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Liver cirrhosis and concomitant gastric *Helicobacter pylori* infection

Girish Kumar Pati, Ayaskanta Singh *, Jimmy Narayan, Manas Kumar Behera, Manoj Kumar Sahu, Debakanta Mishra, Shobhit Agarwal, Chinmayee Kar

Department of Gastroenterology, IMS and SUM Hospital,Siksha O Anusandhan, Deemed to be University, Bhubaneswar, Odisha, India.

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ABSTRACT

Background: Cirrhosis of liver causes a lot of morbidities and mortalities. Around one third Indians had *Helicobacter Pylori (H.Pylori)* infection, whose effect in disease course of cirrhosis is poorly defined. Therefore this study was undertaken with an aim to find out variable effects of *H.Pylori* infection in cirrhotic patients. **Methods:** This cross-sectional, observational, open labeled, non interventional, single centered study was carried out in the Department of Gastroenterology of Institute of Medical Sciences (I.M.S.) & SUM Hospital, Bhubaneswar in between January 2018 and December 2019. Consecutive cirrhotic cases attending the hospital were enrolled in the study, after undergoing biochemical, radiological and endoscopic evaluation. All of them were also subjected to rapid urease test (RUT) to rule out *H.Pylori* infection. **Result:** Total 864 cirrhotic cases were included in this study, amongst which male outnumbered female. Mean age of presentation was 48.24±10.77 years. Alcohol was the most common etiology. Around 57.4% of cirrhosis cases had *H.Pylori* infection. 70.96% of alcoholic liver disease (ALD) and 50% of cryptogenic cirrhosis cases had *H.Pylori* infection, whereas none of chronic hepatitis B virus (HBV) related cirrhotic had RUT positivity. Cases with *H.Pylori* infection presented early and had relatively higher prevalence of higher grade of esophageal varix, portal hypertensive gastropathy, duodenal ulcer, gastric antral vascular ectasia, gastroesophageal varix II compared to cases without *H.Pylori* infection. The prognostic score such as model for end stage liver disease (MELD) was relatively higher in cases without *H.Pylori* infection compared to cases with *H.Pylori* infection. **Conclusion:** In our study, we found most of cirrhotic cases had alcoholic liver disease and were male. Around half of cases had *H.Pylori* infection and earlier presentation. Although the cases with *H.Pylori* infection had relatively higher endoscopic severity but had lower prognostic score compared to cases without *H.Pylori* infection, which should be validated in future by further studies.

Introduction

Cirrhosis is a burning health hazard with high worldwide occurrence. It causes significant morbidity and mortality. Although variable etiological factors of cirrhosis may lead to apparently similar clinico-pathological syndrome, but the rates of progression and clinical course may vary [1,2]. Most of the chronic liver disease (CLD) related mortality has been noticed amongst the cases with low and middle socioeconomic status [3]. The developing countries including India were regularly facing demographic and epidemiologic transition in disease burden with time [4-6]. Published report suggested that CLD cases may suffer from altered gastrointestinal mucosal defense, with high risk for development of peptic ulcer disease [7].

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* *Corresponding author:* Ayaskanta Singh
E-mail address: ayaskant1ce@gmail.com

Different experts hypothesize that *Helicobacter pylori (H. Pylori)* infection in CLD cases may be far detrimental but there were not sufficient published reports to support this. Associations between *H. pylori* infection and liver disease progression to high grade fibrosis have also been suggested. After the discovery of *H.Pylori* by Warren and Hastings in the early eighties; lot of researches on *H. pylori* were published [8,9]. It is presumed to be amongst the most common chronic bacterial infections which affect almost two thirds of global population [10].Various reports suggested that this infection may result in development of peptic ulcer disease (PUD), atrophic gastritis, gastric neoplasm, and "mucosa-associated lymphoid tissue (MALT)"lymphoma [11-13].

