

Clinico - Epidemiological Feature of Gallbladder Cancer in a Tertiary Care Hospital of Guwahati City: A Hospital Base Case Control StudyMousumi Krishnatreya¹, Rohit Kumar Sinha², Anjana Moyee Saikia³¹Associate Professor, Department of Community Medicine, Gauhati Medical College, Guwahati, Assam
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Conflict of interest: Nil

Abstract:

Background: Gallbladder cancer is the most common carcinoma of the biliary tree with very poor prognosis as it is one of the most highly malignant tumours. Various risk factors have been suggested for gallbladder cancer in medical literature but still there is lot to be known. Gallstones, female gender, obesity, older age, ethnicity and geography, porcelain gallbladder, choledochal cysts, gallbladder polyps, industrial and environmental chemicals. GBC is very common in India particularly in the North-Eastern and northern parts of the country where it surpasses, other high incidence areas of the world, due to some yet unknown reasons. Few studies have been conducted in the past regarding Gall-Bladder cancer in the North-Eastern region. This study will attempt to throw light on some factors related to gall bladder cancer with the objectives of 1) To assess the clinical profile of Gall-bladder cancer in tertiary care hospitals in Guwahati city 2) To know some of the epidemiological factors related to gallbladder cancer patients diagnosed in tertiary care hospitals in Guwahati city except age and sex which were matched in this study.

Materials and Methods: This is a Hospital based case control study done in The Gauhati Medical College and Hospital of Guwahati, Assam from August 2020 to July 2021. A sample size of 200 cases and 200 controls was taken. For the purpose of collection of data from cases, Gauhati Medical College and Hospital was visited, and cases of GBC who met the inclusion criteria were identified from case sheets of the surgery ward and interviewed subsequently. For the purpose of collection of data from controls GMCH was visited. Patients who met inclusion criteria were identified through case sheets and interviewed and examined after taking consent. The controls were selected after matching for age and sex.

Results: Most common presenting clinical features among gallbladder cancer patients were pain abdomen (87%) and jaundice (34%). Association between family history of GBC and gallbladder cancer was found to be statistically significant. Association between tobacco (chewed) consumption and gallbladder cancer was found to be statistically significant. Ever users had 1.6 times more chances of developing GBC in comparison to never users. Association between family history of GBC and gallbladder cancer was found to be statistically insignificant. It is found that persons who were hypertensive had 1.7 times more chances of developing GBC in comparison to non-hypertensive persons. Association between physical activity and gallbladder cancer was found to be statistically significant. Thus, more physical activity had a protective role in GBC.

Conclusion: Gall bladder cancer shows association with family history of GBC, Smoking, Tobacco and Alcohol Consumption. It also shows that hypertension and physical activity is also associated with gall bladder cancer.

Keywords: Gall bladder cancer, Family history, Educational status, socioeconomic class.

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Introduction

Gallbladder cancer is the most common carcinoma of the biliary tree with very poor prognosis as it is one of the most highly malignant tumours. Because early symptoms are very vague and anatomically the gallbladder lacks a serosa layer to limit the spread of cancer, the diagnosis of prognosis. Various risk factors have been suggested for gallbladder cancer in medical literature but still

there is lot to be known. Gallstones, female gender, obesity, older age, ethnicity and geography, porcelain gallbladder, choledochal cysts, gallbladder polyps, industrial and environmental chemicals. Typhoid and family history of Gall Bladder cancer are few predisposing factors for Gall Bladder cancer. Reason for geographical variation of incidence of this cancer both

internationally and in India are a matter of speculation. According to the Hospital Based Cancer Registry, Dr B Baruah Cancer institute (BBCI) of Assam showed that Gall bladder cancer were 13.6% and 4.7% for Female and male respectively.

