Dietary Risk Factors Contributing To Cholelithiasis Among Inpatients Admitted At Surgical Unit In Benghazi Medical Center

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(بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ)

﴿ يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ ﴾

(صدق الله العظيم)

[المجادلة:11]

Dedication

TO the spirit of my father .

TO my mother , my brothers , my sisters .

TO my whole Family members , my friends .

To all of them I dedicate this work .

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GSD	Gall stone disease
US	United status
BMI	Body mass index
HDL	High density lipoprotein
LDL	Low density lipoprotein
TG	Triglycerides
FFQ	Food frequency questionnaire
WHO	World health organization
SPSS	Statistical package for social sciences
SD	Standard deviation

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Abstract

Background : Studying the dietary risk factors that contributing to the prevalence of cholelithiasis is important because gall bladder stone is one of the major surgical problems in the Libyan population.

Objective: the present study was aimed to determine the dietary risk factors that contributing to the high prevalence of gall stones among male and female inpatients admitted at surgical unit in Benghazi medical center.

Subjects and methods: A case control study was performed at surgical unit in Benghazi medical center, and the population of the study included fifty patients with newly diagnosed gall bladder stone (cases), and sixty healthy individuals (controls). Both cases including control subjects, completed a questionnaire about their dietary habits, usual dietary intake were evaluated by using twenty four hour dietary recall and a food frequency questionnaire, anthropometric measurement (weight, height, BMI) was taken from the cases and controls. Blood samples were collected and analyzed for lipid profile, and statistical analysis was done and p value < 0.05 were considered statistically significant.

Results : the results of the study showed that dietary intake of high cholesterol and saturated fat diet (red meat, fried eggs) is higher in cases compared with control, whereas dietary intake of fiber, calcium, vitamin C, coffee is higher in controls compared with cases. Cases having high body mass index compared with control.

Conclusion : This study concluded that dietary risk factors that contributing to the high prevalence of gall stone formation were because of high intake of high cholesterol and saturated fatty diet like (red meat , fried eggs) and low intake of dietary fiber, coffee, vitamin C, calcium. Obesity is also risk factor for gall stone formation .

1. Introduction :

The gall bladder lies on the undersurface of the right lobe of the liver, the most important function of the gall bladder is to concentrate, store, and excrete bile, a liquid which is produced by the liver that helps digestion of fat. (Mahan, et al., and Al -Ohali. 2006).

A gall stone is a solid mass that forms in the gall bladder from cholesterol, bilirubin and calcium salts precipitated from the bile. (Cuevas, et al., 2004). Most gall stones (about eighty percent) are composed mainly of cholesterol, while others have a higher amount of bilirubin, calcium and pigments. (Webster, et al., 2011).

The formation of gall stones is cholelithiasis. almost all gall stones form within the gall bladder. (Mahan, et al., 2012). Cholelithiasis is one of the most widespread and most expensive gastroenterological diseases, it belong to the group of a multifaceted metabolic disorders that affects humans. (Al – Ohali . 2006).

Cholelithiasis resulting from a mixture of several factors including supersaturation of bile with cholesterol, accelerated nucleation of cholesterol monohydrate in bile, and bile stasis or delayed gall bladder emptying due to impaired gall bladder motility. (Alan. 2009). Cholesterol supersaturation can result from an excessive concentration of cholesterol in bile, a deficiency of substances that maintain cholesterol in solution (bile salts and phospholipids) or a mixture of these factors. (Alan. 2009). A number of biochemical defects as well as diet, may cause hyper secretion of cholesterol. (Mendez, et al., 2003).

The most common manifestation of gall stones is biliary colic, but serious complications include acute pancreatitis, gall bladder inflammation, biliary obstruction, gall bladder empyema or perforation .etc (Getachew. 2008 and Tseng, et al ., 1999).

Cholecystectomy is the most common procedure for treating gall stones. (Alsaif. 2005). Cholecystectomy is surgical removal of the gall bladder.

Cholecystectomy could be done as a traditional open laparotomy or as a laparoscopic procedure. (Mahan, et al ., 2012).

Cholelithiasis is a multifactorial disease, caused by the interaction of genetic and environmental factors. (Davidovic, et al., 2011). One of the most important

environmental exposures contributing to gall stone formation is the nutritional exposure, the gradual increasing in the prevalence rate of gall stones during this century supports the important role of life style and dietary factors in gall stone pathogenesis. (Acalovschi. 2001).

Diet has long been a suspected risk factor in the formation of gall stones. (Alsaif. 2005). Diet not only increase the serum cholesterol but also increase biliary cholesterol secretion. Therefore, the need to study the dietary factors contributing to gall stone formation is essential. (Rakesh. 2003).

Gall stone disease is one of the major surgical problems in the Libyan population, and account for many hospital admissions and surgical interventions. (Jaraari, et al., 2010).

2. Objective :

To determine the dietary risk factors that contributing to the high prevalence of gallstones among male and female inpatients admitted at surgical unit in Benghazi medical center, Benghazi, Libya .

3.1 Background

Gallstone disease (GSD) is one of the more common and costly digestive diseases worldwide, and its incidence is growing progressively, and it is more widespread in Europe and America than in Asia and Africa. (Chi - Ming Liu, et al., 2012 and Ostrowska, et al., 2005). actual increase in the incidence of cholelithiasis, increased frequency of symptomatic gall stones. (Pitchumoni. 2010). In the United Status (US) 700,000 cholecystectomies are performed per year. (Pitchumoni. 2010). and 190,000 patients with gall stone disease undergo surgery in Germany. (Pitchumoni. 2010 and Acalovschi, et al., 2016).

In western Europe the prevalence ranges from five point nine percent to twenty one point nine percent with the highest prevalence seen in Norway, Sweden, Germany and the lowest in Simion, Italy. In South America the highest prevalence is reported in Chilli with incidence of one point two per one hundred women per year. The lowest prevalence is found in Asian and African countries. The reported prevalence in Asia ranges from four point three five percent to ten point seven percent. In Africa, the prevalence of gall stone disease was reported from few countries, in a group of antenatal women, the prevalence was two point one percent in Nigeria, four percent in Tunisia, five point two percent in Sudan and ten percent in black women of Soweto. (Getachew. 2008).

In the last fifty years the prevalence of gall stone disease in Japan has doubled and there has been a change from pigment to cholesterol gall stones. (Pitchumoni. 2010).

In Libya (1993). Abdulwahab and et al. reported that about seventy seven percent of all operations in the surgical department at Al − Hawari teaching hospital in Benghazi, Libya, were cholecystectomies, with a female to male ratio of four to one. And no data has been reported from Libya on the prevalence of gall bladder stone. (Elmehdawi, et al,. 2009).

In all populations of the World, women are almost twice as likely as men to experience cholelithiasis, gender is one of the most powerful effects in the formation of gallstones, which are more common in female during their fertile years than in males in the same age groups. (Al − Ohali. 2006).

3.2 Risk Factors :

The risk factors for the development of cholelithiasis include: female sex and advancing age (age more than forty years), pregnancy and parity, use of contraceptive pills, a family history of gall stones, rapid weight loss, fasting, physical inactivity, alcohol intake, smoking, tube feeding or total parenteral nutrition, drugs like (lipid lowering medications, estrogens, progesterone, diuretics, immune suppressive drugs), diabetes mellitus and insulin resistance, chronic liver diseases, inflammatory bowel disease, cystic fibrosis, hemolytic anemia, gall bladder dysmotility, illeal disease or resection, and major abdominal surgery. (Mahan, et al., 2012, Al − Ohali . 2006, Webster, et al ., 2011, Alsaif. 2005 and Acalovschi, et al., 2016).

3.3 Dietary risk factors :

A number of dietary factors have been involved in the pathogenesis of cholelithiasis including : calorie intake, cholesterol, fatty acids, refined carbohydrates, dietary fiber, vitamins and minerals (vitamin C, calcium), other dietary factors (coffee). (Cuevas, et al., 2004).

Intake of high calorie, saturated fat, cholesterol, trans fatty acids, refined carbohydrates favors gall stone formation, while intake of dietary fiber, poly unsaturated fat, mono unsaturated fat, vitamin c, calcium, coffee, is associated with decreased risk. (Cuevas, et al., 2004 and Alan. 2009).

3.3.1 Role of Energy intake :

Excessive energy intake is considered to increase the risk for gall stones mainly by contributing to obesity. (Tseng, et al., 1999). The mechanism of which is believed to be responsible for increased gall stones in patients with increased calorie intake is an increase in hepatic cholesterol secretion.(Rakesh. 2003). The most important critical variable in lithogenic bile formation is the relative mass of free cholesterol fluxing throughout the bile, in humans this correlates with the absolute load of calories consumed and the resulting lipoprotein cholesterol that must eventually return to the liver and pass into the bile as bile acids or failing that as free cholesterol. (Nahum, et al., 2003).

Sarles et al, first reported that calorie intake was significantly more in gall stone patients as compared with controls. (Rakesh. 2003). these results have been confirmed in other studies, with stampfer. etal finding a strong positive correlation between high energy intake and risk of gall bladder disease. (Mendez, et al., 2003). A Spanish study showed a higher consumption of calories in patients with cholelithiasis compared to the control subjects. Studies in north American Indians also reported that a hyper caloric diet correlated with a higher prevalence of gall stones. (Cuevas, et al., 2004).

In Serbia, Davidovic D.B, Tomic D.V, and Jorg J.B. (2011). Dietary habits as a risk factor of gall stone disease in Serbia. The aim of this study is to analyze the potential relationship between nutrition and the development of gall stone disease, and to establish the possibility for its prevention. They reported high energy intake and overnight fasting period were the most important predicators of gall stone, after adjustment for body mass index. (Davidovic, et al., 2011).

In Japan, Tsunodak, Shiraiy and Hatake Yamak. (2004) prevalence of cholesterol gall stones positively correlated with per capita daily calorie intake. This study was undertaken to delineate the changing trends in gall stone composition in Japan since the 1920 s and to assess dietary influences on gall stone composition. They reported during the twentieth century, the prevalence of cholesterol gall stones in the Japanese population increased steadily until the 1970 s declining thereafter; per capita daily total calorie intake appears to be the predominant dietary factor affecting cholesterol gall stone prevalence. (Tsunodak, et al., 2004).

Sichieri R, Everhart J.E and Roth H. (1991) A prospective study of hospitalization with gall stone disease among women : Role of dietary factors, fasting period and dieting. Evaluated the role of dietary constituents, fasting and dieting on subsequent hospitalization with gall stone disease among 4,730 women, ages from twenty five to seventy four years, they reported the effect of energy intake was significant only among women younger than age fiftieth years at base line. (Sichieri, et al., 1991).

3.3.1.1 Obesity :

Obesity is a significant risk factor for gall stone disease, and more in women than men. It raises the risk of cholesterol gall stones by increasing biliary secretion of cholesterol. (Acalovschi. 2001). Females having body mass index (BMI) exceeding

thirty two, have six times the risk of those with a BMI of less than twenty two. Similarly is the increased risk of gall stones associated with increased caloric consumption in non – obese women. (Mendez. 2003).