Around 50% of the populations of the developed countries were suspected to be infected by *H. Pylori*, whereas 90% of the populations in the developing countries seem to be affected by this bacterium [9,14]. *Helicobacter pylori* infection causes not only local inflammation by its cytopathic effect but also results in generalized increase of proinflammatory cytokines such as interleukin (IL) IL-1, IL-2, IL-4, IL-6, IL-8, IL-10, IL-17, interferon-β, and tumor necrosis factor-α (TNF-α) [15], affecting not only the gastric mucous membrane but also affects the extragastric organs leading to exacerbation of cardiovascular (CVS) diseases, metabolic diseases, disturbed liver function tests (LFT), preferentially in cirrhotic patients [15]. *Helicobacter pylori* infection also leads to hypertriglyceridemia, hypercholesterolemia, and decreased high-density lipoprotein (HDL) resulting in altered metabolism of the hepatocytes, hepatic steatosis, and finally liver fibrosis in long run [16], which is especially important in cases with much advanced liver injury. Published reports suggested strong cytopathological effect of *H. pylori* on hepatocytes in cases with advanced liver injury [17]. However; there is paucity of data on cirrhotic cases with *H. pylori* infection in the India Subcontinent.

Aim of the study

As there is scarcity of published reports on cirrhotic with *H. pylori* infection, this study was carried out with an aim to evaluate:

(i) Prevalence of *H. pylori* infection in cirrhotic cases
(ii) Various biochemical parameters in cirrhotic cases with *H. pylori* infection.
(iii) Effect of *H. pylori* infection on the endoscopic findings in cirrhotic cases.
(iv) Comparative analysis between cirrhotic cases with and without *H. pylori* infection.

Material and Methods

This cross-sectional, observational, open labeled, non-interventional, single centered study was carried out in the Department of Gastroenterology of Institute of Medical Sciences (I.M.S.) & SUM Hospital, Bhubaneswar in between January 2018 and December 2019. Total 864 consecutive cirrhotic cases attending the outpatient clinic of the hospital were enrolled in the study and evaluated.

The inclusion criteria for the cases were:

(i) Age ≥18 years
(ii) Case of cirrhosis as diagnosed by detailed clinical history, biochemistry, physical examination, radiologicand endoscopic evaluation.

The exclusion criteria were:

(i)Age < 18 years; (ii) Pregnant ladies; (iii) Cases with hepatocellular carcinoma; (iv) Cases with recent history (within 5 days) of upper gastrointestinal (UGI) bleeding; (v) Cases with history of consumption of antibiotics within 4 weeks; (vi) Cases with history of consumption of proton pump inhibitor (PPI) within 2 weeks; (vii) Cases with prior history of abdominal surgery; (viii) Non-cirrhotic cases; (ix) Cases who refuse to participate and (x) Cases who were under immunosuppression therapy.

All the cirrhotic cases were evaluated by detailed clinical history and subjected to hemogram study including complete blood count, liver function test (LFT), renal function test, INR (PT), testing for hepatitis B surface antigen and anti hepatitis C virus. Antibody and other biochemical tests as deemed appropriate to find out the etiological back ground of cirrhosis. All of them were also subjected to meticulous ultrasonographic (USG) evaluation of abdomen and pelvis followed by upper gastrointestinal (UGI) endoscopy study to find out endoscopic features suggestive of portal hypertension such as presence of esophageal varix (EV), fundic varix, gastroesophageal varix (GOV), portal hypertensive gastropathy (PHG), and gastric antral vascular ectasia (GAVE). The cases were further evaluated using prognostic scoring such as Model for End-Stage Liver Disease (MELD) score at baseline.

Also all the cases were searched for presence of gastric and duodenal ulcers. All of them also subjected to RUT to rule out presence of *H. Pylori* infection. For this purpose, a small biopsy of normal

looking antral mucosa was collected using standard biopsy forceps and subjected to RUT test by putting the collected sample in the specified portion of RUT kit (agar-based dry kit, popularly known as pylokit), which was commercially available and prepared by Halifax Research Laboratories, Kolkata. The RUT test was said to be positive when the color of the pylokit changed to pink color within 24 hours of putting the antral tissue at specified spherical portion of pylokit which was originally yellow colored.The RUT test is an indirect test for the presence of *H. pylori*, which was based on the presence of urease in or on the gastric mucosa. The RUT kit had urea containing substrate with a pH indicator. The urease produced by *H. pylori* in the gastric mucosa hydrolyzes the urea substrate to produce ammonia and carbon dioxide. The ammonia increases the pH leading to the color change (from yellow to pink). This RUT test was presumed to be superior to serology as it only detects the presence of an active infection for which approximately 10^5 bacteria must be present in the biopsy sample for a positive result [18]. Although for the color change 24 hours is the maximum waiting period but inmost cases color changes occur within 2 to 3 hours [19, 20].