As per the Registry, gall bladder cancer is the second most common cancer among female in BBCI and Assam Medical College. Most common cancer among female in both the sites is Breast cancer, most common cancer among males in BBCI and AMC were oesophageal cancer and hypopharyngeal Cancer respectively. According to Hospital Based Cancer Registry, in Cachar Cancer Hospital, Silchar Gall Bladder cancer is the most common cancer among female and 5th most common cancer among males. [1]

According to the Population Based Cancer Registry, Kamrup Metro District, out of all male cases 4.2 % were Gall Bladder cancer and out of all female cases 9.3% were Gall Bladder cancer. Gall Bladder cancer is the 3rd most common cancer among female in Kamrup district. Similarly in Dibrugarh district of Assam also, the leading cancer sites among female were breast (19.0%), Gall Bladder (10.7%), Oesophagus (9.4%), ovary (8.9%) and cervix (6.4%) while among males Gall Bladder cancer cases comprised of 4.5% of total male cases. [1] Most common form (90%) of gall bladder cancer is adenocarcinoma. Papillary adenocarcinoma or just papillary cancer is a type of gall bladder adenocarcinoma that deserves special mention. They usually have a better prognosis than most other kind of gall bladder adenocarcinoma. About 6% of all gallbladder cancers are papillary adenocarcinoma. Other type of cancers such as adenosquamous carcinoma, squamous cell carcinoma, small cell carcinomas and sarcomas can develop in the gall bladder, but these are uncommon. [2] Cholelithiasis is found in approximately 85% of people with gallbladder cancer.

The larger the gallstones (>2–3 cm in diameter), the greater the association with gallbladder cancer. 3-6 *Salmonella typhi* (~6% of carriers develop gallbladder cancer: a 12-fold risk increase) and *Helicobacter bilis* have been implicated in gallbladder cancer. [7-9] Gallstones and gallbladder inflammation are much more common in women than men and are also the important risk factors for gallbladder cancer. Overweight or obese people are more likely to develop gallbladder cancer in comparison to non-overweight or obese people.

The link between GBC and obesity may be explained from the fact that obesity is also a risk factor for cholelithiasis. Gallbladder cancer mainly affects older people, but younger people can be affected as well.

The mean age of people when they are diagnosed is 72 and more than 66% of people with gallbladder cancer are 65 years or older when it is diagnosed [2] A gallbladder polyp is also considered to be a risk factor for gallbladder cancer.

Signs and symptoms of carcinoma of the gallbladder are generally similar to cholecystitis and cholelithiasis. These include abdominal pain, nausea and vomiting. Jaundice, abdominal mass, weight loss, anorexia and ascites are less common presenting symptoms. Ultrasonography often reveals a thickened, irregular gallbladder wall or a mass replacing the gallbladder.

Ultrasonography may visualize tumour invasion of the liver, lymphadenopathy, and a dilated biliary tree. CT scan may demonstrate a gallbladder mass or an invasion into adjacent organs. Most patients with gallbladder cancer have unresectable disease at the time of diagnosis. The 5-year survival rate of all patients with gallbladder cancer is less than 5 percent, with a median survival of 6 months. [10] GBC is very common in India particularly in the North- Eastern and northern parts of the country where it surpasses, other high incidence areas of the world, due to some yet unknown reasons.

Few studies had been conducted in the past regarding Gall-Bladder cancer in the North-Eastern region but numbers of analytical studies are lacking to test various hypotheses. This study will attempt to throw light on some factors related to gall bladder cancer.

Aims & Objectives

Aim: To know the clinico-epidemiological features of gallbladder cancer patients diagnosed in the tertiary care hospitals in Guwahati city.

Objectives:

1. To access the clinical profile of Gall-bladder cancer in tertiary care hospitals in Guwahati city
2. To know some of the epidemiological factor related to gallbladder cancer patients diagnosed in tertiary care hospitals in Guwahati city except age and sex which were matched in this study.

Materials and Methods

Type of Study: Hospital based case control study.

Study Area:

Gauhati Medical College and Hospital: The Gauhati Medical College and Hospital is a tertiary care hospital with bed strength of 2185.

