

PROBING INTO THE PREVALENCE AND FACTORS OF GALLSTONES FORMATION IN JHARKHAND REGION IN INDIA

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ABSTRACT: Gallstone is one of the major gastrointestinal problems. There are many factors which leads to gallstone formation, like age, sex, obesity etc. Many factors are still under study. In our study we have tried to analyse our data of gallstone patients with the factors which have already been studied in past elsewhere but not in Jharkhand. In a data survey in Jharkhand region of India, we have tried to study different risk factors of gallstone formation. It was analysed that cholesterol rich diet especially non-vegetarian consumption (68% of patients were nonvegetarian) and age are the major influencing factors. Gallstones are found more frequently in women than men. The ratio of male to female gallstone patients is about 1: 3. It was seen that 72.6% of the cases were in the age of 21-50. This means that with growing age incidence of gallstone increases. In our study we found out that genetics, diabetes and smoking are not much related to gallstone formation.

Keywords: Cholelithiasis, Diet, Gender, Age, lithogenic index, obesity.

INTRODUCTION

People are passing painful and sleepless nights due to stones in their gall bladder. If the stone is in the kidney or urinary tract, there is a possibility that it can be flushed out with medicines and taking copious amount of water. But if it lies in the gall bladder, there is no vent for it and the ultimate cure is cholecystectomy. From recorded history it is obvious that providers of medical services are forever trying to devise better and more efficient medicines, and surgical procedures for healing the sick faster and with greater success. In earlier times a physician would experiment with newer methods of treatment based on trial and error, anecdotes, and information from peers. The same is applied for the gallstones.

Gallstone formation occurs because certain substances in bile are present in concentrations that approach the limits of their solubility. When bile is concentrated in the gallbladder, it can become supersaturated with these substances, which then precipitate from solution as microscopic crystals. The crystals are trapped in gallbladder mucus, producing gallbladder sludge. Over time, the crystals grow, aggregate, and fuse to form macroscopic stones. Occlusion of the ducts by sludge and/or stones produces the complications of gallstone disease. Presence of stones in the gallbladder is referred to as cholelithiasis. If gallstones migrate into the ducts of the biliary tract, the condition is referred to as choledocholithiasis. Sometimes stones from mineral accretions and rocklike clumps of cholesterol or other digestive substances form within the gallbladder and are collectively known as gallstones. The constitution and chemical composition of the bile content in the gall bladder determines to a large extent the chances of the formation of gallstones (Shaffer EA, 2006). They can range in size from miniscule sizes like the head of a pin or grow as big as a golf ball. A diet rich in sugars and fats as well as one having low-fiber content, is the most likely contributing factor to the formation of gallstones. Presence of gallstones in the gallbladder may lead to acute cholecystitis, an inflammatory condition characterized by retention of bile in the gallbladder and often secondary infection by intestinal microorganisms, predominantly *Escherichia coli* and *Bacteroides* species.

Obstruction of bile flow by a stone at this critical point may lead to abdominal pain and jaundice. Stagnant bile above an obstructing bile duct stone often becomes infected, and bacteria can spread rapidly back up the ductal system into the liver to produce a life-threatening infection called ascending cholangitis. Gallstones in the gallbladder may cause progressive fibrosis and loss of function of the gallbladder, a condition known as chronic cholecystitis. Chronic cholecystitis predisposes to gallbladder cancer. In a survey from government hospital of Jharkhand region of India, out of 1065 data of stone cases [gallstones, urinary stones, renal stones] collected in three consecutive years (2008 – 2011), gallstones were found in 716 cases. [Fig: 1] This means that the prevalence of gallstones in Jharkhand region is far more than the occurrence of other kinds of stones cases.

MATERIALS AND METHOD

Certificate of Consent was first obtained from the Ethical committee of the Government Hospital of Jharkhand, RIMS (Rajendra Institute of Medical Sciences, Ranchi, Jharkhand) for obtaining data and gallstones samples of human patients suffering from gallstones. Ultrasonography was done to diagnose different types of stone. Data of different types of stones diseases were collected of three consecutive years (2008-2011). These stones diseases comprised of renal stones, ureter stones, gallstones etc. [Table 1] Out of these stones data of gallstones patient were chosen for study. The age and gender of the patient were recorded. In case of female their parity and age of marriage was also recorded. Interrogations of each patients were done to fill the query form which included may aspects under study, as age, gender, diet, diseases like diabetes etc.