Informed consent was obtained from all the patients prior to inclusion in this study. The study was approved by the Institutional ethics committee.

Statistical analysis

All the results were expressed as mean ± standard deviation (SD) or frequency (in percent). The quantitative and categorical variables were compared using student's t-test and Chi-square test, respectively. All the analyses were performed using SPSS 22 software. A '*P-value* of *<0.05*' was considered statistically significant.

Results

Total 864 cirrhotic cases were included in this study, out of which 90.74% cases were male. Mean age of presentation of all the cases at baseline was 48.24±10.77 years. The etiological background of the cirrhosis was due to significant alcohol consumption, no attributable cause or, cryptogenic, and history of chronic hepatitis B virus (HBV) infection in 57.4%, 33.33% and 9.25% cases respectively. Out of total 864 cases, 14.8% and 27.77% cases had duodenal ulcer (DU) and gastric ulcer (GU) respectively, whereas 3.7% cases had both duodenal and gastric ulcers. *Helicobacter Pylori* was found to be positive in 57.4% of total cases as evidenced by presence of RUT positivity. All the findings including demography; biochemical parameters; endoscopic findings and prognostic score among all the cirrhotic were described in **table (1)**.

In cases with DU and GU, 87.5% and 40% cases had RUT positivity respectively, whereas in case with gastroduodenal ulcer 50% had RUT positivity. 87% cases had portal hypertensive gastropathy (PHG); out of which 59.57% cases had RUT positivity and 91.48% cases were associated with presence of EV. 12.96% cases had GAVE, out of which 71.42% cases had RUT positivity. Biochemical parameters in different cirrhotic cases basing on etiological background are narrated in **table (2)**.

Findings including demography; endoscopic findings and prognostic score in different cirrhotic cases basing on etiological background were illustrated in **table (3)**. Mean age of presentation in cryptogenic cirrhotic cases was relatively higher compared to mean age of presentation in case of ALD (*p - 0.001*) and HBV related cirrhotic cases (*p- 0.09*). Males outnumbered females among all the cirrhotic irrespective of their etiological background. Most (70.96%) of the cases with ALD and half of the cases with cryptogenic cirrhosis had evidence of *H. pylori* infection, whereas none of HBV related cirrhotic had RUT positivity. The cases with HBV related cirrhosis had relatively non significantly higher prevalence of DU, GU and gastroduodenal ulcer compared to cirrhotic with other etiological background (*p> 0.05*).Most of the cirrhotic had endoscopic evidence of EV and PHG irrespective of their etiological background. None of HBV related cirrhotic had GOV II and GAVE. Biochemical parameters in RUT positive and RUT negative cirrhotic cases were described in **table (4)**.

Cases with *H. pylori* infection had relatively significantly higher hemoglobin (Hb) level compared to RUT negative cases (p – 0.03). Findings including demography; endoscopic findings and prognostic score In RUT positive and RUT negative cirrhotic cases were narrated in **table (5)**. Cases without *H. pylori* infection had relatively significantly higher mean age of presentation compared to RUT positive cases (*p – 0.02*). Cases with *H. pylori* infection had relatively non significantly higher prevalence of DU and lesser prevalence of GU and gastroduodenal ulcer compared to RUT negative cases (*p>0.05*). Cases with RUT positivity had relatively non significantly

higher prevalence of high grade EV, GOV-II, PHG, severe PHG and GAVE compared to RUT negative cases($p>0.05$). Cases with RUT negativity had relatively non significantly higher prognostic (MELD) score compared to RUT positive cases ($p>0.05$).