Study design: Hospital based case control study

Study Period: August 2020 to July 2021

Study Population

1. Newly diagnosed cases of Gall-bladder cancer in the above mentioned hospitals during the study period were taken as cases.
2. Patients suffering from different diseases other than known cancer patients admitted in Gauhati Medical College and Hospital during the study period were taken as controls in 1:1 ratio after matching for age and sex.

Case definition

Cases - Newly diagnosed cases of gallbladder cancer (as per the diagnostic protocols of GMCH) in the above mentioned hospitals during the study period.

Controls - Patients suffering from different diseases other than known cancer patients admitted in Gauhati Medical College and Hospital who underwent USG-Whole Abdomen and showed negative results for any GB disease or abnormality.

Inclusion Criteria for cases-

- Only the newly occurring (incident) cases during the study period were taken as cases.

Exclusion Criteria for cases-

- Previously diagnosed old cases coming for follow up.
- Cases refusing to participate in the study.
- Bedridden cases unable to respond.

Inclusion Criteria for controls-

- Patients admitted in Gauhati Medical College and Hospital who underwent USG-Whole Abdomen and showed negative results for any GB disease or abnormality were taken as controls.
- Controls were included in study after matching for age and sex.

Exclusion Criteria for controls-

- Patients suffering from known cancers were excluded from study.
- Patients refusing to participate in the study.
- Bedridden patients unable to respond.

Sample size and sampling technique

According to Hospital Based Cancer Registry (HBCR), Dr. Bhubaneswar Borooah Cancer Institute (BBCI) during 2012-2014 has registered total 13124 male and 9438 female cases. Out of these, Gall-Bladder cancer cases were 13.6% and 4.7% for females and males respectively. Hence total Gall-Bladder cancer cases during this period came out to be 1899 cases (616 males and 1283 females). By taking average of these three years, cases per year came out to be 633.

In view of multiple risk factors being studied, to give an 80% power in a two-sided test with 5% alpha error for any factor whose prevalence is at

least 15% among controls and assuming the associated odd ratios (OR) to be 2.0, the minimum sample size was calculated to be 175. Thus, sample size of 200 cases and 200 controls was taken.

Following formula is used for calculation of minimum sample size:

$$N = \{z_{1-\alpha/2} \sqrt{2P_2(1-P_2)} + z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)}\}^2 / (P_1 - P_2)^2$$

Where,

P_1 can be calculated by following formula

$$P_1 = OR \times P_2 / [1 + P_2 (OR - 1)]$$

N = Minimum sample size.

$Z_{1-\alpha/2}$ = Value of two tailed alpha error; this is 1.96 at 5%.

$Z_{1-\beta}$ = Value of beta error; this is 0.84 at 20%.

P_1 = Anticipated probability of "exposure" among cases, 1.875% (calculated)

P_2 = Anticipated probability of "exposure" among controls, i.e. 15% (assumed)

OR = 2 (assumed)

Study Variables

Socio demographic variables: Age, sex, religion,, educational status, socio-economic status, per capita income, occupation.

History

- History of any gallbladder disease, family history of Gall-bladder cancer, family history of any other cancer, alcohol consumption, tobacco usage, physical activity
- Blood pressure
- Clinical features of cases.

Data Collection Tools

- A Predesigned and pretested interview schedule.
- Socio economic status: B.G. Prasad socioeconomic classification scale, 2016.
- Stethoscope.
- Sphygmomanometer.
- Weighing scale (bathroom type).
- Non stretchable measuring tape.
- Mercury thermometer.
- Hospital case sheets (Secondary data).

Data Collection technique

I) For cases

For the purpose of collection of data from cases, Gauhati Medical College and Hospital was visited. And cases of GBC who met the inclusion criteria were identified from case sheets of the surgery ward and interviewed subsequently after taking consent.

II) For Controls

For the purpose of collection of data from controls GMCH was visited. Patients who met inclusion

criteria were identified through case sheets and interviewed and examined after taking consent. The controls were selected after matching for age and sex.