The relationship between obesity and gall bladder stone formation increases the importance of diet as a risk factor. (Tseng, et al., 1999). The association of gall stones with obesity and caloric over consumption most likely reflects cholesterol production, or flux which is considerably elevated both in obese people and in people with gall stones. (Mendez. 2003).

The risk seems to be greater when obesity starts early in life (obesity present by the age of eighteen and then maintained). (Acalovschi. 2001). Weight loss may decrease the risk of gall stone formation in overweight people, but very rapid weight loss (more than three pounds per week) may increase the increased risk of gall stones. The increased risk, linked with rapid weight loss may be due to an increase in the ratio of cholesterol to bile salts in the gall bladder and to bile stasis resulting from a decrease in gall bladder contractions. (Alan. 2009).

An increase of the body mass index between 1980 and 2008 has been reported Worldwide, with great variations in different countries. In 2008, an estimated one point four six billion adults were overweight, and of these, 500 millions were obese. (Acalovschi, et al., 2016).

In Poland, Ostrowskal, Czapska D, and Karczewski J.K. (2005) Body weight gain as the major risk factor of cholelithiasis in women and an important risk factor in man. The study involved 169 patients and 202 controls, previous exposure of patients of both groups to the chosen risk factors of cholelithiasis was evaluated based on a history questionnaire designed by the authors of the study. The result of this study showed obesity is the major risk factor in women and statistically significant in men. (Ostrowskal, et al., 2005).

In India, Jayanthi V, A.N and L Ashokl and Vijaya Srinivasan. (2005) Dietary factors in pathogenesis of gall stone disease in southern India – A hospital based case control study. To determine the association of dietary factors with mixed / pigment gall stones amongst southern Indian patients. They reported higher BMI is a risk factor in the formation of gall stones in southern India. (Jayanthi, et al., 2005).

3.3.2 Role of Refined carbohydrate :

The effect of carbohydrates on gall stone disease has been reported in several studies. In general, most of the studies have shown that the consumption of refined sugars is directly linked to gallbladder disease. (Cuevas, et al., 2004). Refined sugar increases cholesterol saturation and lithogenicity of bile. (Rakesh. 2003). It has been estimated that the equivalent of 40 grams of sugar daily doubles the risk of gall stone formation. (Cuevas, et al., 2004).

Refined carbohydrates cause obesity, raise plasma triglyceride and fasting plasma insulin level, and lower plasma high density lipoproteins (HDL) cholesterol. (Al – Ohali . 2006).

The majority of the authors have the same opinion about that over consumption of carbohydrates is risk for cholelithiasis and the increased calories in patients with gall stone disease are due to increase intake of refined sugars such as sucrose and fructose. (Alan. 2009 and Rakesh. 2003). Misciagna. et al. reported that a high intake of refined sugars may increase the risk of gall stone development. This result was referred to a higher synthesis of cholesterol in the liver secondary to an increase in insulin secretion. (Cuevas, et al., 2004).

Consumption of highly refined carbohydrates together with low fiber intakes may increases risk of gall stone development. (Tseng, et al., 1999). Individuals consuming refined carbohydrates have a sixty percent greater risk of developing gall stones, compared with those who consumed the most fiber, in particular insoluble fiber. (Mahan, et al., 2012).

In conclusion, most authors agree that a diet high in refined sugar and beverages containing saccharose may represent a risk factor for gall stones in both sexes. (Cuevas, et al., 2004). Consequently the risk of gall stones might be reduced by avoidance of refined carbohydrate foods. (Al – Ohali .2006).

3.3.3 Role of Fatty acids :

Dietary fatty acids have also been suggested as a risk factor for gall stones. (Tseng, et al., 1999). It was primarily thought that high fat content in the diet may lead to increased loss of bile acids in the stool and decreased bile acid pool per day lead to significant increase in biliary cholesterol saturation as well as the plasma cholesterol levels. (Rakesh. 2003). High fat intake in general may also increase risk of gall stone formation and contributing to obesity. (Tseng, et al., 1999).

Indeed, Sarles et al found a significant relationship between consumption of total lipids (more than 125 grams / day) and cholelithiasis. (Rakesh. 2003). Other studies also reported that patients with cholelithiasis showed a higher consumption of total lipids, mostly saturated fatty acids. (Cuevas, et al., 2004). In food level analysis, a number of studies have found no association for fats or oils in diet, including butter or margarine, while other studies have. (Tseng, et al., 1999).

Higher intake of saturated fat or trans fatty acids was associated with an increased risk of gall stones, in contrast, higher intake of poly unsaturated or monounsaturated Fatty acids was associated with decreased risk. (Alan. 2009).

Experimental studies show that fish oil have a protective effect against gall stone formation, it has been reported that people consuming a diet rich in fish oil and omega - 3 fatty acids show a low incidence of cholesterol cholelithiasis. (Cuevas, et al., 2004). In patients with gall stones supplementation with eleven point three gm per day of fish oil (which is high in poly unsaturated fatty acids) decreased the cholesterol saturation of bile by twenty five percent, while both omega – three and – six poly unsaturated fatty acid may be protective. (Alan. 2009). The different mechanisms explain the inhibitory effect of fish oil on the formation of gall stones, such as changes in cholesterol metabolism that may decrease biliary cholesterol saturation, reduction in cholesterol precipitation by changes in the composition of biliary phospholipids and decrease in biliary protein concentration. (Cuevas, et al., 2004).

Nuts are rich in a number of compounds that may be protecting against the formation of gall stones. (Tsai, et al., 2004). The healthy mono and poly unsaturated fats in nuts that help control blood cholesterol may also help prevent gall stones. (Mcveigh. 2011). Increased consumption of peanuts and other nuts each one was linked with a lower risk

of cholecystectomy, women who consumed five or more ounces of nuts weekly had a twenty five percent decreased risk of having a cholecystectomy, in contrast with women who rarely or never ate nuts. (Alan. 2009) .

Tsai C.J, Leitmann M.F, HUFB, Willett W.C, and Giovannucci E.L.(2004) A prospective cohort study of nut consumption and the risk of gall stone disease in men. To examine the relation between nut consumption and gall stone disease in the health professionals follow up study. they reported that frequent nut consumption is associated with a decreased risk of gall stone disease in men. (Tsai, et al., 2004).

In Spain, Yago M.D et al. (2005) Effect of the type of dietary fat on biliary lipid composition and bile lithogenicity in humans with cholesterol gall stone disease. To compare the effects of two dietary oils that differed in fatty acid profile on biliary lipid composition in human. In response to the test meal, the cholesterol saturation index decreased significantly in patients given the olive oil diet, in contrast, hepatic bile secreted by patients who consumed sunflower oil appeared supersaturated, the study suggest that the type of dietary fat usually consumed can influence bile composition in humans. (yago, et al., 2005).

In United States, Chung – Jyi Tsai. et al. (2005). Long - term intake of trans – fatty acids and risk of gall stone disease in men. To study consumption of trans – fatty acids in relation to the risk of gall stone disease. This study suggest that a higher intake of trans – fatty acids increase risk of gall stone disease, this adds to the concern that partial hydrogenation of vegetable oils to form shortening and margarine can lead to adverse health effects. (Chung – Jyi Tsai, et al., 2005).

In Greece, Linos A.D, Daras V, Linos D.A, Kekis V, Tsoukas M.M, Golematis V. (1989). Dietary and other risk factors in the etiology of cholelithiasis : A case control study. studied the effect of dietary factors and a variety of other risk factors on the development of cholelithiasis, though a case control study. From all the dietary factors the only ones that showed a positive statistically association was consumption of animal fat as expressed by eating all visible fat on the meat and using butter on the table, high consumption of olive oil had a negative (protective) association with the disease. (Linos, et al., 1989).

3.3.4 Role of Cholesterol :

It has been hypothesized that a high cholesterol intake may influence gall stone formation. (Cuevas, et al., 2004). A high cholesterol diet increase the concentration of cholesterol in the bile and then increase the risk of gall stone formation. consequently a low cholesterol diet may give some protective effect. (Al-Ohali. 2006). Diets supplemented with cholesterol have been shown to create lithogenic bile and gall stones in experimental animals. (Cuevas, et al., 2004).

One study with human subjects maintained on a formula diet, it was noted that consumption of 750 grams of cholesterol daily lead to significant increase in biliary cholesterol saturation and the plasma cholesterol level. (Rakesh. 2003). De Besten gave food to ten healthy normolipemic men with a eucaloric cholesterol – free fluid formula for three week, cholesterol (750 mg / day) in the form of egg yolk was added at expense of protein and fat for another three weeks, on the high cholesterol diet, the result is increase in biliary cholesterol saturation, four subjects developed lithogenic bile and three developed cholesterol crystals. (Cuevas, et al ., 2004).

Results from case control studies vary considerably, with one of the largest, showed an inverse association, two smaller, more new studies showed a positive association, and two others showed no association. (Tseng, et al., 1999).

In Libya, Jaraari, A.M. et al. (2010) studied quantitative analysis of gall stones in libyan patients. To determine the composition of gall stones and their possible etiology in a Libyan population, the chemical composition of gall stones from forty one patients (six males and thirty five females) was analyzed, the stones were classified into cholesterol, pigment, and mixed stones. The study showed high levels of cholesterol in stones and dyslipidemia associated with mixed as well as cholesterol gall stones, suggest an etiological association and efforts to decrease dietary fat intake among the libyan population may lead to decrease cholesterol and mixed gall stones. (Jaraari, et al., 2010).

3.3.5 Role of dietary fiber :

Higher intake of dietary fiber was linked with a lower prevalence of gall stones, (Alan. 2009). A dietary soluble fiber, inhibits cholesterol stone formation by decreasing

the biliary cholesterol saturation index. (Al- Ohali. 2006). The protective role of dietary fiber has been recognized to various factors, the most important of them being decreased intestinal transit time as a result, there is less time for colonic bacteria to create secondary bile acids like deoxycholic acid from cholic acid and a fewer of deoxycholic acid is absorbed due to rapid intestinal transit. (Rakesh. 2003).

A large number of epidemiological studies reported that insoluble fiber intake is inversely associated with gall bladder disease. An increased risk of gall stones for low fiber intakes was seen in a prospective cohort study conducted in the Netherlands. (Cuevas, et al., 2004).

A large amount of fiber in the form of wheat bran lowers the cholesterol saturation of bile. (Acalovschi. 2001). Supplementation of the diet with ten to fifty gm or more daily of wheat bran for four to six weeks decreased the cholesterol saturation of bile in healthy volunteers, individuals with constipation, and patients with gall stones. (Alan. 2009). Bran is working primarily in the colon, decreasing the formation of deoxycholic acid by intestinal bacteria and increasing the synthesis of chenodeoxycholic acid. deoxycholic acid increases the lithogenicity of bile, while chenodeoxycholic acid decreases lithogenicity. (Alan. 2009).

In addition, a clinical interventional study reported that fiber supplementation of obese patients who had decreasing weight, may prevent gall stones formation. (Cuevas, et al., 2004).

3.3.6 Role of Vitamins and Minerals :

3.3.6.1 Vitamin C :

One of the causes of biliary supersaturation is decreased cholesterol catabolism due to a low rate of cholesterol seven alpha hydroxylase, the rate limiting step in the catabolism of cholesterol to bile acids. (Rakesh. 2003). Vitamin C is a cofactor for the enzyme seven alpha hydroxylase the rate – limiting step in the conversion of cholesterol to bile acids, therefore vitamin C show to prevent gall stone formation by stimulating the conversion of cholesterol to bile salts, thus decreasing the lithogenicity of bile. (Alan. 2009).

