

## Original Article

### Association of Risk Factors and Inflammatory Bowel Disease: a Case Control Study in a Tertiary Level Hospital

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#### ABSTRACT

The rising incidence of inflammatory bowel disease (IBD) in Bangladesh supports the importance of various risk factors in disease etiology. This case-control study aims to measure association of IBD among the patients who were exposed to various risk factors. The study was conducted in patients with IBD and a control group without IBD in the Department of Gastroenterology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh during the period of March 2016 to January 2018. Diagnosed IBD patients aged more than eighteen years admitted or visiting for follow up in the Department of Gastroenterology were selected as cases. Controls were selected from patient's attendants other than IBD, where age and sex were matched with cases. Controls were non-relative to the cases in the same department, and free from any bowel symptoms. Data were collected by using pre-tested questionnaire and then analyzed. Total 164 participants were selected among them 82 cases and 82 controls. Among the cases, 38 patients were diagnosed as ulcerative colitis and 44 patients were diagnosed as Crohn's disease. Study found that ulcerative colitis were associated with the following factors namely being smoker (OR 20.31; 95% CI 2.39-172), exposure to pets (OR 11.24; 95% CI 1.86-67.76), not drinking boiling water (OR 7.33; 95% CI

1.62-33.05), bathing in open water such as river and ponds (OR 5.04; 95% CI 1.04-24.40), walking bare footed in grounds and toilet (OR 10.49; 95% CI 2.08-52.78), taking street food (OR 5.17; 95% CI 1.15-23.28) and soft drinks (OR 11.55; 95% CI 0.24-9.48), where high odds ratios (OR) were measures. On the other hand, crohn's disease were associated with the factors of being smoker (OR 10.30; 95% CI 1.15-91.9), exposure to pets (OR 19.19; 95% CI 1.74-211), not drinking boiling water (OR 10.33; 95% CI 2.54-43.51), bathing in open water such as river and ponds (OR 6.48; 95% CI 1.35-31.09), consuming unpasteurized milk (OR 8.50; 95% CI 1.71-42.10) and soft drinks (OR 42.74; 95% CI 5.56-328). This study determined the risk factors of IBD in the ground of childhood behavior, hygienic condition and dietary habit for the development of IBD.

**Keywords:** IBD, ulcerative colitis, crohn's disease.

#### INTRODUCTION

Inflammatory bowel diseases (IBD) are chronic inflammatory disorders of the gastrointestinal tract marked by episodes of relapse and remission. There are two identified subtypes of the disease, ulcerative colitis (UC) and Crohn's Disease (CD), which differ in patterns of involvement. Though varying in clinical presentation, the two subtypes share a presumed etiology of genetic predisposition, environmental risk factors or exposures, and alterations of the gut micro biome that contributes to the manifestation of disease. Ongoing changes in environmental factors, including infections, diet, lifestyle factors, and medication use have contributed to shifts in the global prevalence of the disease.<sup>1</sup> There is a rising incidence of UC in North India may be attributable to inadequate sanitary measures.<sup>2</sup>

The incidence of IBD has increased dramatically over the past half century.<sup>3</sup> Although more than 160 genetic risk loci have been identified that underlie disease predisposition,<sup>4</sup> these loci have not completely explained the disease etiology. Striking epidemiological observations including the rising incidence in developing countries and the increased risk of disease in migrant populations implicate the importance of environmental influence on genetic predisposition.<sup>5</sup>

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Regarding Asia a study carried in eight countries of Asia and Australia showed in multivariate model, being breast fed >12 months, antibiotic use, having dogs, daily tea consumption and daily physical activity decreased the odds for CD in Asians. On the other hand, being breastfed >12 months, antibiotic use, daily tea or coffee consumption, presence of hot water taps and flush toilet in childhood were protective for UC development whereas ex-smoking increased the risk of UC. This first population-based study of IBD risk factors in Asia-Pacific supports the importance of childhood immunological, hygiene and dietary factors in the development of IBD, suggesting that markers of altered intestinal microbiota may modulate risk of IBD later in life.<sup>5</sup>