Data analysis: Was done using appropriate statistical methods.

- Data collected was entered in Microsoft Office Excel and analysed by using Graphpad Instat software.
- Criteria for significance used in the study was $p < 0.05$ at 95% Confidence Interval (C.I).
- Chi-square test and Fisher exact test was used for analysis of categorical variables.
- Odds ratio was calculated for measuring strength of association.

Ethical consideration

1. Before carrying out the study, ethical clearance was obtained from the Institutional Ethics Committee, GMCH Informed consent before the interview was taken from the patient.
2. Privacy and confidentiality of personal information was strictly maintained in every step of the study

Limitation of the study

Although sincere efforts were made to cover all desired parameters and to derive the best results out of it as far as possible. However keeping this in mind the study was conducted within the framework of the below mentioned limitations:

1. Due to limited resources, many investigations couldn't be done like blood sugar, serum cholesterol etc. So many potential risk factors were not studied in the present study.
2. It was not possible to diagnose the GBC cases ourselves, so we have to depend on the diagnostic protocols of GMCH
3. Cases and controls were not from the same source population since it was hospital-based case-control study.
4. Possibility of recall bias was there.

Results

Out of 200 GBC cases, Majority of the cases, i.e. 87% of them presented with pain abdomen, 34% presented with jaundice, 20% presented with lump abdomen, 12.5% presented with Pruritus, 15.5% presented with weight loss, 9% presented with fever, 6.5% presented with Ascites and 6% presented with vomiting. Among the Gall bladder cancer cases 67% of them had no history of gallbladder disease and 33% had history of gallbladder disease. From the study, it was found that Association between religion and gallbladder cancer was statistically insignificant. (As the number of GBC cases among Sikh religion were very less (2%), cases and controls of both the

Muslim and Sikh religion were clumped together as cases of non-Hindu religion for the convenience of statistical analysis). It was also found that Association between educational status and gallbladder cancer was statistically insignificant. Out of 200 GBC cases, 54% belonged to Class III, 17.5% belonged to Class II and 22.5% belonged to Class IV according to revised modified B.G. Prasad Classification (2016), while among controls 58.5% belonged to Class III, 10% belonged to Class II and 25.5% belonged to Class IV. Association between socio-economic status and gallbladder cancer was found to be statistically insignificant. (Table 1)

Table 2 shows that Among the GBC cases, 7.5% had family history of GBC while among controls, 2.5% had family history of GBC. Association between family history of GBC and gallbladder cancer was found to be statistically significant. Persons having family history of GBC had 3.2 times more chances of developing GBC. From table 2 it was also found that Among 200 GBC cases and controls, 11% and 8.5% had family history of other cancer respectively which was not statistically significant. From the study, it was also found that Among GBC cases, 33% were hypertensive while among controls, 22.5% were hypertensive. Association between hypertension and gallbladder cancer was found to be statistically significant. Persons who were hypertensive have 1.7 times more chances of developing GBC in comparison to non-hypertensive persons.

Among GBC cases, 16.5% are ever users of smoking while among controls, 13.5% are ever users of smoking. Ever users had 1.27 times more chances of developing GBC in comparison to never users. But this Association between smoking and gallbladder cancer was found to be statistically insignificant.

Out of all GBC cases and controls, 18.5% and 20.5% are ever user of alcohol respectively. Association between alcohol consumption and gallbladder cancer was found to be statistically insignificant. Again in the table it is seen that, 57.5% of GBC cases are ever users of tobacco while 45.5% controls are ever users of tobacco. Association between tobacco (chewed) consumption and gallbladder cancer was found to be statistically significant. Ever users had 1.6 times more chances of developing GBC in comparison to never users. (Table 3) This Study also showed that out of all GBC cases, 74% of them had an occupation with sedentary or mild physical activity while among controls, 64% of them had an occupation with sedentary or mild physical activity. Association between physical activity and gallbladder cancer was found to be statistically significant. Thus, more physical activity had a protective role in GBC.

