Original Article

Association Between Body Mass Index And Risk Of Symptomatic Cholelithiasis

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Abstract

Introduction: There is an increasing trend towards obesity worldwide and obesity is an important risk factor for various diseases. Gallstone disease is one of the most common and costly gastroenterological disorders. Although obesity is a risk factor for gallstone disease, the excess risk of symptoms associated with higher levels of obesity and weight change are poorly quantified. This study aims to find a relationship between BMI and symptomatic Cholelithiasis and to know the association between obesity and conversion to open cholecystectomy in the Nepalese population.

Methods: This is a prospective observational study conducted in the Department of General Surgery Kathmandu Medical College from February 2019 to January 2020. Those patients who had indications for cholecystectomy were included in the study. Patient data were entered in a structured proforma. The collected data were stored in an electronic database (MS Excel Sheet). Statistical analysis was performed with statistical software (SPSS 23.0 for Windows).

Results: A total of 337 patients were enrolled in the study. The mean age of the study population was 44.96±14 years. The maximum participants, 144(42.7%) had normal BMI (18.5-24.9kg/m²) and 65(19.2%) patients had BMI more than 30. The association between BMI and symptomatic cholelithiasis is was not significant(p=0.77). The majority of the participants had biliary colic i.e., 182(54%) followed by acute calculus cholecystitis in 67(19.9%), and pancreatitis in 44(13.1%). 31 cases were asymptomatic. The majority of the cases 325(96.4%) underwent laparoscopic cholecystectomy while 12(3.6%) of the cases underwent laparoscopic turned open cholecystectomy.

Conclusion: The risk of development of symptomatic cholelithiasis as well as the risk of conversion to open cholecystectomy is not dependent on the BMI of the patients however both parameters have increased risk as age advances.

Keywords: Body mass Index; Laparoscopic Cholecystectomy; Symptomatic cholelithiasis.

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Introduction

Obesity is one of the most neglected epidemics despite being prevalent in the general public. It is an important risk factor for a large number of non-malignant and malignant digestive diseases. There is an increasing trend towards obesity worldwide and it is similar for both developed and developing countries.[1] We come across patients with higher body mass index (BMI) even in socioeconomically weaker class; most probably due to a sedentary lifestyle.[2]

Gallstone disease is one of the most common and costly gastroenterological disorders. Different phenotypes of Gallstone disease are likely to result from the complex interaction of genetic factors, chronic over nutrition with carbohydrates, depletion of dietary fiber, and environmental factors including physical inactivity and infections.[3] However, there is a possible importance of modifiable risk factors in gallstone etiology, given the substantial variation in the prevalence of gallstones worldwide.[5] Obesity is an established risk /factor for gallstone disease.[4] Obesity increases the risk of formation of cholesterol gallstones and these patients are at increased risk of gallstone-related complications and cholecystectomy.[5] Several epidemiological studies have found an increased risk of gallstone disease with greater BMI, however, the strength of the association has varied between studies with some studies reporting a twofold to threefold increase in the risk among obese persons, while other studies using more refined and extreme categorization of BMI have reported up to five to seven-fold increased risk among person with obesity.[6] The optimal BMI for the prevention of gallbladder disease is unknown.[7] The incidence of gallstones and gallstones-related complications will decrease with the adoption of health policies that aim to decrease the incidence of obesity worldwide.[5]

Generally, most patients with gallstones have an asymptomatic clinical course.8 Gallstone disease can cause various clinical events ranging from uncomplicated diseases such as biliary colic to complicated disease including acute cholecystitis, common bile duct stones, cholangitis, and pancreatitis. Several studies have also suggested increased gallbladder cancer risk in persons with gallstone disease.[9,10] Increased BMI increases the risk for symptomatic gallstone disease.[3] Other factors such as female sex, younger age, and larger stones are also associated to symptomatic gallstone disease in a few prospective cohort studies.[8]

Cholelithiasis is a common disease in clinical practice in Nepal. Although obesity is a risk factor for gallstone disease, the excess risk associated with higher levels of obesity and recent weight change are poorly quantified.[7] The aim of this study is to find out a relationship between BMI and symptomatic Cholelithiasis and to know the association between obesity and conversion to open cholecystectomy in the Nepalese population.