Some studies reported that ascorbic acid supplementation among women was linked with a lower prevalence of gall bladder disease. Therefore, the association between ascorbic acid status and cholelithiasis has been reported only in women, and may be the result due to a biological interaction between ascorbic acid status and sex hormones. (Cuevas, et al., .2004). In experimental models it has been shown that deficiency of vitamin c increases the incidence of gall stones formation. (Rakesh. 2003).

3.3.6.2 Calcium :

Calcium intake appeared to be inversely associated with gall stone prevalence. (Acalovschi. 2001). Calcium decreases cholesterol saturation of gall bladder bile by preventing the reabsorption of secondary bile acids in the colon, by binding secondary bile acids (deoxycholate) in the small intestinal lumen, therefore reducing the deoxycholate and cholesterol content of the bile. (Cuevas, et al., 2004 and Acalovschi. 2001).

A number of studies reported that an inverse association between dietary calcium and gall bladder disease but others found no association. An inverse association has also been observed with dairy products in some studies. (Cuevas, et al., 2004).

3.3.7 Role of other Dietary factors :

3.3.7.1 Coffee :

Coffee consumption considered to be inversely associated with gall stone prevalence. (Acalovschi. 2001). Coffee affects a number of hepatobiliary processes that are involved in cholesterol gall stone formation. (Cuevas, et al., 2004). Coffee stimulates cholecystokinin release, increases gall bladder motilityand maybe promoting large bowel motility. Caffeine inhibits biliary cholesterol crystallization, decreases gall bladder fluid absorption, and increases hepatic bile flow. (Rakesh. 2003).

Two large, prospective cohort studies reported that consumption of caffeinated coffee could protect against the development of symptomatic gall stones, compared with non- coffee drinkers. The decrease in risk associated with consumption of two or more cups of coffee per day was forty to forty five percent in men and twenty two to twenty eight percent in women. (Alan. 2009). A new survey, in a cohort study, of approximately 81,000 women followed during twenty years, reported that a lower risk

of cholecystectomy in women that drink caffeinated coffee, a consistent intake of more than or equal to four cups of coffee daily was associated with a twenty five percent risk reduction in general. (Cuevas, et al., 2004).

Consumption of decaffeinated coffee was not associated with a decreased risk of gall stone disease, suggestive of the beneficial effect of coffee is due to caffeine. (Alan. 2009).

3.4 Background from previous studies :

There are several studies reported that association between gall stone disease with all these dietary factors :

In India. Jalaja D. Kumari and B. Sri Hari Krishna. (2010) Role of body mass index, physical activity and nutrients in cholelithiasis in Guntur, Andhra Pradesh. to compare dietary intakes of gall stone patients and controls. They reported individuals with overweight, obesity, and low physical activity high serum total cholesterol and high triglycerides and low HDL are more prone to risk of cholelithiasis, also results of this study showed that high intake of energy, proteins, carbohydrates, refined sugar and calcium may increase the risk of gall stone formation; while a high intake of dietary fiber, and Vitamin C may protect against gall stone formation. (Jalaja, et al., 2010).

In Saudi Arabia. Al – Ohali . (2006) Dietary risk factors contributing to cholelithiasis in Riyadh armed forces hospital patients. To investigate gall stone disease in relation to diet and other risk factors for patients attending inpatient surgical units at Riyadh armed forces hospital, they reported that high consumption of fat rich foods like chicken with skin, whole milk, cream cheese, and simple sugars like table sugar and dates, and obesity are risk factors for the causation of gall stone disease beside the genetic predisposition. High consumption of brown bread, bran bread, legumes and arabic coffee may play a protective role against this disease. (Al – Ohali. 2006).

 In Saudi Arabia. Alsaif M.(2005) Variations in dietary intake between newly diagnosed gall stone patients and controls. To compare dietary intake of newly diagnosed gall stone patients and controls. They reported patients were significantly older than control and had higher BMI, HDL cholesterol levels were found significantly higher in controls, high intake of energy, proteins, carbohydrates, refined sugar, and calcium may increase the risk of gall stone formation, while a high intake of dietary fiber and

antioxidant vitamin (Vitamin C) may protect against gall stone formation. (Alsaif. 2005).

In Italy. Giovanni Misciagna. et al. (1999) Diet, physical activity, and gall stones – a population – based, case control study in southern Italy; to evaluate the association between diet, physical activity, and incident cases of gall stones. This study suggest that a sedentary life style, high body mass index, and a diet rich in animal fat and refined sugars and low in fibers are significant risk factors for gall stone formation. (Misciagna, et al., 1999).

In France .Caroli – Bosc F.X. et al .(1998) Cholelithiasis and dietary risk factors : An epidemiologic investigation in vidauban southeast France. General practitioners group of vidauban. The aim of this study was to determine in a homogenous French population whether a particular type of diet may be lithogenic. This study suggests that a change in dietary habits by limiting excess calories, saturated fats and carbohydrates could reduce the incidence of cholelithiasis. (Caroli, et al., 1998).

In Spain. Ortega R.M, Fernandez M – Azuela, Encino A – Sotillos, Andres P and lopez A.M – Sobaler. (1997) Differences in diet and food habits between patients with gall stones and controls. to compare the food, energy, macronutrient and micronutrient intake of patients with gall stones to those of a control group of similar demographic characteristics. They reported gall stone patients consumed less food per day, and less fish and fruits than did control subjects. They also showed greater intakes of cereals, oils, sugars and meats than did control subjects. They also experienced fluctuations in body weight with greater frequency, patients consumed more total calories (energy) and fats (especially monounsaturated fatty acids and saturated fatty acids) and less fiber, folate and magnesium than did control subjects, for all vitamins and minerals studied, patients showed a greater percentage of intakes below those recommended.(Ortega, et al., 1997).

In Italy. Misciagna G. et al. (1996) Epidemiology of cholelithiasis in southern Italy Part II. risk factors. to determine behavioural, dietary and other common factors associated with new cases of gall stones. The results of this study confirm many gall stone associated factors reported in previous studies such as BMI, cigarette smoking, weight change, a history of diabetes, constipation, consumption of fried foods and excessive oil were positively associated with the incidence of gall stone, where as

consumption of wine, coffee, fish and whole meal bread was inversely associated. (Misciagna, et al., 1996).

In Denmark. Jorgensen T and Jorgensen L.M. (1989) Gall stones and diet in a Danish population. A cross – sectional study of gall stone disease. They reported a trend towards positive association between gall stones and intake of refined sugars and total fat, whereas a negative trend was found between gall stones and intake of fibers and polyunsaturated to saturated fat ratio. (Jorgensen, et al., 1989).

4. Methodology

4.1 Study design :

The present study is an analytical case – control study.

4.2 Study site :

The study was conducted in the surgical unit in Benghazi medical center.

4.3 Population of the study :

The population of the study includes inpatients admitted at surgical unit in Benghazi medical center and suffering from gall bladder stone (cases), and patients from other units and also from general population (controls).

4.4 Sample size :

The sample of the study consisted of 110 participants divided into two groups, case study group consisted of fifty patients with gall bladder stone (forty two females and eight males), and control group consisted of sixty healthy individuals (fifty female and ten males) was selected from more than one source matched for age and sex without gall stone disease and also free from any chronic diseases.

4.5 Period of the study :

The study was carried out during the period from (August 2014 to December 2015).

4.6 Eligibility criteria :

4.6.1 Inclusion criteria :

All gall bladder stone patients, don't have one of the factors mentioned below in the exclusion criteria.

4.6.2 Exclusion criteria :

Female more than forty years of age, female using of contraceptive pills, pregnant female patients, patients with a family history of gall stones, smoker or alcoholic (for male patients), patient on tube feeding or total parenteral nutrition, patient who are

receiving drugs like (lipid lowering drugs, estrogens, immunosuppressive drugs), patients having diseases like (diabetes mellitus, chronic liver disease, inflammatory bowel disease, cystic fibrosis, illeal disease or resection, hemolytic anemia, and possible abdominal surgery), patient with a history of the rapid weight loss program, sedentary patients.

4.7 Procedure :

4.7.1 Questionnaire :

Data was collected by using questionnaires that designed for matching the study need among the study population, during the survey, The researcher explained any of the questions that were not clear.

The questionnaire was based on the questions of previous studies with some modifications (Al- Ohali .2006).

The questionnaire included date regarding socio – demographic factors such as (age, sex, marital status, educational level, occupation, nutritional information was also obtained including questions such as (number of daily meals, snacks, type of food included in these meals and snacks, type of fat used in cooking every day, type of milk and milk products consumed). (Appendix A).

4.7.2 Dietary intake assessment :

4.7.2.1 A 24 hour food recall method :

A twenty four hour food recall was used to collect detailed information about all foods and beverages consumed by the subjects in the past twenty four hour before admission, and total daily intakes of energy, fat, calcium, and vitamin C for each participant was calculated by using the Libyan food composition table. (Appendix A).

4.7.2.2 Food frequency questionnaire :

Dietary data were collected using a validated food frequency questionnaire (FFQ). which includes forty two food items most commonly eaten by both cases and controls participants report the frequency of consumption of each food from list of foods for a specific period. (Appendix A) .

4.7.3 Anthropometric measurements :

Weight and height were measured, and BMI was calculated from the anthropometric data for each patient.

Weight was measured using a seca weighing scale, the scale was calibrated before using, Subjects were weighed with minimally clothed, without shoes, weight was recorded to nearest zero point one kg.

Height was measured using a seca height scale, and measured to the nearest zero point five cm, in a standing position without shoes.

BMI was calculated from the anthropometric data by using the equation :

BMI = weight / (height in meters) ^{2}

And classified according to WHO classifications (WHO, 2000). (Appendix B).

4.7.4 Laboratory measurements :

Blood samples were collected in the special container, by the nurse after an overnight fasting (twelve hour) and then sent to the laboratory to estimate lipid profile (cholesterol, triglycerides, LDL, HDL). (Appendix C).

4.8 Statistical analysis :

Collected data were analyzed statistically using the social package of scientific statistics (SPSS version eighteen), descriptive statistics were used as mean, standard deviation (SD), frequencies and percentage. and the data were presented in the form of tabular and graphical presentation, differences between two groups were evaluated by using the chi squared test (x^2) and p value < 0.05 were considered statistically significant. also the independent sample t – test procedure was used to assesses whether the means of two groups are statistically different from each other, also odds ratio and 95% confidence interval were calculated.

4.9 Ethical Consideration :

This study was approved by the ethics committee of the Benghazi University. and also approved by the authorities of the Benghazi medical center – department of surgery, where the study is done and the sample is selected, consent form to participate in the study was obtained from the participants (cases and controls), Every participant had been provided with a full explanation about the goal of the study

5. Results :

5.1 Socio demographic data for the cases and controls :

Table (1) shows that the study sample consisted of 110 participants divided into two groups; fifty cases and sixty controls, and four point five percent of cases, and ten point nine percent controls aged less than twenty five years of age, Thirty percent of cases, Thirty percent of controls aged between twenty five to thirty five years. Ten point nine percent of cases, thirteen point six percent of controls were more than thirty five years of age to forty.