UC was first described by Wilks in 1859. In Bangladesh, it was first studied in 1975.<sup>6</sup> UC is a chronic idiopathic inflammatory condition of gastrointestinal tract, caused by inappropriate and continuing inflammatory response to gut micro biome on background of genetic susceptibility.<sup>7</sup> UC is precipitated by complex interaction of environment, genetic and immunoregulatory factors. Family history is a major risk factor for UC although sporadic cases do occur at large.<sup>8</sup> UC primarily affects the colonic mucosa; the extent and severity of colon involvement are variable. In its most limited form, it may be restricted to the distal rectum, while in its most extended form the entire colon is involved. However, 80% of the patients present with disease extending from the rectum to the splenic flexure, and only 20% have pancolitis. It involves rectum in about 95 % cases and may extend proximally in a symmetrical, circumferential and uninterrupted pattern.<sup>9</sup>

Dr. Burrill Bernard Crohn and his colleague, Dr. Gordon Oppenheimer and Dr. Leon Ginzburg discover the CD in 1930 with the disease named after Dr. Burrill B Crohn. Crohn's disease can affect any part of GIT but it affects ileal and ileocolic region 40% Small intestine 30 to 40% only colon 20% and perianal region <10% it has been proposed.<sup>10</sup>

The clinical features of UC include diarrhea mixed with blood and mucus, constipation, abdominal pain and tenderness weight loss, low grade fever and anaemia.<sup>11, 12</sup> UC can be associated with a number of local as well as extra intestinal complication. The local complication includes fulminate colitis, perforation, massive haemorrhage and colorectal carcinoma<sup>13,14</sup> extra intestinal complication include iritis, arthritis, panniculitis, Deep vein thrombosis, primary sclerosing cholangitis and cholangiocarcinoma.<sup>1-17</sup>

The heterogeneity of manifestations, a potentially insidious onset, the presence of overlapping features with other IBD, and or the presentation without GI symptoms (i.e, extraintestinal symptoms), can make the diagnosis of CD difficult.<sup>18</sup> Characteristic symptoms of chronic or nocturnal diarrhea and abdominal pain, weight loss, fever, or rectal bleeding reflect the underlying inflammatory process.<sup>19,20</sup>

Disease severity is assessed by The Truelove–Witts's criteria for acute severe UC are  $\geq 6$  bloody stools/24 hrs plus one or more of anaemia, fever, tachycardia, and high inflammatory markers.<sup>21</sup> Disease severity of CD can be assessed by Harvey-Bradshaw Index.<sup>22</sup>

Procto-sigmoidoscopy or colonoscopy will reveal the mucosal changes characteristic of UC, consisting of loss of the typical vascular pattern, granularity, friability, and ulceration.<sup>23-25</sup> These changes typically involve the distal rectum, both endoscopically and histologically<sup>26</sup> and proceed proximally in a symmetric, continuous, and circumferential pattern to involve all or part of the colon.<sup>27</sup> CD may be suggested by certain histologic findings such as noncaseating granulomas or microscopic focality, but their absence does not rule out the diagnosis. Furthermore, even in UC or in acute self-limited colitis, microphage (or "cryptolytic") granulomas may form in response to ruptured crypts and are therefore not pathognomonic for CD.<sup>28</sup> The diagnosis of CD is based on a composite of endoscopic, radiographic, and pathological findings documenting focal, asymmetric, transmural, or granulomatous features.<sup>9</sup> Endoscopic feature includes aphthoid ulcer, mucosal edema, luminal narrowing, cobblestoning. Rectal sparing is more specific and discontinuous segmental nature of the disease has high positive predictive value. The discontinuous segmental nature of the disease is an important clue.<sup>29</sup>

