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## Recent Age-specific Trends in the Incidence of Cholelithiasis

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### KEYWORDS

Cholelithiasis, Age-Specific Trends, Ultrasonography

### ABSTRACT:

**Introduction:** Gallstones are the most common pathology of the gall bladder. The incidence in India is estimated to be approximately 4%. Due to clinical evidence of a decrease in age trends in the Outpatient department, we aim to see the variations in age-specific trends in the incidence of cholelithiasis.

**Materials and methods:** The age of patients suffering from cholelithiasis was recorded for an entire year and was analyzed and interpreted. We included three hundred radiologically diagnosed patients of gallstone disease.

**Results:** In this study, 31.33% of the study population was between 31-40 years of age, and another major portion of 20.33% was occupied by patients of 21-30 years of age. 16% of the patients were 41-50 years old, 14.67% were 51-60 years of age, 10.67% were 61-70 years of age, and the rest of the age groups combinedly occupied 6.7%.

**Conclusion:** The incidence of gallstone disease is increasing in younger individuals, most commonly occurring between the ages of 20-40 years. This can be attributed to a variety of factors like obesity, changing dietary habits, changing habits, and lifestyles. More studies need to be carried out regarding the specific prevalence of these factors in younger age groups and their direct relation to the increased incidence of cholelithiasis.

### Introduction

Gallstones are the most common pathology of the gall bladder. They affect 10-15% of the Western population. The incidence in India is estimated to be approximately 4% [1].

Most individuals presenting with gallstone disease are asymptomatic, which makes gallstone disease an incidental finding in radiological scans [2]. Ultrasonography is the gold

standard for diagnosing cholelithiasis [3]. A small proportion of individuals (approximately 3%) become symptomatic, implying that around two-thirds of the patients stay free of symptoms [2]. Previous studies show that gallstones are more common after the age of 40, with an increase in incidence with the increase in age [4]. They are also more common in females than in males, by a ratio of 3:1 [5].



Due to clinical evidence of a decrease in age trends in the Outpatient department, we aim to see the variations in age-specific trends in the incidence of cholelithiasis.

### Materials & Methods

This is a hospital-based cross-sectional study that was conducted in the General Surgery Department at a tertiary care hospital, in Pune, Maharashtra. The age of patients suffering from cholelithiasis was recorded for an entire year. We included three hundred radiologically diagnosed patients of gallstone disease. Data including age, sex, address, history (including their symptomatology including dyspeptic symptoms, pain in the right upper abdomen, with or without fever, and habit formation including alcohol intake, tobacco chewing, smoking), diet, BMI, per abdomen examination findings was recorded in MS Excel spreadsheet and analyzed using ETI info software. All patients diagnosed with cholelithiasis in ultrasonography in the entire year were included in this study irrespective of their age, gender, type of operation (open/ laparoscopic cholecystectomy), or presence of complicated gallstone disease. Only those patients who had

underlying medical conditions and patients who did not consent to be a part of the study were excluded. Informed and written consent was taken from all patients who were enrolled in this study.

### Statistical Tools

The data entry was done in an MS Excel spreadsheet and analysis was done out using ETI info software. Guidelines as per the declaration of Helsinki and good clinical care guidelines were followed while conducting the study.

### Results

In the current study, 31.33% (94) of our study population was between 31-40 years of age, and another major portion of 20.33% (61) was occupied by patients 21-30 years of age. 16% (48) of the patients belonged to the ages of 41-50 years, 14.67% (44) were 51-60 years, 10.67% (32) were 61-70 years, and the rest of the age groups combined occupied 7% (21) (Table 1). The mean age group of study subjects was 41.12 years (median: 38 years, mode: 32 years) (Fig 1).