Table (1) : Age distribution for cases and controls :

Age groups	Cases		Controls	
	No.	%	No.	%
< 25	5	4.5	12	10.9
25 – 35	33	30.0	33	30.0
>35 _ 40	12	10.9	15	13.6
Total	50	45.5	60	54.5

Table (2) shows that thirty eight point two percent of cases were females, seven point three percent were males, and forty five point five percent of controls were females, and nine point one percent were males. In addition, thirty eight point two percent of cases were married, four point five percent cases were single, and twenty one point eight percent of controls were married, thirty one point eight percent controls were single. And Twenty seven point three percent of cases, fifty point nine percent of controls had university education. Four point five percent of cases, one point eight percent of controls had primary school education. Twenty seven point three percent of the cases, eight point two percent of the controls were house wives, Seven point three percent of the cases, nineteen point one percent of the controls were employees as office workers.

Table (2) : Socio demographic characteristics for cases and controls :

Variable	Cases		Controls	
	No.	%	No.	%
Sex				
Female	42	38.2	50	45.5
Male	8	7.3	10	9.1
Marital Status				
Single	5	4.5	35	31.8
Married	42	38.2	24	21.8
Divorced	3	2.7	0	0.0
Widowed	0	0.0	1	0.9
Educational level				
Primary	5	4.5	2	1.8
Intermediate	3	2.7	0	0.0
Secondary	5	4.5	0	0.0
Intermediate or high institute	7	6.4	2	1.8
University	30	27.3	56	50.9
Occupation				
Office worker	8	7.3	21	19.1
Doctor	0	0.0	13	11.8
Teacher	5	4.5	4	3.6
House wife	30	27.3	9	8.2
Student	3	2.7	13	11.8
Others	4	3.6	0	0.0

5.2 Anthropometric measurements for the cases and controls :

Table (3) shows that cases were significantly more obese than controls, Nineteen point one percent of cases were (obese grade I) compared with eight point two percent of the controls, and six point four percent of cases were (obese grade II) compared with three point six percent of controls, one point eight percent of cases were (obese grade III) compared with zero point nine percent of controls, whereas only six point four

percent of cases were normal weight compared with twenty four point five percent of controls, and a highly significant differences were observed between two groups (p value = 0.000).

Table (3) : Body mass index for cases and controls :

BMI	Case		Control		P value
	No.	%	No.	%	
Under weight	0	0.0	4	3.6	0.000
Normal	7	6.4	27	24.5	
Over weight	13	11.8	15	13.6	
Obese grade I	21	19.1	9	8.2	
Obese grade II	7	6.4	4	3.6	
Obese grade III	2	1.8	1	0.9	

5.3 Laboratory measurements for the cases and controls :

Table (4) shows that thirty eight point two percent of cases and fifty point nine percent of controls have normal cholesterol level, zero point nine percent of cases and zero percent of controls have high cholesterol level, and the difference between two groups is not significant (p value = 0.19). Twenty two point seven percent of cases and thirty eight point two percent of controls have normal HDL level, ten point zero percent of cases and five point five percent of controls have low HDL level, and difference between two groups is not significant (p value = 0.07). Forty point nine percent of cases and forty eight point two percent of controls have normal LDL level, zero point nine percent of cases and zero point nine percent of controls have high LDL level, and difference between two groups is not significant (p value = 0.93). Thirty seven point three percent of cases and forty five point five percent of controls have normal TG level, four point five percent of cases and zero point nine percent of controls have high TG level, and difference between two groups is not significant (p value = 0.09).

Table (4) : Lipid profile for cases and controls

Variables	Cases		Controls		P value
	N0.	%	No.	%	
Cholesterol					
Desirable	42	38.2	56	50.9	
Borderline high	7	6.4	4	3.6	0.19
High risk	1	0.9	0	0.0	
Triglyceride					
Normal	41	37.3	50	45.5	
Borderline high	4	3.6	9	8.2	0.09
High risk	5	4.5	1	0.9	
LDL					
Desirable	45	40.9	53	48.2	
Borderline high	4	3.6	6	5.5	0.93
High risk	1	0.9	1	0.9	
HDL					
No risk	25	22.7	42	38.2	
Moderate risk	14	12.7	12	10.9	0.07
High risk	11	10.0	6	5.5	

5.4 Frequency of consumption of different food items for the cases and controls :

Table (5) shows that twenty three point six percent cases had consumed desserts weekly, in contrast with thirty point nine percent of controls, seventeen point three percent of cases had consumed desserts daily, in contrast with sixteen point four percent of controls, and difference between two groups is statistically not significant (p value = 0.75). For the frequency of honey and jam consumption, seventeen point three percent of cases had consumed honey and jam weekly, in contrast with sixteen point four percent of controls, fourteen point five percent of cases had consumed honey and jam

daily, in contrast with seventeen point three percent of controls, and difference between two groups is statistically not significant (p value = 0.78).

Table (5) : Frequency of Desserts, Honey and Jam consumption for cases and controls :

Frequency	Cases		Controls		P value
	No.	**%**	**No**	**%**	
Desserts					
Daily	19	17.3	18	16.4	
Weekly	26	23.6	34	30.9	
Monthly	3	2.7	6	5.5	0.75
None	2	1.8	2	1.8	
Honey and jam					
Daily	16	14.5	19	17.3	
Weekly	19	17.3	18	16.4	
Monthly	8	7.3	12	10.9	0.78
None	7	6.4	11	10.0	

Figure (1) shows that fourteen point five percent of cases had consumed table sugar once a day, approximatly (one teaspoon daily), in contrast to twenty five point five percent of controls, and ten point nine percent of cases had consumed table sugar (three or more times a day) approximatly from (three or more teaspoons daily), in contrast with eight point two percent of controls, and there was no significant differences between two groups (p value = 0.41).
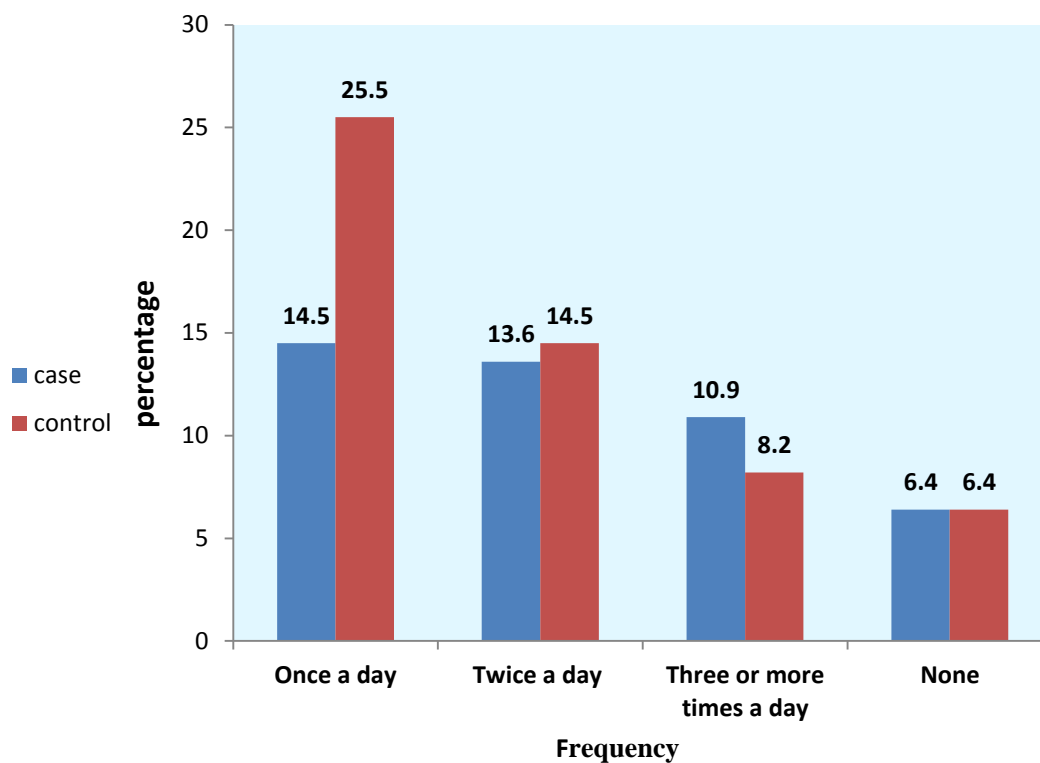
Figure (1) : Freuency of table sugar consumption for cases and controls

Table (6) shows that vegetables were consumed daily by twenty six point four percent of cases in contrast to forty two point seven percent of the controls, and fifteen point five percent of cases have consumed vegetables weekly compared with ten point nine percent of controls, and difference between two groups is statistically significant (p value = 0.04). For fruits consumption. Twenty three point six percent of cases have consumed fruits daily in contrast with thirty one point eight percent of controls, and twenty percent of cases have consumed fruits weekly in contrast with twenty point nine percent of controls, and there was no significant difference between two groups (p value = 0.80).

Table (6) : Frequency of vegetables and fruits consumption for cases and controls:

Frequency	Cases		Controls		P value
	No.	%	No.	%	
Vegetables					
Daily	29	26.4	47	42.7	
Weekly	17	15.5	12	10.9	0.04
None	4	3.6	1	0.9	
Fruits					
Daily	26	23.6	35	31.8	
Weekly	22	20.0	23	20.9	0.80
Monthly	2	1.8	2	1.8	
None	0	0.0	0	0.0	

Figure (2) shows that eighteen point two percent of cases have consumed legumes weekly in contrast to forty percent of controls, and fourteen point five percent of the cases did not consume legumes in contrast with two point seven percent of the controls. and there was highly significant difference between two groups (p value = 0.000).