Other histologic findings that may suggest an infectious etiology include caseating or confluent granulomas in tuberculosis (or less commonly in schistosomiasis, syphilis, and Chlamydia trachomatis), trophozoites in amebiasis, pseudomembranes in *C. difficile* colitis (although in UC, most cases of *C. difficile* infection occur in the absence of pseudomembranes), ova in schistosomiasis, and viral inclusions in herpetic or cytomegaloviral colitis, although the latter appears almost exclusively in immunocompromised patients.<sup>30</sup> In the appropriate clinical settings, sigmoidoscopy or colonoscopy and biopsy may also distinguish the various noninfectious colitides

from UC. These conditions include ischemia, radiation, collagenous and microscopic colitis, drug-induced colitis, and the solitary rectal ulcer syndrome.<sup>31,32</sup>

The inflammatory bowel diseases (IBD) traditionally have afflicted patients in the Western world. In the last two decades, however, there have been numerous studies reporting the emergence of IBD in Asia, where the prevalence of IBD has historically been low.<sup>33-38</sup> Improved diagnostic methods and physician awareness of the disease are unlikely to account fully for the rapid increase in IBD cases in Asia. The incidence and prevalence of IBD were considerably lower than those reported in Western populations, but that they have been increasing over time. The emergence of IBD in Asia has important implications for healthcare policy planners who will need to address both the health needs of the individual and the social burden exerted by these diseases.<sup>39-41</sup>

Currently, the annual incidence of CD is highest in North America (20.2 per 100,000, per person years) whereas the annual incidence of UC is highest in Europe (24.3 per 100,000 per person years). The prevalence of both UC and CD are highest in Europe (505 and 322, per 100,000 per person years respectively).<sup>3</sup> The global prevalence of UC has seen a discernible shift in past decade. A study was performed on 2003 in Ludhiana showing prevalence rate of UC is 44.3/10000 and incidence is 6.02/100000<sup>2</sup>. Ongoing changes in environmental factors, including infections, diet, lifestyle factors, and medication use have contributed to shifts in the global prevalence of the disease.<sup>1</sup> There is a rising incidence of UC in North India may be attributable to inadequate sanitary measures<sup>2</sup>. But the risk factors impacting our population are not yet known. Therefore, this study is to see the association between environmental risk factors and inflammatory bowel disease in patients attending at the department of gastroenterology of Bangabandhu Sheikh Mujib Medical University (BSMMU) in Bangladesh.

## MATERIALS AND METHODS

This is a case control study and was conducted in the Department of Gastroenterology of Bangabandhu Sheikh Mujib Medical University (BSMMU) in Bangladesh. The study period was March 2016 to January 2018. The case group was diagnosed IBD patients aged more than eighteen years admitted or visiting for follow up in Department of Gastroenterology. And the control group was age and gender matched attendants of patient in the same department other than IBD, non-relative to the cases

and free from any bowel symptoms were selected. The sample size of this study was 164, where 82 were case and 82 were controls. Data were collected by using pre-tested questionnaire, patients were interviewed for socio-demographic factors, various risk factor, behavioral factors and some disease conditions related to IBD. Before starting this study, the research protocol was submitted to the institutional review board of BSMMU, Dhaka.

## Statistical analysis:

Computer based statistical analysis were carried out with Statistical Package for the Social Sciences (SPSS). Data were recorded systemically in preformed data collection form (questionnaire). P value <0.05 were labeled as statistically significant. The results were expressed with 95% Confidence Interval (CI) and adjusted for known confounders. In the initial analysis the distribution of hygiene-related variables, potential confounders such as age, sex, family history of IBD, socio-economic status like education, monthly income, and other variables of interest like smoking, use of OCP, previous history of tuberculosis were compared between the cases and controls. The summarized data was interpreted accordingly and then presented in the form of tables and figures. Continuous variables were expressed as mean with standard deviation and categorical variables as count with percentage.

## RESULTS

This case control study was conducted in the Department of Gastroenterology, BSMMU, Bangladesh during the period of March 2016 to January 2018. A total of 82 cases and 82 controls were included in this study.

