri & Rashidkhani, 2015) and it decreases cholesterol synthesis. In comparison, the unhealthy diet is known to increase cholesterol synthesis in the liver due to the increase of sugars in the diet. An intake of 40g of sugar a day can increase the risk of gallstones twofold due to a change in the metabolism lipoproteins which in turn change the composition of the bile (Jessri & Rashidkhani, 2015).

An increase in cholesterol gallstones has also been show in diets high in carbohydrates and fat but not in plant-based vegetarian diets (Lee, Keane, & Pereira, 2019). This is something

that may need to be investigated further, especially with all the different diets that are out there currently like Keto and Atkin's which are high in fat and protein. Vegetable protein has shown the potential to lower a postmenopausal women's risk of getting gallbladder disease possibly because protein that comes from vegetables has less cholesterol and fat than protein that comes from animals (Lander et al., 2016). High calorie diets and diets high in carbs, animal protein, and cholesterol and low in vegetables, fruits and fiber increase a woman's risk for gallbladder disease (Figueiredo et al., 2017). This could be due to an overload of the bile by cholesterol and which can cause the bile to become sluggish (Figueiredo et al., 2017). Too much cholesterol in one's diet causes damage to the liver and gallbladder rather quickly and can fast track the formation of cholesterol gallstones (Lopez-Reyes et al., 2018). It seems in the high cholesterol diets there is a significant change in the cubic pseudo-stratified epithelium of the gallbladder (Lopez-Reyes et al., 2018).

The microbiome of the gut can be changed by diet and impact the microbiome of the gallbladder increasing a women's risk of getting gallstones is explored by Gutierrez-Diaz et al. also in 2018. The movement of the microbiome of the stomach may aid in the progression of gallstones as well because it can change the absorption of the lipids in the bile, increasing the elimination of bile salts in the feces (Gutierrez-Diaz et al., 2018). Analyzing the dietary intake of the study participants, those with cholelithiasis had low intake of vegetables in their diet. This would result in a lower intake of fibers and polyphenols. Lower levels of fibers and polyphenols have been shown to have a direct effect on bile acid metabolism and gut microbiome, which in turn would increase the likelihood of gallstone formation (Gutierrez-Diaz et al., 2018). While it is a very interesting theory that diet may have an impact on how the gut and biliary microbiome

work together in the formation or prevention of cholelithiasis the study needs to be done on a larger scale.

Vegetarian diets seem to have a protective factor against gallstones. Women who follow a vegetarian diet and had total cholesterol of <200 mg/dl were shown to have to have less problems with symptomatic gallstone disease (Chang et al, 2019). Vegetarian diets usually consist of less cholesterol and more fibers and this has been shown to decrease the risk of gallbladder disease in women. Vegetarian diets also decrease the risk of diabetes, insulin resistance and lower BMI. The protective factor of this diet is also increased with physical activity and reasonable caloric intake (Chang et al., 2019). The risk of gallstones can be reduced by 3-4% with an increase of fruits and vegetables in the amount of 200g per meal (Zhang et al., 2019). The fiber in vegetarian diets could potentially lower LDL and total cholesterol "by increasing bile acid excretion and decreasing hepatic synthesis of cholesterol" (Zhang et al., 2019, p. 6). Plant-based diets also typically have lower fat intake which in turn lowers cholesterol because there is a decrease in the dysmotility of the gallbladder which cause the formation of gallstones (Zhang et al., 2019). The type of fat that is consumed in one's diet also influences gallstone formation. Monounsaturated and polyunsaturated fats eaten in a balanced diet were shown to have a protective factor against gallbladder disease, whereas a high intake of fat, monounsaturated and saturated fatty acids showed an increased risk of gallbladder disease (Compagnucci et al., 2016).

Diets that are high in cholesterol, fatty acids and carbohydrates seem to increase the risk of gallstones. Whereas vegetarian diets that are higher in unsaturated fats, coffee, fiber, vitamin C, calcium and lower consumption of alcohol show a reduced risk (Stinton & Shaffer, 2012).

Many places in the world are changing to a more American type diet that higher in carbohydrates and fats and lower in fiber which can increase the formation of gallstones (Stinton & Shaffer, 2012). The dietary intake of different countries and how foods native to those countries and cultures also had different outcomes. For example, women in Spain had a higher calorie intake and their diets were higher in saturated and monounsaturated fats and lower in fiber, magnesium and folate. In contrast the women in France and Italy had more balanced diets in terms of fat consumption and more exercise which together proved to be a preventative factor for gallbladder disease (Compagnucci et al., 2016).

Non-modifiable risk factors include having more than four children, having a first child before the age of 20, and the use of estrogen only hormones for menopause (Figueiredo et al., 2017). Estrogen can influence the metabolism of cholesterol. Estrogen increases the production of cholesterol and deceases the production of bile acids. The bile salts breakdown the cholesterol normally in humans (Di Ciaula & Portincasa, 2018). Ethnicity, advancing age and genetics are also non-modifiable risks factors (Stinton & Shaffer, 2012).