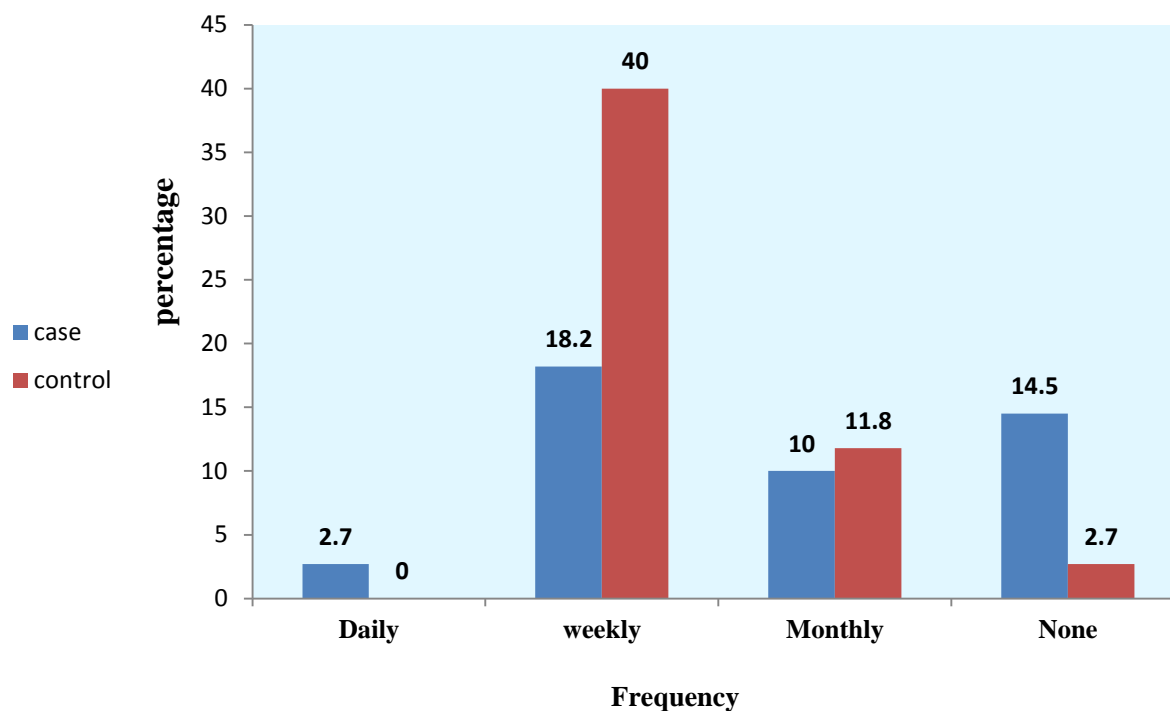**Figure (2) : Frequency of Legumes consumption for cases and controls**

Table (7) shows that seventeen point three percent of cases have consumed red meat daily, in contrast with ten percent of controls, and twenty percent of cases, twenty nine point one percent of controls have consumed red meat weekly, and two point seven percent of cases, eleven point eight percent of controls did not consume red meat, and difference between two groups is statistically significant (p value = 0.02). For other types of meat. eight point two percent of cases, and also eight point two percent of controls have consumed chicken with skin daily, six point four percent of cases, five point five percent of controls have consumed chicken with skin weekly, thirty point nine percent of cases, forty point nine percent of controls did not consume chicken with skin, and there was no significant difference was observed between two groups (p value = 0.7). For the consumption of chicken without skin, twenty six point four percent of cases, thirty seven point three percent of controls have consumed chicken without skin daily, ten point nine percent of cases, six point four percent of controls have consumed chicken without skin weekly, seven point three percent of cases, nine point one percent of controls did not consume chicken without skin, and there was no significant difference was observed between two groups (p value = 0.38). for the consumption of
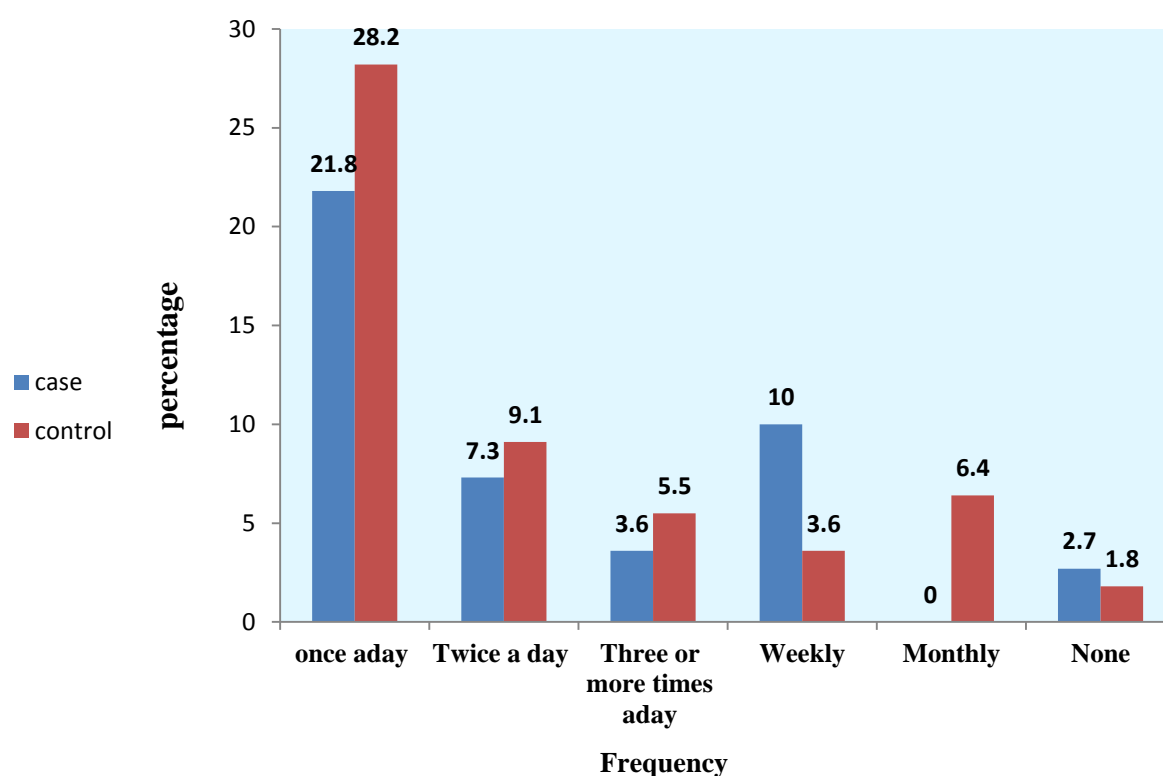
fish, nine point one percent of cases, five point five percent of controls have consumed fish weekly, twenty nine point one percent of cases, thirty eight point two percent of controls have consumed fish monthly, and seven point three percent of cases, ten point nine percent of controls did not consume fish at all, and there was no significant differences between the two groups (p value = 0.32).

Table (7) : Frequency of types of meat consumption for cases and controls :

Frequency	Cases		Controls		P value
	No.	%	No.	%	
Red meat					
Daily	19	17.3	11	10.0	0.02
Weekly	22	20.0	32	29.1	
Monthly	6	5.5	4	3.6	
None	3	2.7	13	11.8	
Chicken with skin					
Daily	9	8.2	9	8.2	
Weekly	7	6.4	6	5.5	0.7
Monthly	0	0	0	0	
None	34	30.9	45	40.9	
Chicken without skin					
Daily	29	26.4	41	37.3	
Weekly	12	10.9	7	6.4	0.38
Monthly	1	0.9	2	1.8	
None	8	7.3	10	9.1	
Fish					
Weekly	10	9.1	6	5.5	
Monthly	32	29.1	42	38.2	0.32
None	8	7.3	12	10.9	

Figure (3) Shows that twenty one point eight percent of cases have consumed coffee once a day, in contrast with twenty eight point two percent of controls, seven point

three percent of cases have consumed coffee two times a day, in contrast with nine point one percent of controls, and three point six percent of cases have consumed coffee three or more times a day, in contrast with five point five percent of controls, and two point seven percent of cases did not consumed coffee, in contrast with one point eight percent of controls, and difference between two groups is statistically significant (p value = 0.02).

Figure (3) : Frequency of coffee consumption for cases and controls

Table (8) shows that twenty nine point one percent of cases have consumed red tea daily, in contrast with thirty four point five percent of controls, and nine point one percent of cases did not consume red tea, in contrast with twelve point seven percent of controls, and there was no statistically significant difference between two groups (p value = 0.38). For the frequency of green tea consumption. Twenty percent of cases have consumed green tea daily, in contrast with thirty three point six percent of controls, and eleven point eight percent of cases did not consume green tea, in contrast

with seven point three percent of controls, and there was no statistically significant difference between two groups (p value = 0.22).

Table (8) : Frequency of Red tea , Green tea consumption for cases and controls :

| Frequency	Cases		Controls		P value
	No.	%	No.	%	
Red tea					
Daily	32	29.1	38	34.5	
Weekly	7	6.4	4	3.6	0.38
Monthly	1	0.9	4	3.6	
None	10	9.1	14	12.7	
Green tea					
Daily	22	20.0	37	33.6	
Weekly	12	10.9	13	11.8	0.22
Monthly	3	2.7	2	1.8	
None	13	11.8	8	7.3	

Figure (4) shows that twenty six point four percent of cases have consumed milk and milk products daily in contrast to forty seven point three percent of controls, fifteen point five percent of cases have consumed milk and milk products weekly in contrast to six point four percent of controls, and there was highly significant difference between two groups (p value = 0.001).
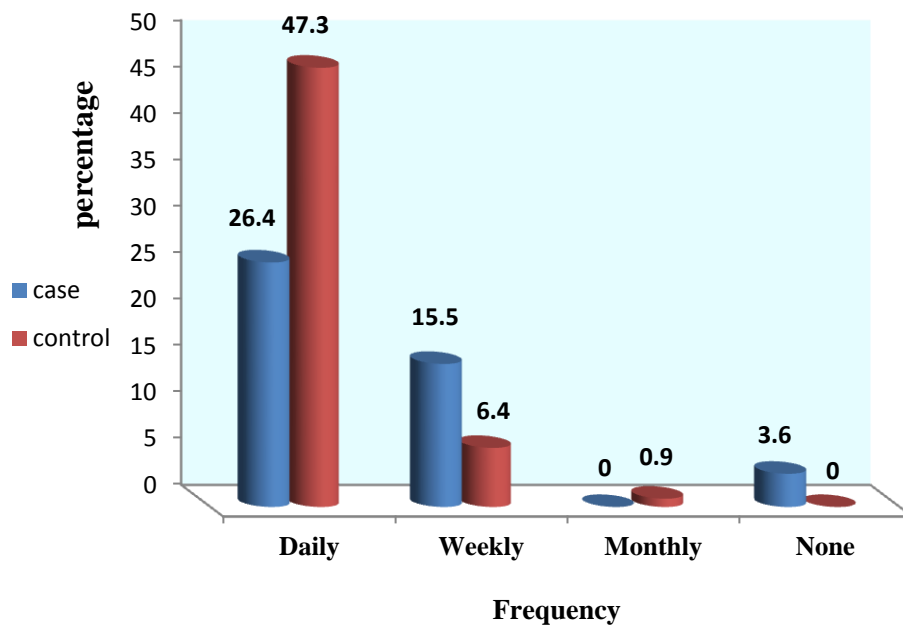
Figure (4) : Frequency of milk and milk products consumption

