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The magnitude and associated factors of *Helicobacter pylori* infection among adult dyspeptic patients attending Bokoji Hospital, Southeast Ethiopia

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Background: *Helicobacter pylori* infection is the most common chronic bacterial infection and there were approximately 4.4 billion individuals with *H pylori* infection worldwide. Among those, hundreds of millions of people develop peptic ulcer disease during their lifetime and still tens of millions might progress to gastric cancer. Hence, early information is very important to prevent upper gastrointestinal complications. Consequently, the current study aimed to assess the magnitude and associated risk factors of *Helicobacter pylori* infection among adult dyspeptic patients attending Bokoji hospital, Southeast Ethiopia.

Methods: A hospital-based cross-sectional study involving 348 adult dyspeptic patients attending Bokoji hospital was carried out from July 16 to October 31, 2019. About 50 mg of fresh stool and 60 µl of capillary blood were collected from each dyspeptic patient and analyzed for detection of *Helicobacter pylori* antigens, presence of intestinal parasites and ABO blood grouping respectively. Data were entered using Epi Info 7 and Statistical analysis was done using SPSS version 21 and a p-value less than 0.05 was considered as statistically significant.

Results: The overall magnitude of *Helicobacter pylori* infection was 47.7%. The magnitude of *H. pylori* infection was almost two times higher in patients who do not have a habit of handwashing

after toilet visit than those who wash their hand's habit of handwashing after visiting toilet (AOR 2.241, 95% CI (1.410, 3.563) and alcohol drinking habit (AOR 1.796, 95% CI (1.087, 2.968).

Conclusions: The magnitude of *H. pylori* was high in the study area and associated with handwashing habits after toilet use and alcohol drinking habits. Therefore, the community could be educated on the handwashing habit to minimize *H. pylori* infections.

Keywords: *H. pylori*, Dyspepsia, Bokoji Hospital Introduction

Background : *Helicobacter pylori* was first identified in 1982 by Australia scientists Dr. Barry Marshall and Dr. Robin Warren, from the stomach of patients with gastritis and stomach ulcers [1]. Three routes of transmission from the stomach of one person to that of another have been described. These were iatrogenic and person to person transmission by either the fecal-oral or oral-oral route [2]. *H. pylori* have been classified as a class I carcinogen by the International Agency for Research on Cancer (IARC) and currently is considered a necessary but insufficient cause of gastric adenocarcinoma [3].

H. pylori had been involved in the pathogenesis of different digestive tract disorders, such as chronic active gastritis, peptic ulcer, gastric cancer, and mucosa-associated lymphoid tissue lymphoma. Infection with *H. pylori* is also associated with dyspepsia which is an extremely common disorder, affecting an estimated 25% of all adults living in the Western developed nations [4]. Even though most people infected with *H. pylori* suffer no related symptoms it increases the risk of gastric cancer. Approximately 95% of duodenal ulcers and 89% of all gastric cancers can be attributable to *H. pylori* infection [3, 5]. The eradication of *H. pylori* reduces gastric cancer risk in previously infected individuals, suggesting that mostly *H. pylori* infection initializes gastric cancer and continued presence is a risk factor for gastric cancer [6, 7].

The prevalence of gastric and duodenal ulceration has decreased in western Europe and the USA over recent decades, following a decline in the prevalence of *H. pylori* [8] this may think to be caused by the reduced chances of childhood infection due to improved hygiene and sanitation and the active elimination of carrier ship via antimicrobial treatment [9].

According to the Federal Ministry of Health, dyspepsia accounts for 3.6% and 4.4% causes of morbidity of all cases among both sexes and females respectively [10]. Also, dyspepsia is one of the commonest complaints in any Ethiopian outpatient department and accounts for 10% of

hospital admissions in Ethiopia [11]. Between 80% and 90% of all ulcers are caused by or are associated with *H. pylori* [12]. *H. pylori* infection was significantly associated with 45.2% of uninvestigated dyspepsia [13].

The present study was intended to assess the magnitude and associated risk factors of *Helicobacter pylori* infection among adult dyspeptic patients attending Bokoji Hospital, Southeast Ethiopia, 2019

METHODS

The hospital-based cross-sectional study design was used to assess the magnitude and associated factors of *Helicobacter pylori* infection among adult dyspeptic patients attending Bokoji Hospital, Southeast Ethiopia. It was conducted from July, 16 to October 31, 2019.

The sample size was determined using the statistical double population proportion formula using Epi info 7 stat-calculator based on factor associated with *H. pylori* infection from a study done in Butajira, South Ethiopia [14]. After correcting using finite population correction formula and adding 10 % contingency for the non-response rate give the final sample size to be 354.

All patients with complaints of dyspepsia who are with persistent or recurrent symptoms occurring at least three times per week. Also, whose age was more than 18 years old and those who did not previously treat *H. pylori* eradication therapy were included in the study. Individuals who are unable to communicate due to different illnesses and unable to obtain stool samples were excluded.