Table 1- Total number of cases among total stone cases: (2008-2011)

S.No.	Name of stone	No.of cases
1.	Gallbladder stone	716
2.	Renal stone	214
3.	Ureteric stone	97
4.	Bladder stone	38
	Total	1065

RESULTS

Gallstones develop treacherously, and they may remain asymptomatic for decades. Cholesterol gallstones, black pigment gallstones, and brown pigment gallstones have different pathogeneses and different risk factors. Since 1980s till date, we are continuously gaining insight to major risk factors for the development of gallstones, including increasing age, female sex, obesity, pregnancy, rapid weight loss, systemic illnesses such as liver disease or hematologic disorders, a long list of medications, and specific bowel surgery. Cholesterol gallstones are associated with female sex, European or Native American ancestry, and increasing age. Other risk factors include obesity, pregnancy, gallbladder stasis, drugs and heredity.

Diets high in fat and cholesterol and low in fiber increase the risk of gallstones due to increased cholesterol in the bile (Sarles H *et al*, 1970; Sarles H, *et al* 1978). Being overweight is a significant risk factor for gallstones. In such cases, the liver over-produces cholesterol, which is delivered into the bile and causes it to become supersaturated. The major risk factors include rapid weight loss due to prolonged fasting, slimming diet (Sichieri R *et al*, 1991), and use of cholesterol lowering drug (Shaffer EA, 2006). Rapid weight loss or cycling (dieting and then putting weight back on) further increases cholesterol production in the liver, which results in supersaturation and an increased risk for gallstones. Along with these, obesity (Leitzmann MF *et al*, 1999; Lamri-Senhadj MY *et al*, 2002), use of saturated edible oil (Dowling RH, 1982) and high calorie intake (Thornton JR *et at*, 1982) also increases the lithogenic index. It has also been seen that person feeding on vegetarian food are less prone to gallstones (Pixley F *et al*, 1985; Tsai CJ *et al*, 2004). Three year (2008-2011) study in Jharkhand region of India also proved that patient with gallstone disease are mainly non-vegetarians was reported that 68% of the cases were non-vegetarian. It has been experimentally proved that consumption of a vegetarian diet, and particularly vegetable protein, may decrease the risk of developing gallstones (Tsai CJ *et al*, 2006; Kritchevsky D *et al*, 1979).

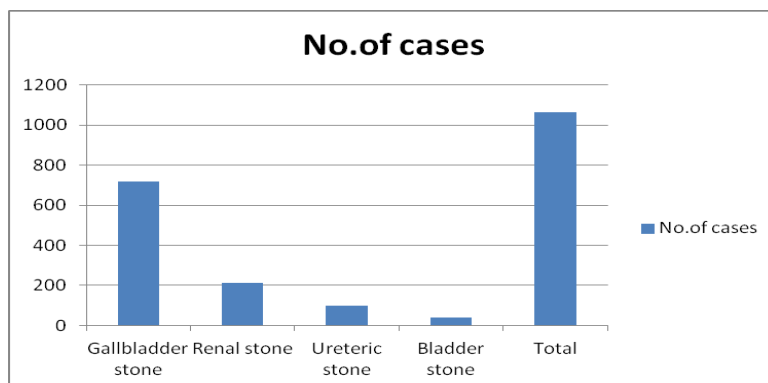


Fig-1- Representation of different types of stone cases in Jharkhand area in year 2008 – 2011.

Gender is unmodifiable risk factor. The prevalence of gall stone disease is found to be same in both sexes until puberty (Poddar U, 2010; Kaechele V *et al*, 2006) but higher in women than in men during the fertility period and after the menopause (Barbara L, 1987; Jorgensen T, 1987). In females the fertility period, pregnancies, and exogenous female sex hormones, increase the lithogenic index. In our study in Jharkhand region we also found the same result. Out of 716 cases 523 were female (73%) and it was found that male: female ratio was 1:2.75 [$p < 0.001$, $\chi^2 = 5.9686$]. [Fig:2] In a study in Nepal, Shrestha *et al* (Shrestha HG *et al*, 1991) found higher incidence of cholelithiasis in females (1:4 male to female ratio). In a similar retrospective study, Pradhan SB *et al* (2009), found female predominance, with male to female ratio (M: F=1:3.20). The major reason for this was their early age of marriage i.e., 20 yr. and higher rate of parity which is 4 children per female and 29% of the female have abortion at the rate of approx. 2 neonates. Five cases supported the same (Scragg RKR *et al* 1984; Friedman GD *et al*, 1996; Bernstein RA *et al*, 1970; Wheeler M, 1970; Linden van der W *et al*, 1961) while two did not (Diehl AK *et al*, 1980; Layde PM *et al*, 1982).