5.5 Differences of consumption of some types of food items for case and controls :

Figure (5) shows that thirty five point five percent of cases have consumed whole milk and milk products in contrast to thirty eight point two percent of controls, and three point six percent of cases have consumed skimmed milk and milk products in contrast to nine point one percent of controls, and there was no significant difference between two groups in the consumption of types of milk and milk products (p value = 0.15).
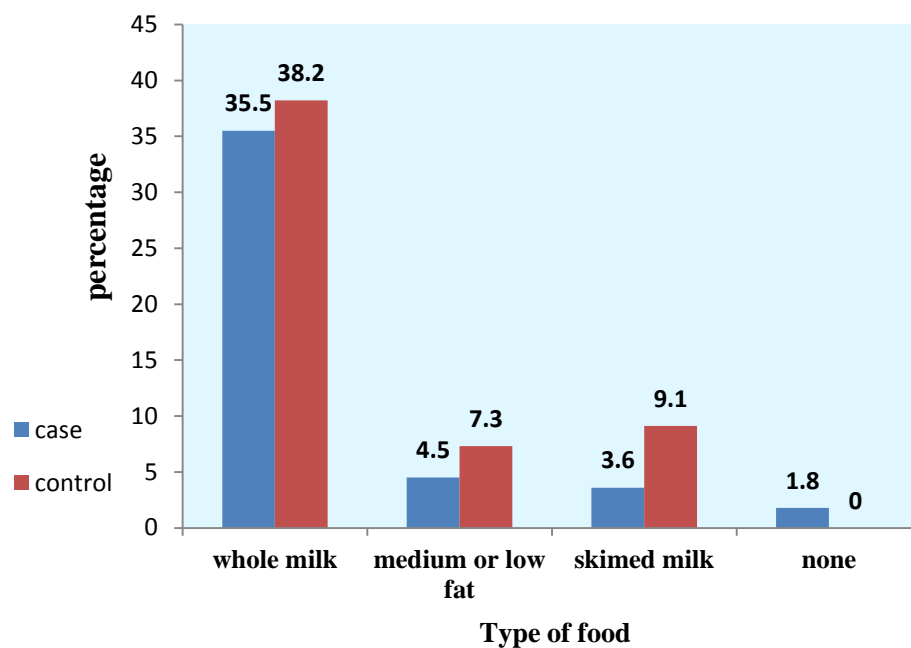
Figure (5) : Type of milk and milk products consumed by cases and controls

Figure (6) shows that forty four point five percent of cases, forty eight point two percent of controls used vegetable oil in cooking, and zero point nine percent of cases, five point five percent of controls used olive oil in cooking, and there was no significant difference between two groups (p value = 0.1).
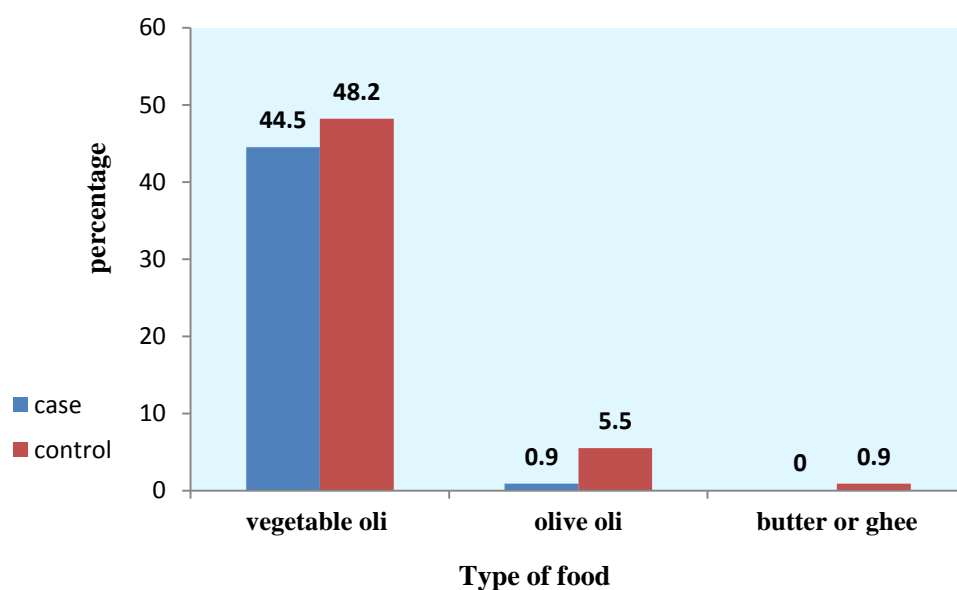
Figure (6) : Type of fat used in cooking by cases and controls

Figure (7) shows that twenty six point four percent of cases did not consume high fat foods used separately (butter, mayonnaise), in contrast with thirty one point eight percent of controls, and three point six percent of cases have consumed both butter and mayonnaise, and also three point six percent of controls used both, and there was no statistically significant difference between two groups (p value = 0.85).
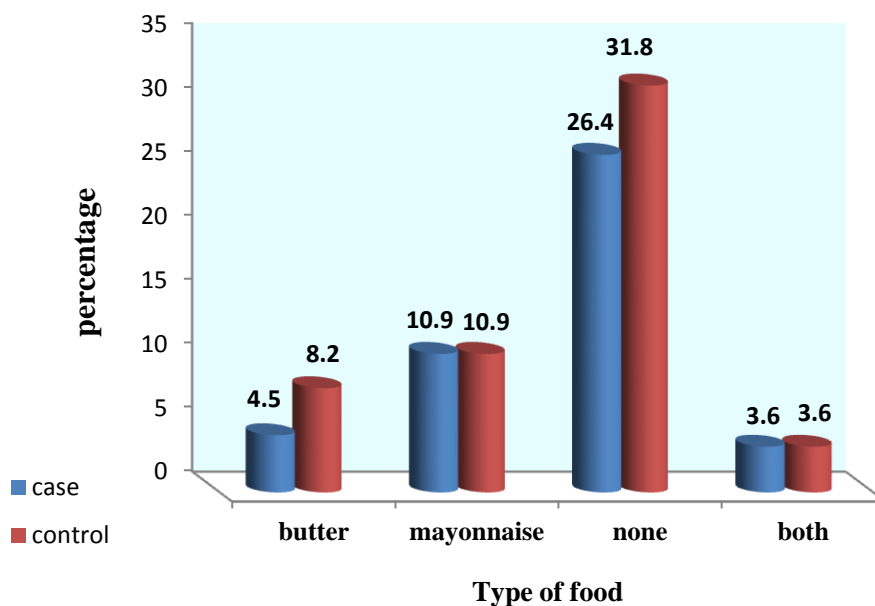
Figure (7) : Type of fat used separately by cases and controls

Figure (8) shows that forty three point six percent of cases have consumed white bread, and also forty three point six percent of controls have consumed white bread, and for the consumption of barley or bran bread, ten point nine percent of controls have consumed barley or bran bread, in contrast with one point eight percent of cases, and there was a statistically significant difference between two groups (p value = 0.012).
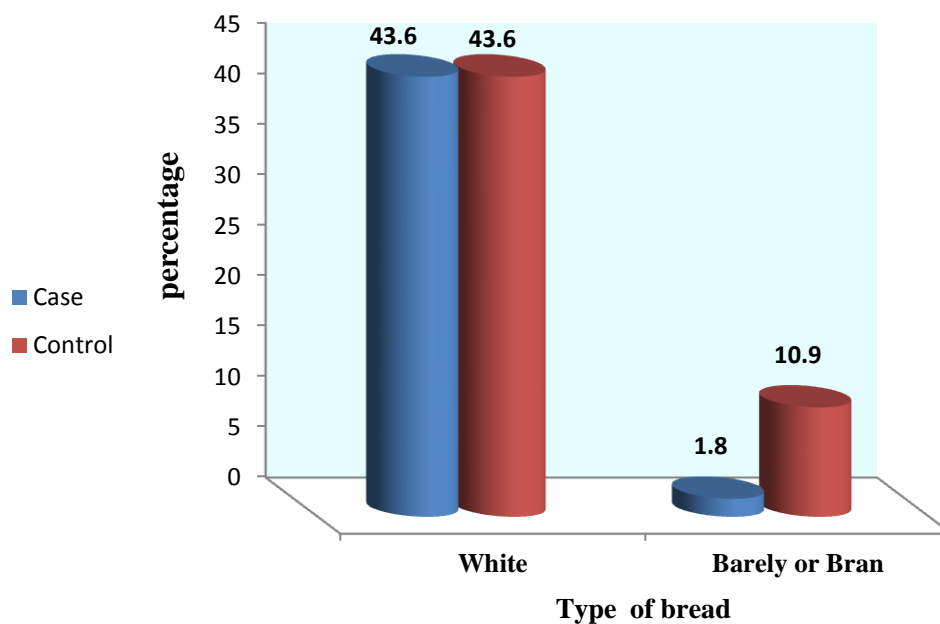
Figure（8）: Type of Bread consumed by cases and controls

Figure (9) shows that forty percent of cases did not consume nuts between meals, in contrast with forty seven point three percent of controls, five point five percent of cases have consumed nuts between meals as snacks, in contrast with seven point three percent of controls, and there was no statistically significant difference between two groups (p value = 0.83).
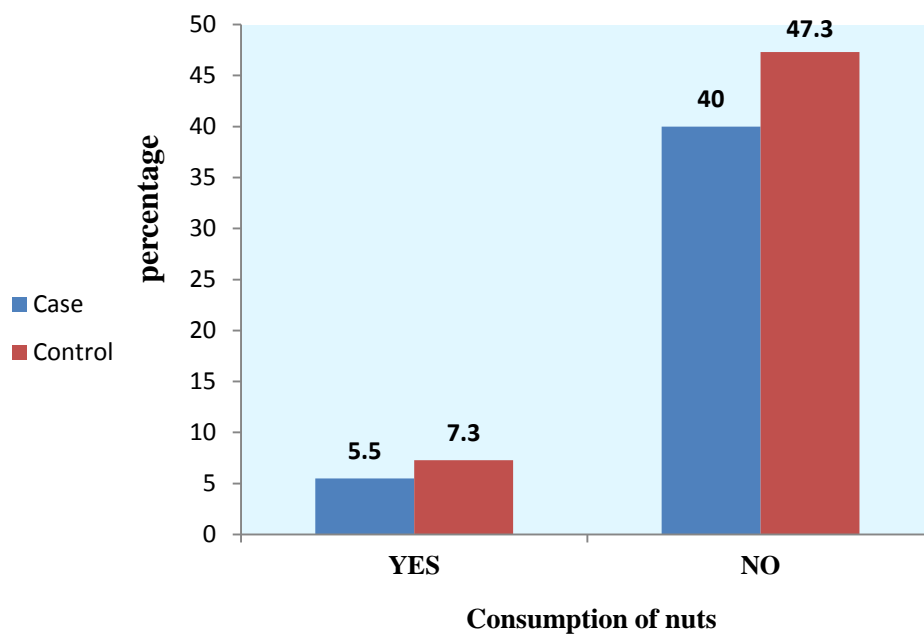
Figure (9) : consumption of nuts between meals by cases and controls