Methods

This is a prospective observational study conducted in the Department of General Surgery, Kathmandu Medical College. All patients more than fifteen years of age who were admitted for elective cholecystectomy were included in the study. The convenience sampling method was used to meet the sample size. The duration of the study period was nearly one year, from February 2019 to January 2020. Excluded patients included pregnant women, lactating mothers, and the patients who refused to participate in the study. The sample size was calculated to be 337 using 95% confidence interval and 5% margin of error.

Patients were diagnosed with cholelithiasis after ultrasonography. Only those patients who had indications for cholecystectomy were included in the study. Symptomatic cases were taken as patients hospitalized for elective cholecystectomy due to Cholelithiasis as defined by biliary colic, acute cholecystitis, cholangitis, common bile duct stones, or pancreatitis. After the patient consented to the participation in the study, written informed consent was obtained from the patients. The height and weight of the patients were measured and BMI was calculated. Obesity was defined as BMI >30 as established by the World Health Organization(WHO) and individuals with BMI between 25-30 were classified as overweight or preobese.[1] Patient data were entered in a structured proforma. BMI was categorized according to the WHO.

The collected data were stored in an electronic database (MS Excel Sheet). Statistical analyses were performed with statistical software (SPSS 23.0 for Windows). Results were analyzed using appropriate statistical methods. Descriptive statistics and chi-square (χ^2) test were used when appropriate for statistical analysis. A P-value of less than 0.05 was considered significant and a Confidence Interval (CI) of 95% was considered. Results are expressed as percentages, mean, standard deviation, and median for variables.

Results

A total of 337 patients were enrolled in the study. The mean age of the study population was 44.96±14 years with a minimum age of 16 and a maximum age of 80 years. There were a maximum 87(25.8%) cases in the age group 26-35 and there were minimum of 25(7.4%) cases in the age group 16-25 years. Among the participants, 76% were female and 24% of patients were male. Most of the patients [306(90.8%)] were symptomatic whereas 31(9.2%) were asymptomatic.

Sixty-five(19.2%) patients had a BMI more than 30. The maximum participants, 144(42.7%) had normal BMI (18.5-24.9kg/m²) while only 6(1.8%) patients had BMI <18.5kg/m². Among the 306 symptomatic participants, the majority (131) were in the normal BMI range. Similarly, among the 31 asymptomatic cases, the highest proportion i.e. 13 (41.9%) also fell within the normal BMI range. The association between BMI and symptomatic cholelithiasis is not significant (p=0.77).

Table 1. Distribution of symptoms according to body mass index (BMI)

BMI	Symptoms distribution		Total
	Symptomatic	Asymptomatic	
<18.5	5	1	6
18.5-24.9	131	13	144
25-29.9	110	12	122
30-34.9	47	5	52
≥35	13	0	13
Total	**306**	**31**	**337**

The majority of the participants had biliary colic i.e. 182(54%), followed by acute calculus cholecystitis in 67(19.9%), pancreatitis in 44(13.1%), choledocholithiasis in 8(2.4%), cholangitis in 5(1.5%), and 31(9.2%) cases are asymptomatic. Most of the participants, 245(72.7%) had multiple gall bladder calculi while 81(24%) had solitary calculus and 11(3.3%) had only gallbladder sludge.

The majority of the cases 325(96.4%) had undergone laparoscopic cholecystectomy while 12(3.6%) of the cases underwent laparoscopic turned open cholecystectomy. Among the 12 participants who underwent laparoscopy turned to open cholecystectomy eight cases were female and four cases were male. The association between gender and conversion to open cholecystectomy was not significant (p=0.443). The majority of lap turned open cholecystectomy fell in the age group >65 years. The association between age and management of symptomatic Cholelithiasis was significant (p=0.05). There were 5 cases each of laparoscopy turned to open cholecystectomy in the BMI range of 18.5-24.9 and 25-29.9kg/m². There was no significant association between BMI and conversion to open cholecystectomy (p=0.848).