Table 1. Findings including demography; biochemical parameters; endoscopic findings and prognostic score among all the cirrhotic cases.

Serial No.	Findings in cirrhotic cases (N = 864)	Values
1.	Age in years	48.24±10.77
2.	Male: Female ratio	9.8: 1
3.	Alcoholic liver disease (%)	57.4
4.	HBV related cirrhotic (%)	9.25
5.	Cryptogenic cirrhotics (%)	33.33
6.	Hemoglobin in gm/ dl	11±2.65
7.	Total platelet count in lacks / cubic ml	1.45±0.98
8.	Serum bilirubin in mg/ dl	3.66±4.23
9.	Serum albumin in gm/ dl	3.15±0.81
10.	Serum urea in mg/ dl	26±15.54
11.	Serum Creatinine in mg/ dl	1±0.34
12.	INR (PT)	1.37±0.37
13.	Presence of duodenal ulcer (%)	14.8
14.	Presence of gastric ulcer (%)	27.77
15.	Presence of gastroduodenal ulcer (%)	3.7
16.	Presence of esophageal varix (%)	87
17.	Presence of high grade EV (%)	78.73
18.	Presence of small EV (%)	21.27
19.	Presence of GOV-II (%)	8.5
20.	Presence of PHG (%)	87
21.	Presence of mild PHG (%)	63.82
22.	Presence of severe PHG (%)	36.17
23.	Presence of GAVE (%)	12.96
24.	MELD	14±5.5

n: Number; No: Number; HBV: Hepatitis B Virus; Gm: Gram; dl: deciliter; ml: milliliter; mg: milligram; INR: International Normalized Ratio; PT: Prothrombin; EV: Esophageal Varix; GOV: Gastroesophageal Varix; PHG: Portal Hypertensive Gastropathy; GAVE: Gastric Antral Vascular Ectasia; MELD: Model For End Stage Liver Disease.

Table 2. Biochemical parameters in cirrhotic cases basing on etiological background.

SL. No.	Biochemical Parameters	ALD (n=496)	Cryptogenic cirrhosis (n=288)	HBV related Cirrhosis (n=80)	'P' value in between ALD & Cryptogenic Cirrhosis	'P' value in between ALD & HBV related Cirrhosis	'P' value in between Cryptogenic & HBV related Cirrhosis
1.	Hemoglobin in gm/ dl	11.42± 2.92	10.97±2.4	9.35± 1.69	*0.65*	*0.18*	*0.23*
2.	TPC lacks / Cubic ml	1.6±0.96	1.42±1.1	0.87±0.3	*0.62*	*0.15*	*0.35*
3.	Serum bilirubin in mg/ dl	4±3.43	3.77±5.86	1.49± 1.42	*0.86*	*0.16*	*0.46*
4.	Serum albumin in Gm/ dl	3.27± 0.77	2.93±0.92	3.16± 0.78	*0.29*	*0.8*	*0.66*
5.	Serum urea in mg/ dl	24.92± 16.83	26.56± 14.67	29±17.78	*0.81*	*0.71*	*0.81*
6.	Serum Creatinine in mg/ dl	1±0.38	0.93±0.25	1.15± 0.59	*0.5*	*0.55*	*0.32*
7.	INR (PT)	1.42± 0.44	1.29±0.28	1.31± 0.21	*0.51*	*0.75*	*0.93*

SL. NO.: Serial Number; ALD: Alcoholic Liver Disease; n: Number; HBV: Hepatitis B Virus; Gm: Gram; dl: deciliter; TPC: Total Platelet Count; ml: milliliter; mg: milligram; INR: International Normalized Ratio; PT: Prothrombin

Table 3. Findings including demography; endoscopic findings and prognostic score in cirrhotic cases basing on etiological background.