Conclusion

Some studies showed that women are at higher risk of having gallbladder disease due to the non-modifiable risk factor of just being female and having estrogen. Most of the studies agree that diets high in fruits, vegetables and fiber as well as increasing physical activity as compared to diets high in fats and refined sugar would could lower the risks of gallbladder disease. Future research needs to be done with larger participant pools to truly see if diet could be used as a preventive measure to decrease gallbladder disease in women. Educating patients of the importance of a healthy diet not only can decrease their chances of developing gallbladder

disease but developing other morbities that can cause problems. If this modifiable risk factor could be implemented there would be significant decrease in the burden put on our ER's, healthcare facilities, and on patients' financial resources.

Vegetarian type diets compared to diets high in protein have been shown to decrease the incidences of gallbladder disease in adult women. Of the eleven studies reviewed for this topic nine of them concluded that vegetarian or plant-based diets decreased the risk of gallbladder disease in women. One study did not concentrate on diet type only on fat consumption and one study had a contradictory finding, but the sample size was very small.

Learning Points

1. Women are at increased risk for gallbladder disease and gallstones as compared to men.
2. Women are predisposed to be at higher risk of having gallbladder disease due to the hormone estrogen and having babies.
3. Diet is a modifiable risk factor that should be explored to decrease chances of getting gallbladder disease.
4. While not completely conclusive diets high in fruits, vegetables and fiber seem to be better at protecting against gallbladder disease than high fat, high protein diets.
5. Prevention of gallbladder disease would save resources at healthcare facilities and save patients money.

References

Chang, C., Chiu, T. H., Chang, C., Lin, M., & Lin, C. (2019, February 4). Plant-Based Diet, Cholesterol, and Risk of Gallstone Disease: A Prospective Study. *Nutrients, 11*, 1-13.

Compagnucci, A. B., Perroud, H. A., Batalles, S. M., Villavicencio, R., Brasca, A., Berli, D., & Pezzotto, S. M. (2016). A nested case-control study on dietary fat consumption and the risk for gallstone disease. *Journal of Human Nutrition and Dietetics*, *29*, 338-344.

Di Ciaula, A., & Portincasa, P. (2018, September 24). Recent advances in understanding and managing cholesterol gallstones. *F1000Research, 7*, 1-14.

Figueiredo, J. C., Haiman, C., Porcel, J., Buxbaum, J., Stram, D., Tambe, N., ... Setiawan, V. W. (2017). Sex and ethnic/racial-specific risk factors for gallbladder disease. *BMC Gastroenterology*, *17*(153), 1-12.

Gutierrez-Diaz, I., Molinero, N., Cabrera, A., Rodriguez, J. I., Margolles, A., Delgado, S., & Gonzalez, S. (2018, September 14). Diet: Cause or Consequence of the Microbial Profile of Cholelithiasis Disease? *Nutrients*, *10*(1307), 1-13.

Jessri, M., & Rashidkhani, B. (2015, March). Dietary Patterns and Risk of Gallbladder Disease: A Hospital-based Case-Control Study in Adult Women. *Journal of Health, Population & Nutrition*, *33*(1), 39-49.

Lander, E. M., Wertheim, B. C., Koch, S. M., Chen, Z., Hsu, C., & Thomson, C. A. (2016, March 20). Vegetable protein intake is associated with lower gallbladder disease risk: Findings from the Women's Health Initiative prospective cohort. *Preventive Medicine, 88*, 20-26.

Lee, J. Y., Keane, M. G., & Pereira, S. (2019, June). Diagnosis and treatment of gallstone disease. *The Practitioner*, *259*, 15-19.

Lopez-Reyes, A., Clavijo-Cornejo, D., Fernandez-Torres, J., Medina-Luna, D., Estrada-Villasenor, E. G., Gomez-Quiroz, L. E., ... Martinez-Flores, K. (2018, September-October). Fast Morphological Gallbladder Changes Triggered by a Hypercholesterolemic Diet. *Annals of Hepatology, 17*(5), 857-863.

McConnell, T., Appleby, P., & Key, T. (2017, March 8). Vegetarian diet as a risk factor for symptomatic gallstone disease. *European Journal of Clinical Nutrition, 71*, 731-735.

Stinton, L. M., & Shaffer, E. A. (2012, April 17). Epidemiology of Gallbladder Disease: Cholelithiasis and Cancer. *Gut and Liver*, *6*(2), 172-187. https://doi.org/10.5009/gnl.2012.6.2.172

Zhang, J., Xiong, J., Xu, W., Sang, X., Huang, H., Bian, J., ... Zhao, H. (2019, June 19). Fruit and vegetables consumption and the risk of gallstone disease: A systematic review and meta-analysis. *Medicine*, *98*(28), 1-9.