Table 1 shows demographic profile of the study populations 82 cases and 82 controls were included. Among the cases, 44(53.7%) patients were Crohn's disease and 38(46.3) patients were Ulcerative colitis. Among the cases, 48(58.5%) were male and 34(41.5%) were female. Among the control group, 54(65.9%) were male and 28(34.1%) were female. Mean age of cases were 36.46 and of controls were 36.70.

**Table 1: Demographic profile of the study population in both groups (n=164)**

Variables	Case Group	Control
Sex		
Group		
Male	48 (58.5%)	54 (65.9%)
Female	34 (41.5%)	28 (34.1%)
Age (Mean ±SD)	36.46 ± 8.76	36.70 ± 11.81

Table II shows different socio demographic and various risk factor associated with UC including behavioral factors and some disease conditions and related to UC with their frequency and percentage in the study population (cases)

**Table II. Socio demographic and childhood factors in UC with their frequency and percentage (n= 38)**

	Frequency (n)	Percentage (%)
Age (median)	35 (22-65)	
Sex (female/male)	24/14	63.2/36.8
Family history of IBD	2	5.3
Smoker	13	34.2
Alcoholic	0	0.0
Drink non safe water	1	2.6
Don't boil water before drink	24	63.2
Wash with unsafe water	4	10.5
Don't wash hand before meal	16	42.1
Don't wash hand after using toilet	6	15.8
Bathing in open water	34	89.5
Use non hygiene toilet	1	2.6
Walking bare footed to toilet	33	86.8
Living abroad	5	13.2
No breast feeding	1	2.6
No exclusive breast feeding	9	23.7
Bottle feeding	11	28.9
Exposure to pets	28	73.7
Exposure to domestic animals	30	78.9
Not taking Anthelmintic	26	68.4
Tonsillectomy	0	0.0
Appendisectomy	1	2.6
Tuberculosis infection	0	0.0
Tuberculosis infection (family member)	3	7.9

Table III shows different socio demographic and various risk factor associated with CD including behavioral factors and some disease conditions and related to CD with their frequency and percentage in the study population (cases)

**Table III. Socio demographic and childhood factors in CD with their frequency and percentage (n= 44)**

	Frequency (n)	Percentage (%)
Age (median)	33.5 (19-60)	
Sex (female/male)	30/14	68.2/31.8
Smoker	13	29.5
Alcoholic	1	2.3
Family history of IBD	5	11.4
Living abroad	7	15.9
No breast feeding	6	13.6
No exclusive breast feeding	17	38.6
Bottle feeding	14	31.8
Exposure to pets	33	75.0
Exposure to domestic animals	27	61.4
Not taking Anthelmintic	30	68.2
Drink non safe water	1	2.3
Don't boil water before drink	28	63.6
Wash with unsafe water	9	20.5
Don't wash hand before meal	15	34.1
Don't wash hand after using toilet	6	13.6
Bathing in open water	37	84.1
Use non hygiene toilet	2	4.5
Walking bare footed to toilet	34	77.3
Tonsillectomy	2	4.5
Appendisectomy	9	20.5
Tuberculosis infection	11	25.0
Tuberculosis infection (family member)	5	11.4

**Table IV. Dietary and other factors in UC with their frequency and percentage (n= 38)**

	Frequency (n)	Percentage (%)
Consuming unpasteurized milk	14	36.8
Taking street food	32	84.2
Taking fast food	22	57.9
Taking tea/coffee	30	78.9
Taking soft drinks	29	76.3
Not taking vegetables	2	5.3
Not taking fruits regularly	17	44.7
Use OCP	11	28.9
Use NSAID	9	23.7

Table V shows different dietary and other factors in CD with their frequency and percentage in the study population (cases)

**Table V. Dietary and other factors in CD with their frequency and percentage (n= 44)**

	Frequency (n)	Percentage (%)
Consuming unpasteurized milk	23	52.3
Taking street food	32	72.7
Taking fast food	24	54.5
Taking tea/coffee	34	77.3
Taking soft drinks	31	70.5
Not taking vegetables	10	22.7
Not taking fruits regularly	16	36.4
Use OCP	10	22.7
Use NSAID	7	15.9

Table VI shows association between lifestyle factors and risk of ulcerative colitis. Here smoking shows significant association (OR 20.31; 95% CI 2.39 to 172). In univariate analysis, living abroad showed association (OR 3.99; 95% CI 0.9 to 17.66) but after adjustment, no association was found. Family history didn't show any association.