Discussion

Among the total of 337 participants, there were 81 males (24%) and 256 females (76%). The female-to-male ratio was 3:1. This is comparable with the study done by Pradhan SB et al in Nepal that showed the female-to-male ratio of 3:1.[11] similarly, female preponderance with the ratio of 3:1 was observed in a study done in East India by Alok Chandra Prakash et al.[12] The study done by Shrestha KB et al in Nepalese Population showed even a higher female preponderance with a female to male ratio of 7:1.[7] Many other studies have shown significant associations of gallstones disease and female sex.[6,9,13-15] The higher risk is attributed to female sex hormones, pregnancy, and OCP use.[16] Estrogen decreases the secretion of bile salts and increases the secretion of cholesterol into the gallbladder, which leads to supersaturation.[17] Progesterone acts synergistically by causing hypomotility of the Gallbladder, which in turn leads to bile stasis. Few studies have shown a male preponderance as well.[18]

Our study showed a higher prevalence of gallstone disease in the age group 26-35 years contributing 87(25.81%) cases followed by 73(21.6%) cases in the age group 36-45 years. The mean age was 44.96 ± 14. This is similar to the study done by Koirala A et al in Bharatpur Nepal where the mean age was 41years and the study by Muhammed Yaser Hasan et al in the Asian Population which showed a mean age of 43 years.[19,20]

A study done in Copenhagen, Denmark revealed that fewer than 20% of subjects with gallstones develop clinical events.[8] Another study done in India revealed that asymptomatic cholelithiasis was a common occurrence contributing 47% of the cases.[21] In our study symptomatic cholelithiasis included biliary colic (54%), choledocholithiasis (2.4%), Cholecystitis (19.9%), Pancreatitis (13.1%), cholangitis (1.5%). A study done in California showed the spectrum of gallstone disease that includes biliary colic in 56%, acute cholecystitis in 36%, acute pancreatitis in 4%, choledocholithiasis in 3%, gallbladder cancer 0.3%, and cholangitis in 0.2%.[22]

In the current study the maximum number of participants 144(42.2%) were within the normal BMI range of 18.5-24.9kg/m². There were 187(55.45%) participants in the overweight and obese BMI group. The maximum asymptomatic cases i.e., 13(9%) fell into the BMI range of 18.5-24.9kg/m². There were no participants with a BMI >40kg/m². The mean BMI of the study population was 26.07±5. A study by Frahat Jaleel et al in Pakistan showed the mean BMI of gallstone disease in the female population fell in the normal range.[23] However various studies show a higher prevalence of gallstone disease in patients with higher BMI.[24-26]

In this study, the maximum number of symptomatic gallstone diseases was seen in 16-25 years of age, which contributed to 131 cases (38.8%). There was no association between the BMI and risk of symptomatic disease. A study by Lee et al has revealed a negative correlation between BMI and inflammation severity in acute cholecystitis.[8] However, many other studies have found a positive correlation between BMI and symptomatic cholelithiasis.[27-30] In our study, most of the participants, 72.7% had multiple gall bladder calculi while 24.7% had solitary calculus and 3.3% cases had sludge only. A study done in East India revealed multiple calculus in 64% of the study population.[31]

The rate of conversion to open cholecystectomy was 3.56% in our study. A study done in Kathmandu Medical College, Nepal in 2007 by S K Sharma et al where the conversion rate of laparoscopic cholecystectomy to open cholecystectomy was 4%.[32] Among the 12 cases who underwent laparoscopy turned to open cholecystectomy, 8 cases were female and 4 cases were male. In a study by Genc V et al in 5164 cases, the overall rate of conversion to open cholecystectomy was 3.16% (163 patients). The rate of conversion was higher in males i.e. 84(51.53%) male and 79(48.4%) female which is in contrast to our study.[33] Other studies have also shown a higher conversion rate in male than in female

patients.[34,35] In our study, the majority of the conversion to open i.e. 5(41.66%) was in the age group >65 years. This is in accordance with the study by Kauvar DS et al where the conversion to open cholecystectomy was performed in 20 out of 315 patients with 65% of patients with age more than 65. This increased rate may be due to the chronicity of the disease that leads to chronic inflammation and fibrosis leading to the inability to perform safe dissection and distortion of the anatomy of the hepato-cystic triangle and hence conversion to open.[36]

There were a few limitations in our study. This is a single-center study and the population of the study was the patients that presented to the hospital rather than the community. The convenience sampling method was used which may create a bias in the study.

Conclusion

The risk of development of symptomatic cholelithiasis as well as the risk of conversion to open cholecystectomy is not dependent on the BMI of the patients however both parameters have increased risk as age advances.

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