Table 1: Comparison of cases and controls according to some of their Epidemiological factors

Factors		Cases (Percentage)	Controls (Percentage)	P Value	Odds Ratio [95%CI]	
Religion	Hindu	139 (69.5)	129 (64.5)	> 0.05	1.2 (0.79 to 1.81)	$\chi^2 = 0.5499$, df=1 Not significant
	Non-Hindu	63 (31.5)	71 (35.5)			
Educational status	Illiterate	27 (13.5)	18 (9.0)	>0.05		$\chi^2 = 3.486$, df=5 Not Significant
	Primary school	112 (56.0)	117 (58.5)			
	Middle school	29 (14.5)	26 (13.0)			
	High school	22 (11.0)	23 (11.5)			
	Higher secondary	8 (4.0)	13 (6.5)			
	Graduate and above	2 (1.0)	3 (1.5)			
Socio- economic status	I	5 (2.5)	8 (4.0)	>0.05		$\chi^2 = 6.336$, df=4 Not Significant
	II	35 (17.5)	20 (10.0)			
	III	108 (54.0)	117 (58.5)			
	IV	45 (22.5)	51 (25.5)			
	V	7 (3.5)	4 (2.0)			

N.B. Figure in bracket shows column wise percentage.

Table 2: Comparison of cases and controls according to the family history of Cancers

History of Cancers		Cases (Percentage)	Controls (Percentage)	P Value	Odds Ratio [95%CI]	
Family history of Gall bladder Cancer	Present	15 (7.5)	5 (2.5)	< 0.05	3.16[1.13 to 8.88]	Fischer exact test Significant
	Absent	185 (92.5)	195 (97.5)			
Family history of other Cancers	Present	22 (11)	17 (8.5)	>0.05	1.33[0.68 to 2.59]	$\chi^2 = 0.4546$, df = 1 Not significant
	Absent	178 (89)	183 (91.5)			

N.B. Figure in bracket shows column wise percentage.

Table 3: Comparison of cases and controls according to their Personal Habits

History of Cancers		Cases (Percentage)	Controls (Percentage)	P Value	Odds Ratio [95%CI]	
Smoking	Ever user	33 (16.5)	27 (13.5)	>0.05	1.27 [0.73 to 2.20]	$\chi^2 = 0.4902$, df = 1 Not Significant
	Never user	167 (83.5)	173 (86.5)			
Tobacco consumption	Ever user	115 (57.5)	91 (45.5)	<0.05	1.62[1.09 to 2.41]	$\chi^2 = 5.295$, df = 1 Significant
	Never user	85 (42.5)	109 (54.5)			
Alcohol consumption	Ever user	37 (18.5)	41 (20.5)	>0.05	0.88[0.54 to 1.45]	$\chi^2 = 0.1433$, df = 1 Not significant
	Never user	163 (81.5)	159 (79.5)			

N.B. Figure in bracket shows column wise percentage

Discussion

The results and observations of the study are compared in the light of available data, information and observation made by other workers in similar region.

This Study shows that that majority of the cases, i.e. 87% of them presented with pain abdomen, 34% presented with jaundice, 20% presented with lump abdomen, 12.5% presented with Pruritus, 15.5% presented with weight loss, 9% presented with fever, 6.5% presented with Ascites and 6% presented with vomiting. According to a study by T. Qazi and co-workers, out of total GBC patients 87.5% patients presented with pain in the right hypochondrium, 3 7.5% patients with post prandial fullness, 62.5% patients had associated nausea and vomiting, 37.5 % patients had associated jaundice and 62.5% had anorexia and of loss weight. [11] In

the present study also, 87% of them presented with pain abdomen but only 6% presented with vomiting. Similar to this study, where 37.5 % patients had associated jaundice, 34% presented with jaundice in the present study. Almost similar type of findings was reported by I. Khan and co-workers [12] K. Jain and co-workers [13].