**Table VI. Lifestyle factors and risk of UC**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
Smoker	4.81	1.78-12.95	0.001	20.31	2.39-172	0.006
Family history of IBD			0.098			
Living abroad	3.99	0.90-17.66	0.108			

Table VII shows significant association between smoking and crohn's disease (OR 10.30; 95% CI 1.15 to 91.9). Living abroad showed association in univariate analysis (OR 4.98; 95% CI 1.21 to 20.36) but failed to show association after adjustment. Alcohol and family history didn't show any association.

**Table VII. Lifestyle factors and risk of CD**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
Smoker	3.87	1.46-10.28	0.004	10.30	1.15-91.9	0.037
Alcoholic			0.349			
Family history of IBD			0.004			
Living abroad	4.98	1.21-20.36	0.032			

Table VIII shows not boiling water before drinking (OR 7.33; 95% CI 1.62 to 33.05), bathing in open water (OR 5.04; 95% CI 1.04 to 24.40) and walking bare footed

(OR 10.49; 95%CI 2.08 to 52.78) have significant association with ulcerative colitis. Most of the other factors showed associations on univariate analysis but failed to show after adjustment.

**Table VIII. Hygienic factors and risk of UC**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
Not taking Anti-helminthic	0.89	0.39-2.06	0.797			
Drinking non safe water	2.18	0.13-35.96	0.535			
Not boiling water before drinking	3.49	1.56-7.80	0.002	7.33	1.62-33.05	0.009
Washing with unsafe water	1.81	0.45-7.16	0.462			
Not washing hand before meal	1.08	0.49-2.35	0.847			
Not washing hand after using toilet	1.73	0.55-5.40	0.338			
Bathing in open water	13.28	4.30-40.99	<0.001	5.04	1.04-24.40	0.044
Using non hygiene toilet	1.08	0.09-12.30	1.000			
Walking bare footed on toilet and ground	12.72	4.47-36.21	<0.001	10.49	2.08-52.78	0.004

Table IX shows not boiling water before drinking (OR 10.33; 95% CI 2.54 to 43.51) and bathing in open water (OR 6.48; 95% CI 1.35 to 31.09) have significant association with crohn's disease. Most of the other factors showed associations on univariate analysis but failed to show after adjustment.

**Table IX. Hygienic factors and risk of CD**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
Not taking Anti-helminthic	0.88	0.40-1.95	0.766			
Drinking non safe water	1.88	0.11-30.86	1.000			
Not boiling water before drinking	3.56	1.65-7.68	0.001	10.33	2.54-43.51	0.001
Washing with unsafe water	3.96	1.23-12.68	0.015			
Not washing hand before meal	0.76	0.35-1.64	0.498			
Not washing hand after using toilet	1.46	0.47-4.51	0.558			
Bathing in open water	8.25	3.28-20.75	<0.001	6.48	1.35-31.09	0.019
Using non hygiene toilet	1.90	0.25-14.00	0.611			
Walking bare footed on toilet and ground	6.55	2.83-15.18	<0.001			

Table X shows exposure to pets such as cat, dog, birds have significant association with ulcerative colitis (OR 11.24; 95% CI 1.86 to 67.76). Exposure to domestic animals (cow, goat) shows association on univariate analysis but failed to show after adjustment. Other factors didn't show any association.

**Table X. Childhood factors and risk of UC**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
No breast feeding	0.09	0.01-0.74	0.006			
No exclusive breast feeding	0.26	0.11-0.63	0.002			
Bottle feeding	0.107	0.04-0.25	<0.001			
Exposure to pets	3.95	1.69-9.20	0.001	11.24	1.86-67.76	0.008
Exposure to domestic animals	5.03	2.05-12.31	<0.001			

Table XI shows exposure to pets such as cat, dog, birds have significant association with crohn's disease (OR 19.19; 95% CI 1.74 to 211). Exposure to domestic animals (cow, goat) shows association on univariate analysis but failed to show after adjustment. Other factors didn't show any association.