Figure (10) shows that cases have consumed significantly more canned juice forty two point seven percent as compared to thirty three point six percent of controls, in contrast with the fresh juice, cases have consumed significantly less fresh juice two point seven percent as compared to twenty point nine percent of controls, and there was highly significant difference between two groups (p value = 0.000).
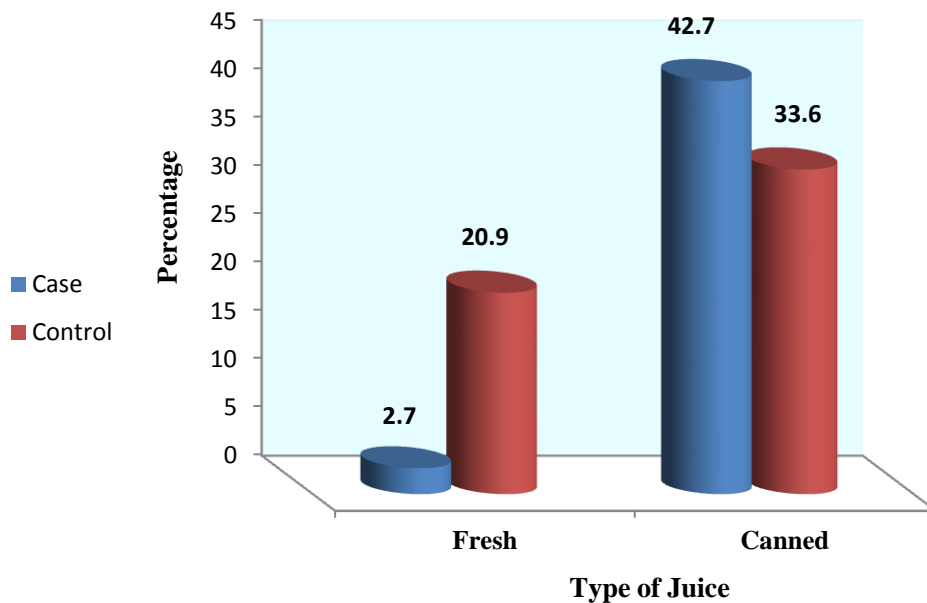
Figure (10) Type of Juice consumed by cases and controls

Figure (11) shows that fried eggs were consumed by thirty six point four percent of cases, in contrast with twenty eight point two percent of controls, and boiled eggs were consumed by five point five percent of cases in contrast with twenty two point seven percent of controls, and difference between two groups is statistically significant (p value = 0.002).
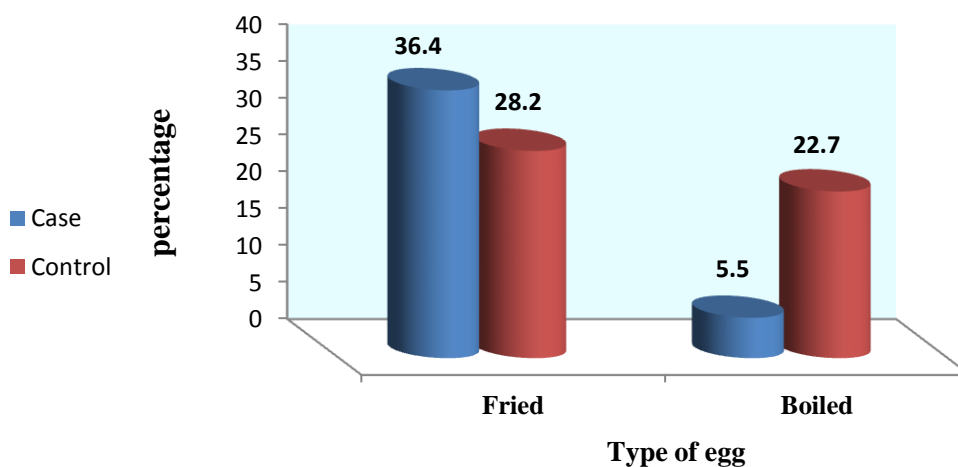
Figure : (11) : Type of egg consumed by cases and controls

5.6 Differences in nutrients intakes between cases and controls :

Table (9) shows that no significant difference between cases and control in the average daily caloric intake (1664 k. cal / 1469 k.cal) respectively, (p value = 0.05). and fat daily intake sixty one point one gm for cases, eighty point nine gm for controls, and there was no significant differences between two groups (p value = 0.07). and for dietary calcium intake, cases have consumed 488.5 mg, in contrast with the controls consumed 632.1 mg, and this result indicates a statistically significant difference between two groups (p value = 0.02). Cases have consumed significantly less dietary Vitamin C forty three point three mg in contrast with the controls consumed seventy five point four mg, and there was a highly significant differences between two groups (p value = 0.001), and the odds ratio for Vitamin C and calcium is less than 1 (0.2 , 0.8) respectively,and means that intake of dietary Vitamin C and calcium could be a protective factor against formation of gall stones .

Table (9) : Differences in nutrients daily intakes between cases and controls (Mean ± SD) :

Variables (daily)	Cases n = 50	Controls n = 60	95 % confidence interval		P value	Odds ratio
			lower	upper		
Energy (K . cal)	1469 ± 527.4	1664 ± 528.9	-394.94	6.097	0.050	1.3
Fat (gm)	61.1 ± 51.4	80.9 ± 61.1	-41.40	1.835	0.072	2.8
Calcium (mg)	488.5 ± 384.2	632.1 ± 266.2	-267.0	-20.2	0.028	0.8
Vitamin C (mg)	43.3 ± 47.3	75.4 ± 52.4	-51.12	-13.0	0.001	0.2

6. Discussion

Gall stone disease is a Worldwide problem and remains to be one of the most common health problems leading to surgical intervention. (Getachew. 2008).

Excessive energy intake is considered to increase risk for gall stones mainly by contributing to obesity. (Tseng, et al., (1999), Jalaja, et al., (2010) and Al saif. (2005) reported that high intake of energy may increase the risk of gall stone formation. also Tsunoda, et al., (2004) and Davidovic, et al., (2001) showed that high energy intake was the most important predicator of gall stone. And a study conducted by sichieri, et al., (1991) reported that energy intake was significant only among women younger than fifty years ago at base line. Whereas the results of the present study shows that caloric intake is not different between cases and control and difference between two groups is not statistically significant (p value = 0.05). This results could be due to obese or overweight people who are diagnosed to having gallstones tend to minimize their caloric intake, and restricted in dietary fat intake, with a subsequent under estimation of the true caloric intake in those subjects.

Most studies reported that overweight, obesity are risk factors for the formation of gall stones. (Jalaja, et al., (2010), Al – Ohali. (2006) and Jayanthiv, et al., (2005) Also in Italy Misciagna, et al., (1999), Misciagna, et al., (1996) suggested that high body mass index is significant risk factor for gall stone formation. and a study was done in Poland showed obesity is the major risk factor in women and statistically significant in men. (Ostrowska, et al., 2005), These results are in agreement with the results of the our study, we showed a highly significant association between BMI and risk of gall bladder stone (p value = 0.000). The majority of the cases are obese grade I and obese grade II, whereas the majority of the controls is normal weight.

Consumption of highly refined carbohydrate together with low fiber intake may increase risk of gall stone formation. (Tseng, et al., 1999). Canned juices are devoid of fiber, and loaded with a lots of simple sugar after the high heat process, in comparing with fresh fruit juice. In the present study the gall stone patients consumed significantly more canned juice compared with controls, and different between two groups is highly significant (p value = 0.000). but there was no significant difference between cases and controls as regards to frequency of consumption of table sugar, desserts, honey, and jam. (p value = 0.41 , 0.75 , 0.78) respectively. Whereas most of the studies reported

that a positive association between intake of refined sugar and gall stone formation. (Jalaja, et al., (2010), Al – Ohali (2006). and Alsaif. (2005). Misciagna, et al., (1999) and Jorgensent, et al., (1989) also suggested that a diet rich in refined sugars is significant risk factor for gall stone formation.

Dietary fibers have a protective effect against the formation of cholesterol gall stones. (Acalovschi. 2001). Fresh fruit juices is a high source of dietary fiber, The results of this study showed that control subjects consumed significantly more fresh juice than case subjects, and this difference is highly significant (p value = 0.000). and in the frequency of consumption of vegetables, our study showed that there was a significant difference between cases and controls in the consumption of vegetables (p value = 0.04) and controls consumed more vegetables than cases.

Barley and bran bread, legumes are also high sources of dietary fibers, In this study, control subjects consumed significantly more barley or bran bread than cases (p value = 0.01), and there was statistically highly significant difference between cases and controls in the frequency of consumption of legumes, and controls consumed more legumes than cases (p value = 0.000). this result is in agreement with (Al- Ohali 2006, Misciagna, et al., (1996) also reported high consumption of brown, bran bread, whole meal bread, legumes could play a protective role against this disease. Most studies reported that a negative association between intake of fiber and gall stone formation (Jalaja, et al., (2010), Alsaif. (2005), Misciagna, et al., (1999), Jorgensen, et al., (1989). and results of these studies indicated that high intake of dietary fiber may protect against gall stone formation.

Dietary fatty acids have also been suggested as risk factor for gall stones, Higher intake of saturated fat was associated with increased incidence of gall stones, while higher intake of poly unsaturated or monounsaturated fat was associated with decreased risk. (Alan. 2009 and Tseng, et al ., 1999) .

Present results showed that gall stone patients consumed significantly more red meat than controls (p value = 0.02). while there was no statistically significant difference between two groups as regards to consumption of other types of meats (chicken with skin , chicken without skin, fish). Also in our study the majority of the cases prefer to consume fried eggs, and there was a statistically significant difference between two

groups (p value = 0.002). this result is in agreement with some previous studies suggested that a diet rich in animal fat, and consumption of fried food and excessive oil were positively associated with the incidence of gall stone. (Misciagna, et al., (1999), Misciagna, et al., (1996).

The results of this study showed that no significant difference between cases and controls as regards to consumption of types of milk and milk products, Consumption of type of fat used in cooking. high fat foods using separately like butter and mayonnaise. Our study is not in agreement with previous study (Yago, et al., (2005) reported that type of dietary fat consumed can influence bile composition in humans. In our study 24 hr food recall method showed that there was no significant difference between cases and controls (p value = 0.07) in the mean of daily intake of total fat. This result could be due to patient with cholelithiasis tend to restrict dietary intake of fat.

Most studies (caroli, et al., (1998) and linos, et al., (1989) suggested that a changing in the dietary habits by limiting saturated fats could reduce the incidence of cholelithiasis, and high consumption of monounsaturated fatty acids like olive oil had a protective effect against this disease. a study was done in Libya by (Jaraari, etal., (2010) this study showed that high levels of cholesterol in stones and dyslipidemia suggest an etiological association and efforts to reduce dietary fat among the Libyan population may lead to decrease gall stone disease. Jalaja, et al., (2010) reported individuals with high serum cholesterol, high triglycerides and low HDL are more prone to the risk of cholelithiasis. while, in our study there was no significant difference in lipid profile between two groups.

Nuts are rich in several compounds that may be protective against formation of gall stones. (Tsai, et al., 2004). a study conducted by Tsai, et al., (2004) they reported that the frequent nut consumption is associated with a reduced risk of gall stone disease in men. these results is different with the results of our study, They showed there is no relationship between consumption of nuts between meals as snacks and gall stone formation.

Calcium has been hypothesized to protect against the formation of gall stones. (Cuevas, et al., 2004). In the present study, there is significant difference in the mean of daily intake of calcium between cases and controls was recorded (p value = 0.02), which means that mean of dietary calcium intake was significantly lower among cases

compared to controls. Milk and milk products the best dietary sources of calcium, Our study showed that there was a highly significant difference between cases and controls in the frequency of consumption of milk and milk products (p value = 0.001), these results indicating that consumption of milk and milk products daily was significantly lower among cases compared to controls. Our result differ with previous studies showed that high intake of calcium may increase the risk of gall bladder stone formation (jalaja, et al., (2010), Alsaif. (2005). But a study was done in Spain (Ortega, et al., (1997), they reported that all vitamins and minerals studied patients with gall bladder stone showed a greater percentage of intakes below those recommended.