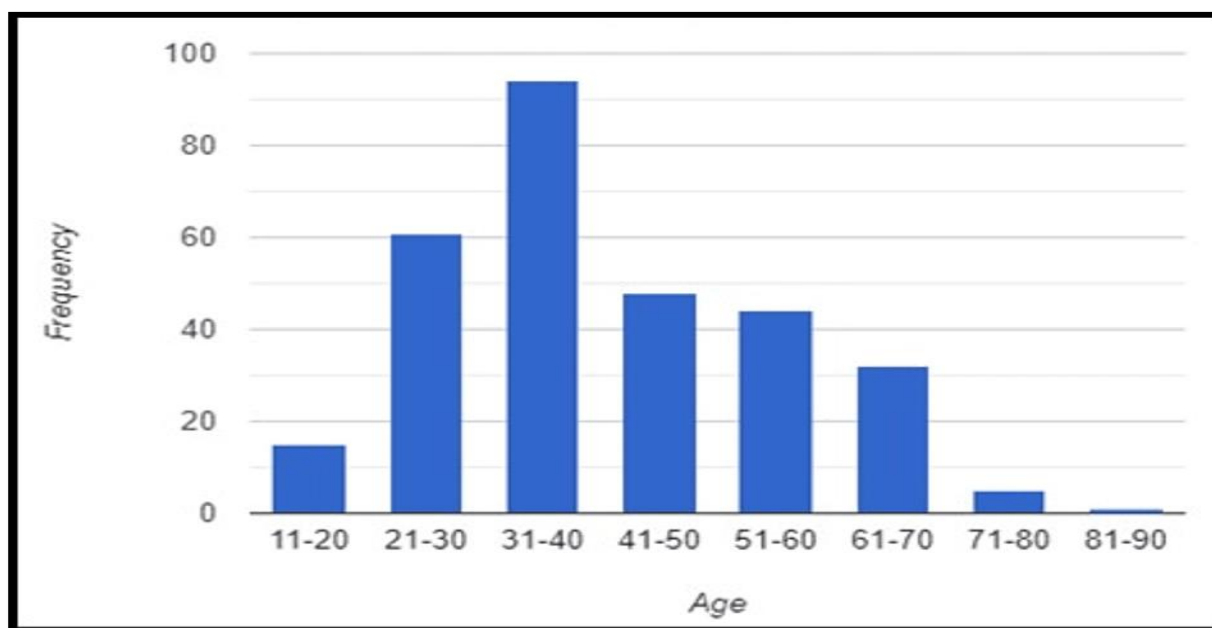


Figure 1: The distribution of patients according to various age groups in the form of a bar graph



**Table 1: Percentage of patients belonging to specific age groups**

Age group (years)	Frequency (n)	Percentage (%)
10 to 20	15	5.00
21 to 30	61	20.33
31 to 40	94	31.33
41 to 50	48	16.00
51 to 60	44	14.67
61 to 70	32	10.67
71 to 80	5	1.67
81 to 90	1	0.33
TOTAL	300	100.00

Table 2 represents the patient distribution according to their gender. Gallstones were diagnosed more commonly in females as compared to males. This may be due to the increased

production of hormones like estrogen and progesterone in women as these are the main hormones involved.

**Table 2: Increased incidence of cholelithiasis in younger females**

Sex Distribution	Frequency (n)	Percentage (%)
Female	200	66.67
Male	100	33.33
Total	300	100.00

Table 3 represents the percentage of people who consumed alcohol or had a habit of smoking or tobacco chewing. In our study, it was evident that alcohol intake and tobacco chewing increase the risk of acquiring gall stone disease, but it's

correlation to smoking was not evident. In our study 66% (198) of the patients consumed alcohol while 64% (192) of the patients were chronic tobacco chewers.

**Table 3: Effect of tobacco chewing, alcohol intake, and smoking on the incidence of cholelithiasis**

Addictions	Frequency (n)	Percentage (%)
<b>Alcohol Intake</b>		
Yes	198	66
No	102	34
<b>Smoking</b>		
Yes	100	33.33
No	200	66.67
<b>Tobacco</b>		
Yes	192	64
No	108	36



In our study, 154 out of 300 patients belonged to the category of being overweight (BMI: 25-29.9) and 37 belonged to the obese category (BMI  $\geq 30$ ) which consisted of 63.7 percent

of the study group (Table 4). Gall stone disease was more commonly found in the patients having a higher BMI.

