

RELATION OF CHOLELITHIASIS AND BODY MASS INDEX AMONG DIFFERENT AGE GROUPS

Umesh Kumar Yadav,¹ Pashupati Bhatta,¹ Akash Raya,¹ Vibina Aryal²

ABSTRACT

INTRODUCTION

Cholelithiasis is a common presentation in the department of surgery. One of the potential risk factors of cholelithiasis is obesity, which is a common problem faced by most adult population. The aim of this study is to see the association of cholelithiasis with body mass index among different age groups.

MATERIAL AND METHODS

This cross-sectional study was done in the Department of General Surgery of National Medical College, Birgunj. Ethical clearance (Ref. F-NMC/565/078-079) was obtained from the institutional review committee. Total of 75 subjects were included in the study. Subjects presenting with cholelithiasis in the out-patient department of Surgery were included in the study. Height and weight of the subjects were recorded along with age and other parameters. Body mass index (BMI) was calculated using the Quetelet's formula, weight in kg/ height in m². The body mass index was then categorized according to World Health Organization.

RESULTS

The mean age of the total participants was 43.85 ±11.82 years. The mean BMI was 25.81 ±9.95 kg/m². Among the age group 20–35 years 30% were overweight and 15% were obese whereas in age group 36–50 years 44.4% were overweight and 11.2% were obese. Similarly in participants above 50 years 32.1% were overweight and only 3.6% were obese.

CONCLUSION

Cholelithiasis is one of the common surgical problems. Number of patients with gallstones increases with increasing age. In this study, more number patients are seen with normal BMI. However, higher number of patients are found having overweight or obesity in the age group of 36-50 years.

KEYWORDS

Age group, Body Mass Index (BMI), Cholelithiasis.

1. Department of Surgery, National Medical College, Birgunj,
2. Department of Physiology, National Medical College, Birgunj

DOI: <https://doi.org/10.3126/jucms.v10i01.47219>

For Correspondence

Dr. Umesh Kumar Yadav
Department of Surgery
National Medical College
Birganj, Nepal
Email: kumardrumesh07@gmail.com

INTRODUCTION

Cholelithiasis is a common problem that affects the adult population. It is one of the common disorders encountered in the General Surgery Department. Prevalence of the disease in North American Indian women was 64.1% and 29.1% among males and was less than 5% in black Africans and Asians which alters according to geographic distribution.^{1,2} The prevalence of gallstone disease in Nepal was 4.87% where 6.29% were females and 2.68% were males.²

Recent studies have shown that age, weight, obesity, alanine transaminase (ALT), total standard bicarbonate (SB), free SB, triglyceride TG, and low density lipoprotein (LDL) were associated with the indices of gallstone disease.^{3,4} A study done in a tertiary care center showed that raised BMI, non-vegetarian diet, family history of gallstone disease, diabetes mellitus, smoking and increased parity were the risk factors for cholelithiasis.⁵

Along with many clinical and medical conditions, obesity has also been considered as an important risk factor for the development of cholelithiasis. There are different parameters to evaluate obesity like waist circumference, waist hip ratio and Body Mass Index (BMI).⁶ BMI is considered as an evaluator for body fat and it is widely used to define obesity.⁷ Many studies have shown that BMI is one of the major risk factor for cholelithiasis.^{5,8-10}

The incidence of cholelithiasis increases with age and about 20% of adults above 40 years and 30% of adults above 70 have gallstones. The risk of cholelithiasis increases among people, mainly women, who are overweight.¹¹

The aim of this study is to see the presentation of cholelithiasis and its distribution in different age groups and BMI.

MATERIAL AND METHODS

A descriptive cross-sectional study was done at National Medical College Department of Surgery, Birgunj from December 2021 to March 2022. Ethical clearance was taken from the Institutional Review Committee (reference number: FNMC/565/078/079). The study was done among patients who presented to surgery out patient department (OPD) diagnosed with cholelithiasis on ultrasonography. Patients willing to participate in the study with the diagnosis of cholelithiasis were included in the study. Lottery method was used for sampling and the sample size was calculated using the formula

$$N = Z^2 pq / e^2$$

Where,

N= sample size

Z = 1.96 (at 5% type 1 error, p<0.05)

p = 0.0487 (prevalence of gallstone disease in Nepal)²

q = 1-0.0487 = 0.9513

e = margin of error = 5%

Keeping all the values in the formula the sample size obtained was 71

Therefore, the minimum required sample size was 71 but we included 75 participants in our study. Height and weight of the participants were measured using standard stadiometer digital weighting machine respectively. BMI was calculated using the Quetelet's Formula, weight in kg/ height in meter². BMI ranges for adults are: BMI below 18.5 regarded as underweight, BMI between 18.5-24.9 considered normal, BMI between 25-29.9 considered over weight and BMI 30 and above considered obese. Age, sex and other parameters were obtained and filled in the proforma sheet.