Vitamin C have a protective role against the formation of gall stones (Rakesh. 2003). In our study, there was a highly significant difference between cases and controls in the mean of dietary daily intake of Vitamin C estimated by twenty four hr food recall method (p value = 0.001), and this results showed that control group consumed significantly more dietary Vitamin C compared to gall stone patients. Our study is in agreement with previous studies, showed that a high intake of vitamin C may protect against gall stone formation (Jalaja, et al., (2010) , Alsaif. (2005).

Coffee consumption considered to be inversely associated with gall stone prevalence. (Acalovschi. (2001). Al – Ohali (2006) and Misciagna, et al., (1996) reported that high consumption of coffee could play a protective role against this disease. These results are in agreement with our study, showed that a statistically significant different between cases and controls in the frequency of consumption of coffee (p value = 0.02). for the consumption of other types of caffeinated beverages (red , green tea) our study showed that there was no significant difference between two groups.

7. Conclusion

The present study indicated that nutritional factors play an important role in the etiology of gall stone formation, the dietary risk factors that associated with the development of gall stone formation were high intake of high cholesterol and saturated fat diet like (red meat, fried eggs), and low intake of high fiber diet like (vegetables, fruits and fresh fruit juice, legumes, barely and bran bread).

Coffee consumption, dietary calcium and vitamin C have a protective role against the formation of gall stones. Obesity is also a risk factor for gall stone formation.

8. Recommendation

1-Improving nutritional habits by increasing a nutrition educational programs for the people.

2- Reducing weight by using moderate caloric restriction programs, and avoid very low caloric diet programs (due to very low caloric diet may exacerbate bile saturation).

3- Change in dietary habits by decreasing intake of high cholesterol and saturated fat diet like (red meat, fried eggs), and increasing intake of high fiber diet like (vegetables, fruits and fresh fruit juice, legumes, barely and bran bread) could reduce the formation of gall stones.

4- Increasing intake of high sources of dietary calcium, vitamin C could protect against the formation of gall stones.

5- More researches relating to the dietary risk factors and cholelithiasis should be performed in future.

9. Limitations

1-The food frequency questionnaire used in this study did not assess the specific quantity of each of the various dietary constituents, and this type of food frequency questionnaire used in this study give only information about the frequency of each food type and require more accurate a dietary content assessment questionnaire.

2- Laboratory measurements of Calcium and Vitamin C is difficult, because facilities not available in the hospital, and expensive outside the hospital.

3- We took a long time for the data collection, because of the security situation in the our country, and stop the admission of cases of gall bladder stones to the hospital at the time of data collection, and admitted of emergency cases only, and also the large exclusion criteria was a reason for small sample size.

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11.1 Appendix (A)

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

تهدف هذه الدراسة الى معرفة العوامل الغذائية ذات الخطورة فى تكوين حصوات المرارة لدى المرضى المقيمين فى قسم الجراحة العامة بمركز بنغازى الطبى .

يحتوى الاستبيان على مجموعة من الاسئلة التى ستستعمل اجوبتها للبحث فقط لذلك نشكر حسن تفهمكم ومشاركتكم معنا فى اتمام هذا العمل للحصول على درجة الماجستير فى مجال التغذية العلاجية .

- **العمر** : 1- اقل من 25 سنة   2- 25 – 35 سنة   3- اكثر من 35 سنة

- **الجنس** : 1- انثى   2- ذكر

- **الحالة الاجتماعية** : 1- اعزب   2- متزوج   3- مطلق   4- ارمل

- **المستوى التعليمى** :

- **المهنة الحالية** :

المعلومات الغذائية :

- **كم عدد الوجبات الرئيسية التى تأخذها يوميا :**

1- وجبة واحدة   2- وجبتان   3- 3 وجبات

- **ما هى الوجبة الاساسية :**

1- الافطار   2- الغداء   3- العشاء

- **ما هى محتويات الوجبات الرئيسية (يمكن الاشارة على اكثر من واحدة) :**

1- اللحوم   2- البقوليات   3- النشويات والحبوب والخبز   4- الحليب ومشتقاته

5- الفواكه   6- الخضراوات   7 – البيض

- **ما هو نوع الدهون التى تستخدم فى الطبخ :**

1- الزيت النباتى   2- الزبدة   3- زيت الزيتون   4 - السمن

- **ما هو نوع الحليب ومشتقاته التى تستهلكها :**

1- كاملة الدسم   2- متوسطة او قليلة الدسم   3- خالية الدسم

- **كم عدد الوجبات الاضافية التى تؤخذ بين الوجبات الرئيسية :**

1- واحدة   2- اثنتان   3- ثلاثة   4- ولا وجبة

- **ما هو نوع هذه الاطعمة والمشروبات التى تؤخذ بين الوجبات (يمكن الاشارة على اكثر من واحدة) :**

1- القهوة والشاى   2- الكيك والبسكويت والحلويات   3- الفواكه   4 – المكسرات

5 – الشكولاتة   6- السندوتشات

- **هل تتناول الاغذية التالية بشكل منفصل :**

1- الزبدة   2- المايونيز   3- لا تتناولها   4 – الاثنين معا

- ما هى الوجبات التى تناولتها خلال الاربعة والعشرون ساعة من اليوم السابق :

الكمية	نوع الطعام	الوجبة
		الافطار
		وجبة اضافية
		الغداء
		وجبة اضافية
		العشاء
		وجبة اضافية

‑   **معدلات استهلاك بعض انواع الاطعمة و المشروبات :**

الرجاء وضع علامة (✓) فى مربع واحد فقط :

لا يأخذها	شهريا	اسبوعيا			يوميا			النوع
	مرة او مرتان	6-5 مرات	4-3 مرات	مرة او مرتان	3 مرات او اكثر	مرتان	مرة واحدة	
								اللحوم الحمراء
								الدجاج مع الجلد
								الدجاج من غير الجلد
								سمك مشوى او مطبوخ
								سمك مقلى
								البيض المقلى
								البيض المطبوخ
								الفول
								العدس
								الفاصوليا
								الحمص
								حليب كامل الدسم
								حليب خالى الدسم
								زبادى كامل الدسم
								زبادى خالى الدسم
								القشطة
								جبنه كاملة الدسم
								جبنه خالية الدسم

لا يأخذها	شهريا	اسبوعيا			يوميا			النوع
	مرة او مرتان	6-5 مرات	4-3 مرات	مرة او مرتان	3 مرات او اكثر	مرتان	مرة واحدة	
								جبنه كريميه
								الخبز الابيض
								خبز الشعير
								خبز النخالة
								خضراوات مطبوخة
								خضراوات طازجة
								فواكه طازجة
								عصير فواكه طازجة
								عصير معلب
								تمر
								المايونيز
								الزبدة
								الزيت النباتى
								السمن
								السكر (ملعقة صغيرة)
								العسل
								المربى
								الحلويات
								مشروبات الدايت
								القهوة العربية
								النسكافيه
								الشاى الاحمر
								الشاى الاخضر

11.2 Appendix (B) :

Anthropometric measurements :

Weight	Kg
Height	Cm
BMI	Kg/m²

BMI Classification according (WHO 2000) :

BMI	Classification
< 18.5	Underweight
18.5 – 24.9	Normal weight
25.0 – 29.9	Over weight
30.0 – 34.9	Class I Obesity
35.0 – 39.9	Class II Obesity
≥ 40.0	Class III Obesity

Appendix (C) :

Laboratory measurements (Lipid profile) :

Test	Result	Normal value
Cholesterol		Desirable < 200 mg/dl Borderline high 200 -239 mg/dl High risk > 240 mg/dl
HDL		No risk > 65 mg/dl Moderate risk 45 – 65 mg/dl High risk < 45 mg/dl
LDL		Desirable < 130 mg/dl Borderline high 130 – 159 mg/dl High risk > 160 mg/dl
Triglycerides		Normal < 150 mg/dl Borderline high 150 – 199 mg/dl High 200 – 499 mg/dl Very high ≥ 500 mg/dl

العوامل الغذائية ذات الخطورة فى تكوين حصوات المرارة لدى المرضى

المقيمين فى وحدة الجراحة العامة فى مركز بنغازى الطبي

قدمت من قبل :

اسماء حمد فرج بالخير

تحت اشراف :

ا.د . صلاح سالم الطقطوق

الخلاصة

المقدمة : من المهم دراسة العوامل الغذائية ذات العلاقة فى تكوين حصوات المرارة وذلك لان الاصابة بحصوات المرارة تعتبر مشكلة من المشاكل التى تتطلب تدخلا جراحيا لدى المجتمع الليبي.

الهدف : تهدف هذه الدراسة الى تحديد العوامل الغذائية ذات الخطورة فى تكوين حصوات المرارة لدى المرضى الذكور والإناث المصابين بحصوات المرارة الداخلين الى وحدة الجراحة فى مركز بنغازى الطبى .

طرق البحث : تتضمن هذه الدراسة خمسون مريضا مصابا بحصوات المرارة وتم تشخيصه حديثا (الحالات) بالإضافة الى عدد ستون شخصا من الافراد الاصحاء (عينات مقارنة) مطابقة مع العمر والجنس ومن اكثر من مصدر . حيث تم تقييم الوضع التغذوي باستخدام استبيان معد مسبقا يتضمن اسئلة عن العادات الغذائية وأيضا حساب كميات الغذاء المستهلك المعتادة لمدة اربعة وعشرون ساعة وأيضا استخدام استبيان تردد الغذاء . وتم اخذ القياسات الانثربومترية (الوزن / الطول / معدل كتلة الجسم) باستخدام معدات خاصة بذلك . وأيضا تم جمع عينات الدم وتحليلها لقياس نسبة الدهون فى الدم . وتم استخدام برنامج احصائي خاص لتحليل العلاقة بين العوامل الغذائية والإصابة بحصوات المرارة.

النتائج : اظهرت نتائج الدراسة ان معدل الاستهلاك الغذائى للأطعمة الغنية بالكلسترول والدهون المشبعة مثل (اللحوم الحمراء / البيض المقلى) اعلى فى الحالات مقارنة مع العينات المقارنة . بينما معدل استهلاك الاطعمة الغنية بالألياف الغذائية والكالسيوم وفيتامين سى وأيضا معدل استهلاك القهوة اعلى فى العينات المقارنة مقارنة مع الحالات . كما اظهرت نتائج الدراسة ارتفاع معدل كتلة الجسم عند الحالات مقارنة مع العينات المقارنة .

الخلاصة : خلصت الدراسة الى ان العوامل الغذائية ذات العلاقة فى تكوين حصوات المرارة هى ارتفاع معدلات استهلاك الاطعمة الغنية بالكلسترول والدهون المشبعة مثل (اللحوم الحمراء / البيض المقلى) ونقص فى معدلات استهلاك الاطعمة الغنية بالألياف الغذائية والكالسيوم و فيتامين سى وأيضا القهوة . وتعتبر السمنة وزيادة الوزن عاملا مهما فى تكوين حصوات المرارة .

العوامل الغذائية ذات الخطورة فى تكوين حصوات المرارة لدى المرضى

المقيمين فى وحدة الجراحة العامة فى مركز بنغازى الطبي

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قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير فى التغذية

جامعة بنغازي

كلية الصحة العامة

فبراير 2018