**Table 4: Association of gall bladder stone disease with BMI**

BMI classification	BMI (kg/m <sup>2</sup> )	Frequency (n)	Percentage (%)
Severely Underweight	<16.5	0	0
Underweight	16.5- 18.4	10	03.33
Normal Weight	18.5-24.9	99	33.00
<b>Overweight</b>	<b>25-29.9</b>	<b>154</b>	<b>51.33</b>
<b>Obese</b>	<b><math>\geq 30</math></b>	<b>37</b>	<b>12.34</b>
Total		300	100

## Discussion

The current hospital-based study was carried out in the General Surgery Department at a tertiary-level hospital in Pune, Maharashtra for an entire year. We compared the results we achieved to those of previously existing studies. We included a total of 300 radiologically diagnosed patients with cholelithiasis in our study. Age groups ranging from 14 to 90 years were included of which more than 50% (155) of the patients belonged to the 20-40 years age group. This highlights a recent shift in the age group of people suffering from cholelithiasis.

A study conducted by Aditya M. Patel et al concluded that patients belonging to the 50-70 years of age had an increased incidence, of which sixth decade had the maximum incidence of gallstone disease [6]. Bhagavan's series achieved its peak in the fourth decade [7]. Another study done by Hermann et al found a marked increase in the incidence of cholelithiasis between ages 35 and 55 years which continued to show a gradual increase after 55 years of age [8].

Gallstones were believed to be found more likely in old age due to a decrease in the production of bile acid, a simultaneous increase in biliary cholesterol production, and a rise in cholesterol saturation. This is attributed to a decrease in CYP11 $\beta$  (cholesterol 7 $\alpha$ -hydroxylase), which is a rate-limiting enzyme in bile acid production [9].

Recent studies, however, have shown a shift in trends. This shift in trend is seen due to a lifestyle change noticed in the individuals. This might be attributed to a variety of causes, including poor eating habits, a sedentary lifestyle, metabolic illnesses, rising rates of obesity, and changes in gut flora.

A study done by Barbora Frybova et al on the pediatric population found a significant association between obesity and cholelithiasis patients. Patients with elevated BMI presented with a higher risk of developing complicated cholelithiasis [10]. This is attributed to the fact that a fat-rich diet can trigger various steps of biliary stone formation and output in the biliary tree system. Firstly, an increase in hepatic uptake of cholesterol and an increase in the synthesis of de novo cholesterol leads to hypersaturation of bile. Secondly, cholesterol can directly influence dysmotility and impaired contraction of the gall bladder by acting at a cellular level onto the smooth muscle cell's plasma membrane present in the gall bladder wall [11]. Highly refined sugars with an extremely low intake of Fiber presented a higher tendency of gallstone development in other similar studies. Dietary Fiber shortens gut transit time, giving colonic bacteria less time to create secondary bile acids, resulting in decreased bile acid absorption [12].

Another reason for young cholelithiasis can be attributed to increased alcohol intake in younger age groups. Liver cirrhosis is one of the most prevalent causes of pigment



lithogenesis. Lower levels of apolipoproteins (both AI and AII) is described as a reason for the increased development of stones in the gallbladder in persons who drink heavily and have liver damage [12].

Tobacco consumption in all forms is yet another contributor to the formation of gallstones. Young adults are getting attracted to the concept of smoking or tobacco chewing, both of which are suspected to be huge contributors to this effect. Nicotine has been linked to increased cholesterol precipitation and biliary crystallisation, and it inhibits prostaglandin synthesis, which in turn prevents mucin formation and secretion in the gallbladder [13].

Previous studies also show an indirect relationship with increased stress. There is a well-known relationship between stress and hypertension. With increased levels of stress in young individuals, a substantial increase in the incidence of gallstones is found. Certain mental stresses have been linked to hypercholesterolemia and elevated blood cholesterol levels, both of which increase the risk of gallstone development [14]. Another study done by Kuta et al suggests an independent association between stress and gallstones [15].

Moreover, increased use of ultrasonography for patients presenting with abdominal has added to the earlier diagnosis of cholelithiasis. It is a very specific, sensitive, non-invasive, and cost-effective test for diagnosing gallbladder diseases. With a change in socioeconomic structure, a higher percentage of the population is inclined toward getting the required investigation. Furthermore, it is simple, and rapid and does not expose the patient to radiation, hence is safe even during pregnancy. Also, it is portable and may be conducted at the patient's bedside. All these factors have led to an increase in the number of early diagnoses of gallstone disease [3].