Present Study reveals that out of 200 GBC cases, 67% of them had no history of gallbladder disease and 33% had history of gallbladder disease. Gallbladder cancer rates correlate well with the prevalence of gallstone disease, which more commonly affects certain indigenous populations, particularly in North and South America. [14] In the present study though association between gall stones and gallbladder cancer has not found since it is already a established risk factor for GBC. In the present study, 33% had history of gallbladder disease among GBC cases.

Table 1 depicts that among 200 GBC cases, 69.5% were Hindus while among 200 controls, 64.5% were Hindus. Association between religion and gallbladder cancer was found to be statistically insignificant. According to a study by I. Khan and co-workers there was no significant relationship between religion and GBC and this finding is similar to the finding of the present study. [12]

This table shows that among GBC cases, 66% were studied up to primary school, 13.5% were illiterate and 14.5% studied up to middle school. Among controls, 58.5% were studied up to primary school, 9% were illiterate and 13% studied up to middle school. Association between educational status and gallbladder cancer was found to be statistically insignificant. According to a study by Serra and co-workers low education showed a non-significant positive relationship with gallbladder cancer and low socio economic level showed a significant relationship. In the present study also educational status was not significantly associated with gallbladder cancer. A study done by M. Jessri and B. Rashidkhani found significant relationship between years of education and gallbladder cancer. [16] Another study by Tyagi and co-workers also found significant relationship between GBC and educational status but in the present study there was no significant relationship between educational status and gallbladder cancer. [17]

Table also shows that out of 200 GBC cases, 54% belonged to Class III, 17.5% belonged to Class II and 22.5% belonged to Class IV according to revised modified B.G. Prasad Classification (2016), while among controls 58.5% belonged to Class III, 10% belonged to Class II and 25.5% belonged to Class IV. Association between socio-economic status and gallbladder cancer was found to be statistically insignificant. A study by Tyagi and co-workers also found significant relationship between GBC and monthly income but there was no significant association between socio-economic status and gallbladder cancer in the present study. [17] Since Gauhati Medical College and Hospital, Guwahati is a government hospital, most of patients who seek treatment in this hospital are from lower socio-economic status. This may be the reason that socio-economic status was not significantly associated with gallbladder cancer in the present study. Table 2 of the present study reveals that among 200 GBC cases, 7.5% had family history of GBC while among 200 controls, 2.5% had family history of GBC. Association between family history of GBC and gallbladder cancer was found to be statistically significant. Persons having family history of GBC had 3.2 times more chances of developing GBC. A study was done by Kari Hemminki and Xinjun Li A significant association was noted only for offspring whose mothers were diagnosed with gallbladder

cancer (2.83), suggesting preferential maternal transmission of the disease risk. [18] Similarly in the present study also, association between family history of GBC and gallbladder cancer was found to be statistically significant though it was not a prospective study. This table also reveals that among 200 GBC cases, 11% had family history of other cancer while among 200 controls, 8.5% had family history of other cancer. Association between family history of other cancer and gallbladder cancer was found to be statistically insignificant. According to a study by Jain and co-workers, there was significant association between family history of other cancer and gallbladder cancer [OR=3.5 (1.3–9.6); $p=0.01$] on univariate analysis but this association was not significant on multivariate analysis. [13] In the present study also, association between family history of other cancer and gallbladder cancer was found to be statistically insignificant.