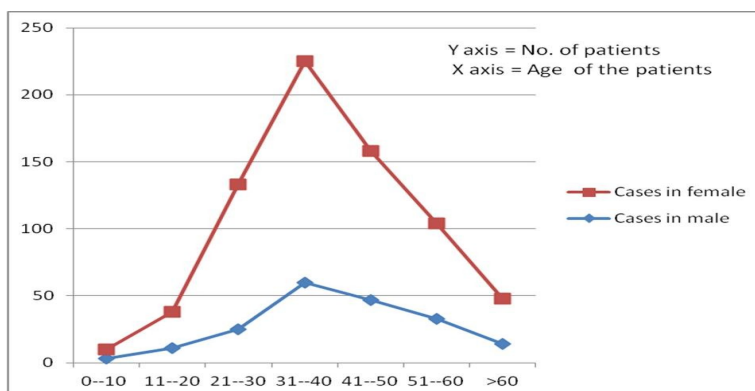


Fig-2- Graph showing the prevalence of gallstones in men and women in Jharkhand area in India.

Age is also an unmodifiable risk factor. Epidemiological and clinical investigations have shown that cholesterol gallstones occur infrequently in childhood and adolescence, and the prevalence of cholesterol gallstone disease increases linearly with age in both genders and approaches 50% at age 70 in females. As age increases cholesterol saturation of bile with enhanced hepatic secretion of cholesterol increases which secondarily leads increase in levels of HMG co-A reductase, the rate-limiting enzyme of cholesterol synthesis (Einarsson K *et al*, 1985) and decreased rate limiting hydroxylase enzyme activity can secondarily decrease the bile acid formation (Bajwa N *et al*, 2010; Bertolotti M *et al*, 1993). In a study in Sant Antonio, USA it was seen that in patients of age below 40, cholesterol gallstones are more frequent and generally pigmented stones are found in patients above 70 (Diehl AK *et al*, 1985). Three year study of Jharkhand has shown that higher number of cases were found in the age of 31-40 [Table 2].

Table 2- Records of gallstone patients: (2008-11)

S.No.	Age	Cases in male	Cases in female
1.	0-10	3	7
2.	11-20	11	27
3.	21-30	25	108
4.	31-40	60	165
5.	41-50	47	111
6.	51-60	33	71
7.	>60	14	34
		Total=193	Total=523

Genetic predisposition has also some role in gallstone pathogenesis. Having a family member or close relative with gallstones may increase the risk. Up to one-third of cases of painful gallstones may be related to genetic factors. A mutation in the gene ABCG8 significantly increases a person's risk of gallstones. This gene controls a cholesterol pump that transports cholesterol from the liver to the bile duct. It appears this mutation may cause the pump to continuously work at a high rate. Defects in transport proteins involved in biliary lipid secretion appear to predispose certain people to gallstone disease, but this alone many not be sufficient to create gallstones. It was seen more commonly in monozygotic twins (KesaniemiYA *et al*, 1989). No such relation is found in our study. Only 7% cases had genetic relation. In these cases all patients were females and their mothers were found to be gallstones sufferers. Same relation was shown in the study of Attili AF *et al*, 2005 (Attili AF *et al*, 2005).

Smoking has been shown to have harmful effects on all parts of the digestive system, contributing to such common disorders as heartburn and peptic ulcers. It also increases the risk of Crohn's disease and possibly gallstones. Some have shown that there is no role of smoking in formation of gallstones (Diehl AK *et al*, 1985; Pixley F *et al*, 1985). Same result was shown in our study also. Only 4 % of patients were found to smoke.

Diabetes has controversial relation with gallstone formation. In diabetic patients triglyceride level is high which may be one of the factors leading to gallstone formation. A case study in Japan, showed a moderate increase in the risk of gallstones in patients with diabetes mellitus (Sasazuki.S, *et al*, 1999). In a study in Taiwan by Chi-Ming Liu *et al* (2004) found 14.4% of gallstone patient diabetic. In our study, we found only 5.7% patient were diabetic.

CONCLUSION

From the data collected from the Government hospital RIMS, Ranchi, we came to the conclusion that among the various types of stone cases, gallstone cases are maximum in Jharkhand area. Among the gallstone cases, the females are more sufferers in this case than males. The male to female ratio is about 1: 3. According to our study in Jharkhand area, diet, age, gender is the main factors on which prevalence of gallstone depends. Genetic relation and Diabetes are still controversial points and smoking has no relation with the occurrence of gallstone.

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Conflicts of interest

We, the authors, wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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