SL. No.	Findings	ALD (n=496)	Cryptogenic cirrhosis (n=288)	HBV related cirrhosis (n=80)	'P' value in between ALD & Cryptogenic Cirrhosis	'P' value in between ALD & HBV related Cirrhosis	'P' value in between Cryptogenic & HBV related Cirrhosis
1.	Age in Years	43.13± 9.53	56.67± 8.13	49.6±7.23	*0.001*	*0.15*	*0.09*
2.	Male (%)	100	83.33	60	*0.01*	*0.0003*	*0.27*
3.	RUT positivity (%)	70.96	50	0	*0.16*	*0.003*	*0.04*
4.	Presence of DU (%)	16.12	11.11	20	*0.62*	*0.82*	*0.59*
5.	Presence of GU (%)	25.8	22.22	60	*0.83*	*0.11*	*0.1*
6.	Presence of gastroduodenal ulcer (%)	3.22	0	20	*0.45*	*0.11*	*0.052*
7.	Presence of EV (%)	87	88.88	80	*0.91*	*0.67*	*0.64*
8.	Presence of high grade EV (%)	85.18	75	50	*0.41*	*0.09*	*0.32*
9.	Presence of GOV-II (%)	9.67	5.5	0	*0.6*	*0.48*	*0.61*
10.	Presence of PHG (%)	90.23	83.33	80	*0.47*	*0.51*	*0.87*
11.	Presence of Severe PHG (%)	28.57	53.33	25	*0.1*	*0.9*	*0.31*
12.	Presence of GAVE (%)	12.9	16.66	0	*0.69*	*0.41*	*0.33*
13.	MELD Score	14.54±5.87	12.29±5.62	16.5±2.12	*0.41*	*0.65*	*0.35*

SL. No: Serial Number; n: Number; ALD: Alcoholic Liver Disease; HBV: Hepatitis B Virus; RUT: Rapid Urease Test; DU: Duodenal Ulcer; GU: Gastric Ulcer; EV: Esophageal Varix; GOV: Gastroesophageal Varix ; PHG: Portal Hypertensive Gastropathy; GAVE: Gastric Antral Vascular Ectasia; MELD: Model For End Stage Liver Disease.

Table 4. Biochemical parameters in RUT positive and RUT negative cirrhotic

Serial no.	Biochemical parameters	Values in 'RUT' positive cases (n=496)	Values in 'RUT' negative cases (n=368)	*'p' value*
1.	Hemoglobin in gm/ dl	11.81±2.76	9.9±2.1	*0.03*
2.	Total Platelet count in lacks / cubic ml	1.44±0.96	1.47±1	*0.93*
3.	Serum bilirubin in mg/ dl	4.2 ±4.9	3±3.1	*0.42*
4.	Serum albumin in gm/ dl	3.21±0.9	3±0.69	*0.62*
5.	Serum urea in mg/ dl	22.69±13.57	29.58±17.3	*0.27*
6.	Serum creatinine in mg/ dl	0.93±0.3	1±0.38	*0.27*
7.	INR (PT)	1.29±0.29	1.48±0.47	*0.25*

No.: Number; RUT: Rapid Urease Test; n: Number; gm: Gram; dl: deciliter; ml: milliliter; mg: milligram; INR: International Normalized Ratio; PT: Prothrombin

Table 5. Findings including demography; endoscopic findings and prognostic score in RUT positive and RUT negative cirrhotic cases.

Serial no.	Findings	'Rut' positive cases (n=496)	'Rut' negative cases (n=368)	*'p' value*
1.	Age in years	45.35±10.18	52.18±10.53	*0.02*
2.	Male: Female ratio	14.5: 1	6.66: 1	*0.39*
3.	Alcoholic liver disease (%)	70.96	39.13	*0.02*
4.	HBV related cirrhotics (%)	0	21.73	*0.007*
5.	Cryptogenic cirrhotics (%)	29.03	39.13	*0.44*
6.	Presence of Duodenal ulcer (%)	22.58	4.34	*0.06*
7.	Presence of gastric ulcer (%)	19.35	39.13	*0.1*
8.	Presence of gastroduodenal ulcer (%)	3.22	4.84	*0.84*
9.	Presence of EV (%)	80.64	95.65	*0.11*
10.	Presence of High grade EV (%)	80	77.27	*0.8*
11.	Presence of GOV-II (%)	12	4.54	*0.32*
12.	Presence of PHG (%)	90.32	82.6	*0.39*
13.	Presence of severe PHG (%)	39.28	31.57	*0.57*
14.	Presence of GAVE (%)	16.12	8.69	*0.38*
15.	MELD	12.62 ± 5.9	16 ± 4.56	*0.16*