**Table XI. Childhood factors and risk of CD**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
No breast feeding	0.56	0.20-1.53	0.257			
No exclusive breast feeding	0.54	0.25-1.14	0.108			
Bottle feeding	0.122	0.05-0.28	<0.001			
Exposure to pets	4.23	1.88-9.53	<0.001	19.19	1.74-211	0.016
Exposure to domestic animals	2.13	1.00-4.50	0.046			

Table XII shows among the dietary factors taking street food (OR 5.17; 95% CI 1.15 to 23.28) and taking soft drinks (OR 11.55; 95%CI .24 to 9.48) have significant association with ulcerative colitis. Consuming unpasteurized milk shows association on univariate analysis but failed to show after adjustment. Other factors did not show any association.

**Table XII. Dietary factors and risk of UC**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
Consuming unpasteurized milk	3.76	1.50-9.40	0.007			
Taking street food	7.16	2.70-18.99	<0.001	5.17	1.15-23.28	0.032
Taking fast food	1.75	0.80-3.82	0.154			
Taking tea/coffee	2.52	1.03-6.18	0.039			
Taking soft drinks	4.78	2.00-11.40	<0.001	11.55	0.24-9.48	0.007
Not taking vegetables	0.35	0.07-1.70	0.232			
Not taking fruits regularly	0.69	0.32-1.51	0.363			

Table XIII shows among the dietary factors consuming unpasteurized milk (OR 8.50; 95% CI 1.71 to 42.10) and taking soft drinks (OR 42.74; 95%CI 5.56 to 328) have significant association with Crohn's disease. Taking street food shows association on univariate analysis but failed to show after adjustment. Other factors did not show any association.

**Table XIII. Dietary factors and risk of CD**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
Consuming unpasteurized milk	7.06	2.96-16.83	<0.001	8.50	1.71-42.10	0.009
Taking street food	3.58	1.61-7.92	0.001			
Taking fast food	1.53	0.73-3.20	0.254			
Taking tea/coffee	2.29	0.99-5.26	0.048			
Taking soft drinks	3.54	1.61-7.75	0.001	42.74	5.56-328	<0.001
Not taking vegetables	1.89	0.73-4.90	0.181			
Not taking fruits regularly	0.49	0.23-1.04	0.064			

Table XIV shows use of NSAID have association with ulcerative colitis on univariate analysis but shows no association after adjustment. Other factors show no association.

**Table XIV. Dietary factors and risk of CD**

	Crude			Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
Tonsillectomy			0.016			
Appendisectomy	0.06	0.01-0.60	0.002			
Tuberculosis infection			<0.01			
Tuberculosis infection (family member)				0.030		
Use of OCP	0.78	0.34-1.81	0.572			
Use of NSAID	2.87	1.01-8.16	0.042			

Table XV shows no association with the above factors and crohn's disease.

**Table XV. Medical factors and risk of CD**

	Crude	Adjusted				
	OR	95%CI	p-value	OR	95%CI	p-value
Tonsillectomy	0.307	0.06-1.45	0.139			
Appendisectomy	0.74	0.30-1.80	0.517			
Tuberculosis infection			<0.001			
Tuberculosis infection (family member)			0.004			
Use of OCP	0.56	0.24-1.31	0.183			
Use of NSAID	1.75	0.58-5.19	0.309			

**DISCUSSION**

This case control study was conducted in the Department of Gastroenterology, BSMMU. The objective of the study was to evaluate the association between environmental risk factors and IBD. Physician diagnosed IBD patients aged more than eighteen years admitted or visiting for follow up in Department of Gastroenterology were the cases. For controls, age and gender matched attendants of patients in Gastroenterology department other than IBD, non-relative to the cases and free from any bowel symptoms were selected. We have selected 82 cases and 82 controls. Among the cases, 38 patients were diagnosed as ulcerative colitis and 44 patients were diagnosed as Crohn's disease.