The data was collected in data collection sheet and was entered in Microsoft Excel 2016. Data analysis was done using the Statistical Package for the Social Sciences (SPSS) version 16. The data were expressed in mean with standard deviation, and frequency with percentage where applicable.

RESULTS

Out of 75 participants included in the study 58 (77%) were females and 17 (23%) were males. The mean age of the total participants was 43.85 ±11.82 years. The mean BMI was 25.81 ±9.95 kg/m² (Table 1).

Table 1. Characteristics of participants

Parameter	N	Mean	Standard Deviation
Age	75	43.85	11.82
Male BMI	17	24.32	3.46
Female BMI	58	26.25	11.15
Total BMI	75	25.81	9.95

BMI of female participants (26.25 ±11.15) was higher when compared with male participants (24.32 ±3.46).

Table 2. Distribution of body mass index among different age groups

Age group (In years)	Body Mass Index (In Kg/m ²)			
	Underweight n (%)	Normal weight n (%)	Overweight n (%)	Obese n (%)
20 – 35	2 (10)	9 (45)	6 (30)	3 (15)
36 – 50	-	12 (44.4)	12 (44.4)	3 (11.2)
>50	2 (7.1)	16 (57.1)	9 (32.1)	1 (3.6)

Among the age group 20 – 35 years 30% were overweight and 15% were obese where as in age group 36–50 years 44.4% were overweight and 11.2% were obese. Similarly in participants above 50 years, 32.1% were overweight and only 3.6% were obese.

DISCUSSION

Cholelithiasis is the most common disorder of the biliary system.³ Risk factors for gallstone formation are modifiable and nonmodifiable. Modifiable factors include overweight or obesity, sedentary lifestyles, hyperlipidaemia and rapid weight loss while ethnicity, increasing age, female gender and family history or genetics are nonmodifiable factors. The prevalence of gall stones is high worldwide. In this study, 58 (77%) patients are female. Female and male (F:M) ratio is 3.41:1 which is comparable to the result of study⁸ where female and male ratio was 3:1. Similarly study by Figueiredo

et al¹¹ and Khan I et al⁹ revealed female predominance of 57.9% and 82.1% respectively. Higher incidence in female is commonly attributed to estrogen hormone.

This study observed that cholelithiasis is seen in all age groups but more common with increasing age. In this study, mean age of patient is 43.85years \pm 11.8 which is comparable to the findings of study by Fatima Shahzad et al⁸ and Neupane et al⁵ where mean age of patients was 42.8years \pm 2.57 and 47.82 years respectively but in study by Gu et al³, mean age of patients was 50.4 years. In this study, 55(73.33%) patients are above 35 years of age and this is comparable with reports in studies.^{5,9}

Obesity is associated with increased rate of cholesterol secretion¹² and is well-established risk factor for cholelithiasis. Obesity increases the activity of rate limiting step in cholesterol synthesis and also causes insulin resistance.¹ Hepatic insulin resistance may act by increasing hepatic cholesterol secretion and decreasing bile salt synthesis.¹³ Another study has observed that retinol binding protein 4 (RBP 4) is closely associated with obesity and insulin resistance.¹⁴ Wang et al¹⁵ reported that bile RBP 4 was correlated positively with BMI. Increase level of RBP 4 has been found to increase the incidence of cholelithiasis.¹⁶ In this study, the mean BMI of patients is 25.81 with SD of 9.95. Most of the patients were having BMI less than 25. The number of patients with BMI more than 25 are 34 (45.33%) as compared to 41(54.66%) patients with BMI less than 25. These findings are comparable to result observed by Fatima Shahzad et al⁸ where the number of patients with BMI more than 25 were 45.5% and 54.4% patients were having BMI less than 25. In a study by Neupane et al⁵, BMI was found to be statistically significant risk factor for cholelithiasis.