No: Number; RUT: Rapid Urease Test; n: Number; HBV: Hepatitis B Virus; EV: Esophageal Varix; GOV: Gastroesophageal Varix ; PHG: Portal Hypertensive Gastropathy; GAVE: Gastric Antral Vascular Ectasia; MELD: Model For End Stage Liver Disease.

Discussion

In our study, most of the cases were male, as similarly observed by the author in previous Indian study in 2016 [21]. Mean age of presentation of all the cirrhotic was 48.24±10.77 years which was similarly reported by the author earlier [21]. Most of the cirrhotic had ALD followed by cryptogenic cirrhosis as evidenced by the author earlier [21], which signifies that there is not much epidemiological changes or, transition in etiological background of cirrhosis in these last 4 to 5 years and warns us increased consumption of alcohol in the community, which should be addressed in effective manner as a preventive strategy.

In our study, although the prevalence of GU was relatively higher (27.77%) compared to prevalence of DU (14.8%), but it was not statistically significant ($p > 0.05$). Surprisingly the prevalence of gastroduodenal (Both GU and DU) ulcer (3.7%) was significantly less ($p<0.05$) compared to prevalence of both gastric and duodenal ulcer individually in our study.

Around 5-20% of cirrhotic had PUD, whereas prevalence of PUD in the community was 2-4% [22-26]; which suggests that cirrhotic were more susceptible for PUD. As prevalence of GU in our study was 27.77% among the cirrhotic cases, we presume that cirrhotic from our region were more susceptible to suffer from PUD compared to other geographic

territories. Possibly increased oxidative stress in cirrhotic cases may lead to altered mucosal blood flow; decreased mucosal defense and increased mucosal injury resulting in increased prevalence of ulcers and other gastroduodenal mucosal lesions such PHG [27]. Although *H. pylori* infection was frequently associated with increased occurrence of both DU and GU in non-cirrhotic; but their role in causation of both GU and DU in cirrhotic cases is poorly defined [28-31]. In our study 57.4% cases had *H. pylori* infection, whereas prior studies reported that around 10 – 49% cirrhotic cases had evidence of *H. pylori* infection [30,32-34], which suggested that cirrhotic cases in our region had relatively higher prevalence of *H. pylori* infection compared to other geographic territories.

In our study in cirrhotic cases with DU, 87.5% cases had *H. pylori* infection, whereas study by; **Kirchner et al**. reported that in cirrhotic cases with gastroduodenal ulcer, 61% cases had evidence of *H. pylori* infection [35], which suggested that cirrhotic cases with PUD had increased prevalence of *H. pylori* infection in our region compared to other geographic locality. In our study mean age of presentation of cirrhotic cases with RUT negativity was significantly higher ($p - 0.02$) compared to cases with *H. pylori* infection, which signifies that cirrhotic cases with *H. pylori* infection become symptomatic earlier and consult physician early compared to cases without evidence of *H. pylori* infection, which is a new finding from our study as not reported earlier in any other study.

Helicobacter pylori has been linked with unexplained iron-deficiency anemia, idiopathic thrombocytopenic purpura, and vitamin B12 deficiency. However, the present study shows that cirrhotic patient with *H. pylori* infection has higher hemoglobin levels. The pathogenesis of anemia in cirrhosis is complex and multifactorial, which includes portal hypertension induced sequestration, bone marrow suppression, alteration in erythropoietin and increased blood loss from gastrointestinal hemorrhage. Thus, detailed subgroup analysis is required before *H. pylori* can be linked with anemia, especially in patients with cirrhosis.