Among the lifestyle factors, smoking was found to be associated with both UC and CD in this study.<sup>13</sup> In different studies, UC was found to be more common in ex-smokers and non-smokers, this dispersion may be

because of that the ex-smokers were included in the smoker group.<sup>42-44</sup> No association was found between alcohol intake and IBD.<sup>45</sup> Though genetic association is found in the development of IBD among family members, we did not find any association between positive family histories of IBD. The likely cause may be the sample size because only 7 cases had positive family history. If sample size was larger, we might find association with positive family history. Living abroad may be associated with IBD because of lifestyle and food habit in different countries but we did not find any association in this study.

Boiling of water is an important hygienic factor specially if not obtained from deep tubewell and most of our urban population use supply water which is contaminated with different organisms.<sup>5</sup> We found strong association between not boiling water before drinking with both UC and CD which may contribute to altered microbiome of gut which



is a unique factor for development of IBD. Most of our population have history of bathing in open water especially in river and pond which can cause swallowing of these contaminated water. We found association between bathing in open water and development of both UC and CD.

Walking bare footed in toilet and ground is a potential cause of acquiring helminthic infection and helminthic infestation is thought to be an important cause of development of IBD<sup>46</sup>. In our study, we found association between walking bare footed and development of UC but we did not find association with CD which was expected. Other hygienic factors such as drinking unsafe water, not taking antihelminthic regularly, not washing hands with soap before eating and after using toilet and using open toilet was not associated with IBD in this study.

Breast feeding during childhood is an important protective factor for development of IBD in later life. Various similar studies found not taking breast milk or taking for shorter duration in childhood to be associated with development of IBD. But we found no association among these, the cause of which may be the respondents might fail to give appropriate history of their breast-feeding history rather if we could take history from their parents regarding this, results might be different.

Presence of household pets such as cats, dogs, and birds is an important risk of acquiring communicable infections which can spread through close contacts which may modulate the immune system and subsequent development of IBD. In this study we found strong association between presence of household pets and development of IBD. We found no association between domestic animals such as cow, goat, buffalo, and development of IBD.

Consuming street food is a risk factor for various gastrointestinal tract infection transmitted by feco oral route and translocation of various organisms in the gut. This may be associated with development of IBD. In this study, we found significant association between consuming street food and UC but not with CD. Consuming unpasteurized milk may cause translocation of bacteria in the gut and subsequent development of IBD and in our study we found association with CD but not with UC. Diet containing high refined sugar is a known risk factor for the development of IBD. In this study we found significant association between soft drinks containing high

sugar and development of both UC and CD. Other dietary factors such as consuming fast food, tea or coffee, not consuming vegetables or fruits were not associated with IBD in this study.

Drug history such as contraceptive pill intake is associated with IBD in several studies, but we found no association in this study. The cause of finding no association may be the number of female respondents which was smaller. Use of NSAID was thought to be associated with IBD, but we found no associations may be due to small number of cases. Association between tonsillectomy, appendisectomy and tuberculosis infection was investigated but we found no association.

#### LIMITATION

- The sample size of the study was small.
- All patients were collected from a single tertiary level hospital which does not reflect the whole country.
- Questions regarding early lifetime factors are likely to be subjected to recall bias.

#### CONCLUSIONS

In this study, smoker, exposure to pets, un-boiled water drinking, bathing in open water such as river and ponds, walking bare footed in grounds and toilet, taking street food and soft drinks increased the odds ratio (OR) for ulcerative colitis. On the other hand, being smoker, exposure to pets, un-boiled water drinking drinking, bathing in open water such as river and ponds, consuming unpasteurized milk and soft drinks increased the odds ratio (OR) for crohn's disease. Further large scale and multi-centered study may be carried out to overcome this problem.

#### Conflict of Interest

This study was funded by the Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh.

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