Table 3 shows that among 200 GBC cases, 16.5% are ever users of smoking and 83.5% are never users of smoking while among 200 controls, 13.5% are ever users of smoking and 86.5% are never users of smoking. Association between smoking and gallbladder cancer was found to be statistically insignificant. According to a meta-analysis by Wenbin et al which comprised of 11 articles (10 case-control and one prospective cohort studies) based on based on a total of 1178 GBC cases found that smokers had an increased risk of GBC development, compared with non-smokers. These increased risks were independent of alcohol use and a history of gallstones. [13] According to a study by Tyagi and co-workers, the ever smokers had increased risk of GB cancer (OR=2.38, CI=1.54-3.66) $p<.001$. Though in the present study, no significant association was found between smoking and gallbladder cancer. In this table among 200 GBC cases, 18.5% are ever user of alcohol while among 200 controls, 20.5% are ever user of alcohol. Association between alcohol consumption and gallbladder cancer was found to be statistically insignificant. According to a study done by K. Jain and co-workers, there was no significant relationship between alcohol consumption and gallbladder cancer. [13] In the present study also, there was no significant relationship between alcohol consumption and gallbladder cancer. According to a prospective study of the association of alcohol with various cancers done on 6,701 American men of Japanese ancestry by J. Kato and co-workers, subjects who subsequently developed cancers of biliary tract consumed significantly larger amounts of alcohol but there was no significant relationship between alcohol consumption and gallbladder cancer in the present study. [19] According to a study by Tyagi and co-workers, alcohol consumption habit was significantly associated with the risk of GB cancer

(OR =2.40, CI =1.32 - 4.36). In the present study though there was no significant relationship between alcohol consumption and gallbladder cancer. This table also describes that among 200 GBC cases, 57.5% are ever users of tobacco while among 200 controls, 45.5% are ever users of tobacco. Association between tobacco (chewed) consumption and gallbladder cancer was found to be statistically significant. Ever users had 1.6 times more chances of developing GBC in comparison to never users. According to a study done by K. Jain and co-workers a significant relation between tobaccos (chewed) consumption and gallbladder cancer was found but no association was seen with smoking and alcohol. [13] In the present study also, association between tobacco (chewed) consumption and gallbladder cancer was found to be statistically significant. Another study by U. Dutta and co-workers also found an association between cigarette smoking and GBC. [9] A prospective study done by Yagy et al also found that cigarette smoking was associated with gallbladder cancer but in the present study, no significant association was found between smoking and gallbladder cancer. [21]

This Study also reveals that among 200 GBC cases, 33% were hypertensive while among 200 controls, 22.5% were hypertensive. Association between hypertension and gallbladder cancer was found to be statistically significant. Persons who were hypertensive have 1.7 times more chances of developing GBC in comparison to non-hypertensive persons. A study by Alvi and co-workers found an insignificant relationship between history of hypertension and gallbladder cancer. [22] Though in the present study, association between hypertension and gallbladder cancer was found to be statistically significant. Study depicts that among 200 GBC cases, 74% of them had an occupation with sedentary or mild physical activity and 26% had an occupation with moderate or strenuous physical activity while among 200 controls, 64% of them had an occupation with sedentary or mild physical activity and 36% had an occupation with moderate or strenuous physical activity. Association between physical activity and gallbladder cancer was found to be statistically significant. Thus, more physical activity had a protective role in GBC. In a hospital based case-control study by M. Jessri and B. Rashidkhani, cases were significantly less educated and less physically active than controls. In the present study also cases were significantly less physically active than controls.

Conclusion

The conclusions derived from the study are as follows.

- 1) Most common presenting clinical features among gallbladder cancer patients were pain abdomen (87%) and jaundice (34%).
- 2) Majority of the gallbladder cancer cases were belonged to class III (54%) but low socioeconomic status was not significantly associated GBC in the present study
- 3) Association between family history of GBC and gallbladder cancer was found to be statistically significant. Persons having family history of GBC had 3.2 times more chances of developing GBC.
- 4) Association between tobacco (chewed) consumption and gallbladder cancer was found to be statistically significant. Ever users had 1.6 times more chances of developing GBC in comparison to never users.
- 5) Association between smoking and gallbladder cancer was found to be statistically insignificant.
- 6) It is found that persons who were hypertensive had 1.7 times more chances of developing GBC in comparison to non-hypertensive persons and this association was statistically significant.
- 7) Among 200 GBC cases, 74% of them had an occupation with sedentary or mild physical activity. Association between physical activity and gallbladder cancer was found to be statistically significant. Thus, more physical activity had a protective role in GBC.

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