We also noticed that cirrhotic cases with history of regular alcohol consumption and cirrhotic cases of cryptogenic etiology had relatively significantly higher prevalence of *H. pylori* infection compared to cirrhotic cases who had chronic hepatitis B related cirrhosis in our study; [($p - 0.003$) and ($p - 0.04$)] respectively. As in our study ALD cases had relatively higher prevalence of *H. pylori* infection compared to other cirrhotic cases, we presume that patients with alcoholism are more prone to suffer from *H. pylori* infection compared to other cases. Findings of our study was contradictory to findings of study by **Pogorzelska et al.** [36], who has reported ALD were less susceptible to suffer from *H. pylori* infection compared to cirrhotic cases with post inflammatory (HBV and HCV related) and nonalcoholic background; therefore our findings should be validated in future study to address this controversy.

It has also been reported by a Chinese meta-analytical study, that the cases with chronic HBV related liver disease were more susceptible to suffer from *H.Pylori* infection if their disease severity increases [37]. In our study although HBV related cirrhotic cases had no evidence of *H.Pylori* infection, but they had relatively non significantly higher prevalence of both GU and DU compared to cirrhotic cases on non-viral background ($p>0.05$). This justifies the previous hypothesis that in cirrhosis the etiology of development of gastroduodenal ulcer disease is multifactorial and not primarily decided by *H. pylori* infection. In our study we noticed mixed results. We observed that cirrhotic cases with RUT positivity had relatively non significantly higher prevalence of DU and lesser prevalence of GU and gastroduodenal ulcer compared to RUT negative cases ($p >0.05$), which suggest that possibly *H. pylori* infection has some contributory role in development of DU in cirrhotic cases.

Although, cases with *H. pylori* infection had relatively(but not significant) higher prevalence of high grade EV, GOV-II, PHG, severe PHG and GAVE compared to RUT negative cases ($p>0.05$), in our study but in contrast, they had relatively non significantly lower prognostic (MELD) score compared to cases without *H. pylori* infection ($p>0.05$), which is difficult to explain and may be related to smaller sample size. Previous studies suggested that cirrhotic cases with *H. pylori* infection were not only more susceptible to develop EV but also more prone to suffer from higher grade of EV, compared to cases without *H. pylori* infection, which suggests that possibly *H. pylori* infection has detrimental effect on liver function [38]. Study by **Sather et al.** reported that cirrhotic cases with *H. pylori* infection were not only more susceptible to suffer from PHG, but also more prone to suffer from higher grade of PHG [39]. All these abovementioned studies supported our findings.

Limitations

Our study has some limitations such as: we have neither healthy control nor, non-cirrhotic cases with PUD for comparative analysis and to avoid confounding error. We have not used other diagnostic measures such as histopathological analysis, urea breath test, serology and stool antigen analysis for diagnosis of *H. pylori* which might have affected the result in our study. We could not use other sophisticated prognostic measures such as sequential organ failure assessment (SOFA), MELD sodium, MELD lactate, and Child Turcot Pugh (CTP) scoring systems to prognosticate cirrhotic cases in our study, which might have affected our results.

Conclusion

In our study, we found that cirrhotic cases with history of regular alcohol consumption and cirrhotic cases of cryptogenic etiology had relatively higher prevalence of *H. pylori* infection compared to cirrhotic cases who had chronic hepatitis B related cirrhosis. Cases with *H. pylori* infection presented early and had relatively higher prevalence of higher grade of EV, PHG, DU, GAVE, GOV-II compared to cases without *H. pylori* infection. Cases with *H. pylori* infection had relatively lesser severity of anemia and lower prognostic score compared to cases without *H. pylori* infection which is inconvincible in current context. However due to mixed results, our findings should be validated in future multicentric studies to give a consensus statement regarding effect of *H. pylori* infection in cirrhosis.

Conflicts of interest: None.

Authors' contributions

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Data availability

All datasets generated or analyzed during this study are included in the manuscript and/or the Supplementary Files.

Ethics statement

The study was approved by the IMS and SUM Hospital Ethical Committee, Bhubaneswar under the protocol number #0027. Informed consent was taken from each and every patient included in this study.

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