The limitations of this study include a small sample size as the study was conducted during the training period. Further research is required to identify the specific factors responsible for this shift in age trends towards a younger population. This study is hospital-based. A wider geographical area needs to be covered for a better understanding of the incidence and prevalence of the same.

## Conclusions

The incidence of gallstone disease is increasing in younger individuals, most commonly occurring between the ages of 20-40 years. This can be attributed to a variety of factors like obesity, changing dietary habits, changing habits, and lifestyles. More studies need to be carried out regarding the specific prevalence of these factors in younger age groups and their direct relation to the increased incidence of cholelithiasis. If specific relationships are established, such lifestyle modifications can be made from early childhood to prevent the establishment of cholelithiasis. Primordial prevention methods can be set in place. Further primary prevention methods may help in reducing the occurrence of complications of cholelithiasis.

## References

- [1] Giordano MT, Breyer MJ, Tinjum B, et al.: 213: Emergency gallbladder ultrasonography: Does fasting matter?. *Ann Emerg Med.* 2007, 50:67. 10.1016/j.annemergmed.2007.06.365
- [2] Taylor B, Francis Group: Higher surgical training in general surgery. *Routledge.com.* Accessed September 23, 2023.
- [3] Gallstone disease: epidemiology of gallbladder stone disease. Shaffer EA. *Best Pract Res Clin Gastroenterol.* 2006, 10.1016/j.bpg.2006.05.004.
- [4] Figueiredo JC, Haiman C, Porcel J, et al.: Sex and ethnic/racial-specific risk factors for gallbladder disease. *BMC Gastroenterol.* 2017, 17:10.1186/s12876-017-0678-6
- [5] Patel AM, Yeola M, Mahakalkar C: Demographic and risk factor profile in patients of gallstone disease in central India. *Cureus.* Published online. 2022, 10.7759/cureus.24993
- [6] B DB, Vanahalli DSS: Body mass index and waist to height ratio as an indicator of obesity in gallstone disease: Our 1 year experience. *SAS J Surg.* 2021, 7:336-339. 10.36347/sasjs.2021.v07i06.019
- [7] Hermann RE: The spectrum of biliary stone disease. *Am J Surg.* 1989, 158:171-173. 10.1016/0002-9610(89)90245-6



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- [8] Tareen H: API textbook of MedicinePDF free download. All Things Medicine. Published November 14. 2019, 23:2023.
- [9] Einarsson K, Nilsell K, Leijd B, Angelin B: Influence of age on secretion of cholesterol and synthesis of bile acids by the liver. *N Engl J Med.* 1985, 313:277-282. 10.1056/nejm198508013130501
- [10] Frybova B, Drabek J, Lochmannova J, et al.: Cholelithiasis and choledocholithiasis in children; risk factors for development. *PLoS One.* 2018, 13:0196475. 10.1371/journal.pone.0196475
- [11] Pozo MJ, Camello PJ, Mawe GM: Chemical mediators of gallbladder dysmotility. *Curr Med Chem.* 2004, 11:1801-1812. 10.2174/0929867043364955
- [12] Cuevas A, Miquel JF, Reyes MS, Zanlungo S, Nervi F: Diet as a risk factor for cholesterol gallstone disease. *J Am Coll Nutr.* 2004, 23:187-196. 10.1080/07315724.2004.10719360
- [13] Walcher T, Haenle MM, Mason RA, Koenig W, Imhof A, Kratzer W: The effect of alcohol, tobacco and caffeine consumption and vegetarian diet on gallstone prevalence. *Eur J Gastroenterol Hepatol.* 2010, 22:1345-1351. 10.1097/meg.0b013e32833efdb2
- [14] Bryant HU, Story JA, Yim GK: Assessment of endogenous opioid mediation in stress-induced hypercholesterolemia in the rat. *Psychosom Med.* 1988, 50:576-585. 10.1097/00006842-198811000-00003
- [15] Kuta C, Abbaspour A, Yim GK: Effect of chronic stress on gallstone formation in mice. *Pharmacologist.* 198426, 10.4103/0970-0218.91327