CONCLUSION

Cholelithiasis is one of the common surgical problems. Number of patients with gallstones increases with increasing age. In this study, more number patients are seen with normal BMI. However, higher number of patients are found having overweight or obesity in the age group of 36-50 years.

ACKNOWLEDGEMENT

We would like to thank all the subjects who gave consent to be involved in our study. We would also like to thank our residents for helping us to fill the Performa sheet.

CONFLICT OF INTEREST

None

REFERENCES

- Stinton LM, Shaffer EA. Epidemiology of Gallbladder Disease: Cholelithiasis and Cancer. *Gut Liver*. 2012 Apr;6(2):172–87.
- Jaisawal RK, Mishra C, Panthee MR, Pathak YR, Acharya AP. Prevalence of gall stone disease in Nepal: multi center ultrasonographic study. *Post-Grad Med J NAMS*. 2007 Dec 1; 7(02).
- Gu Q, Zhou G, Xu T. Risk factors for gallstone disease in Shanghai. *Medicine (Baltimore)*. 2020 Jan 17;99(3):e18754.
- Song ST, Shi J, Wang XH, Guo YB, Hu PF, Zhu F, et al. Prevalence and risk factors for gallstone disease: A population-based cross-sectional study. *J Dig Dis*. 2020;21(4):237–45.
- Neupane RP, Shrestha TM, Raut S, Acharya RP. Risk factors for gall stone diseases in patients presenting to general practice out patient department in a Tertiary Care Center in Nepal. *J Inst Med Nepal*. 2019 Dec 4;41(2):26–9.
- Hu L, Hu G, Huang X, Zhou W, You C, Li J, et al. Different adiposity indices and their associations with hypertension among Chinese population from Jiangxi province. *BMC Cardiovasc Disord*. 2020 Mar 5;20:115.
- Centers for Disease Control and Prevention (U.S., editor. Body mass index : considerations for practitioners. 2022 AD Aug 11; Available from: <https://stacks.cdc.gov/view/cdc/25368>
- Shahzad F, Waqar SH, Siraj Minhaj us, Mirza TI, Shah SA, Ahsan MF. Relationship of BMI and age with gallstone disease. *Ann Pak Inst Med Sc*. 2020;16(2):69–72.
- Khan I, Ahmed T, Iqbal MM, Khan MI, Shah SH, Perveen S. Relationship of BMI and age with cholelithiasis. *J Surg Pak Int*. 2017 Sep;22(3):101–4.
- Liu H, Zhang Y, Ai M, Wang J, Jin B, Teng Z, et al. Body mass index can increase the risk of gallbladder cancer: A meta-analysis of 14 cohort studies. *Med Sci Monit Basic Res*. 2016 Nov 30;22:146–55.
- Figueiredo JC, Haiman C, Porcel J, Buxbaum J, Stram D, Tambe N, et al. Sex and ethnic/racial-specific risk factors for gallbladder disease. *BMC Gastroenterol*. 2017 Dec 8;17(1):153.
- Miettinen TA. Cholesterol production in obesity. *Circulation*. 1971 Nov;44(5):842–50.
- Biddinger SB, Haas JT, Yu BB, Bezy O, Jing E, Zhang W, et al. Hepatic insulin resistance directly promotes formation of cholesterol gallstones. *Nat Med*. 2008 Jul;14(7):778–82.
- Yang Q, Graham TE, Mody N, Preitner F, Peroni OD, Zabolotny JM, et al. Serum retinol binding protein 4 contributes to insulin resistance in obesity and type 2 diabetes. *Nature*. 2005 Jul 21;436(7049):356–62.
- Wang W, Li N. Correlation of retinol binding protein 4 with metabolic indexes of glucose and lipid, bile cholesterol saturation index. *Zhong Nan Da Xue Xue Bao Yi Xue Ban*. 2015 Jun;40(6):657–65.
- Han T, Zhang D, Fu Z, Sun Y, Yang W, Yuan C. Retinol-binding protein 4 as a risk factor for cholesterol gallstone formation. *Mol Cell Biochem*. 2013 May;377(1–2):219–27.