A systematic random sampling technique was used to select study units. Three hundred fifty-four (354) dyspeptic patients were selected randomly for this study. The average number of patients with dyspepsia complaints was 18 per day from two months data of last year the same period in all three adult OPDs. Interval (K^{th}) was determined by dividing the number of dyspeptic patients attending the three OPD (792) to the final sample size. Then systematic sampling method will be used for selecting the patients approximately at each 2nd interval by using their numbers at arrival time as sampling frame at central OPD triage. From this average of eight patients were selected per day. Then the patients were provided code in line with its Medical record folder and sent to OPDs for data collection and requested for laboratory investigation after face to face interviews.

Data collection procedures (instruments, personnel, measurements)

Three B.Sc. Nurses were used as data a collector, two experienced B. Sc Laboratory Technologists were used for Laboratory examination and one senior laboratory technologist was used as a supervisor. One day intensive training before the actual work was given by investigators and experienced laboratory technologists on data collection principles and laboratory procedures before their participation.

Questionnaire

A structured questionnaire based on common factors associated were developed. Information on the demographic and socioeconomic, behavioral factors, sources of drinking water and utilization of latrine was obtained using a structured questionnaire. The questionnaire was initially prepared in English, translated into Afan Oromo by language experts and back to English to ensure consistency. Then, the participants were interviewed with regional language, Afan Oromo. To ensure quality control, 5% of the structured questionnaire was pre-tested in line with laboratory procedures before actual data collection at Gobessa district hospital. The necessary amendment was made on the questionnaires.

Laboratory sample collection and testing

A fecal specimen consisting of 50 milligrams or pea-sized fresh stool was requested from each study participant. The collected samples were kept in a plastic screw-capped container and transported to the laboratory for examination within ten minutes of delivery.

From each stool sample, a small portion of the fecal material was taken using a sterile applicator stick which was screwed on the collection tube and placed the stick in the tube and tighten securely. The samples were diluted using the extraction buffer contained in a vial and vigorously shaken by hand. The resulting diluted material was added in drops on to the NOVA HPSA test strip and the results were read after 15 to 30 minutes according to the manufacturer's instruction although positive results may be visible in as short as 1-minute time.

Also, a direct wet mount with normal saline (0.85% NaCl solution) was prepared at the study site and examined for the presence of motile intestinal parasites, trophozoites, and eggs under a light microscope at 10X and 40X magnification. Lugol's iodine staining was also used to identify cysts of intestinal parasites [15].

Capillary blood samples were collected and tested for ABO blood group phenotype using a hemagglutination test.

At the time of sampling; date of sampling, age, sex, presence or absence of *Helicobacter pylori* infections, presence or absence of intestinal parasites, blood group and code number was recorded for each study participants in the laboratory record format.

All the laboratory procedures including the collection and handling of specimens were carried out by standard protocol [16]. The entire laboratory procedures including the collection and handling of specimens were also carried out following standard leaf-let of the NOVA HPSA test kit. Care was taken to avoid using the strip beyond the expiration date and reading of the results was done within 15 minutes after the sample was applied. Also, test strips were immediately removed from the test area after interpreting the results to avoid confusion.

To ensure general safety, disposable gloves were worn and universal bio-safety precautions [17] were followed at all times.

Data processing and analysis

The data were entered into Epi Info 7. Cleaned and checked against the original document before analysis. All statistical analyses were performed using SPSS version 21. Descriptive statistics were used to express the overall prevalence of the infection in percentage. Bivariate and multivariate logistic regressions were fitted to select candidate variables at ($p\text{-value} \leq 0.25$) and declare significantly associated variables for final at ($p\text{-value} \leq 0.05$) respectively. The 95% CI and Odds ratios (OR) were used to show the effect of independent variables on dependent variables.

RESULT

Among 354 systematically selected adult dyspeptic patients 348 have successfully participated in this study. Thus, the response rate was 98.3%. Six study participants were excluded from the study due to unable to obtain stool samples.

Socio-demographic characteristics of the study participants.

A total of 354 adult dyspeptic patients were included in the study. About 218 (62.6%) were females and 130 (37.4%) were males. The majority of the participants were in the age range of 26 to 40 years 158 (45.4%) with a median age of 30 years (\pm 15 IQR). 195 (56.0%) were urban residents. Out of the total, 238 (68.4%) of the study participants were married while 89 (25.6 %) were single or unmarried. Most of the study participants 230 (66.1%) and 100 (28.7%) were from the Oromo and Amhara ethnic group, respectively. Of the total participants, 100 (28.7%) and 92 (26.4%) were achieved primary education and occupationally housewife, respectively. About the family size, 217(62.4%) of them were living within the family having 1-5 members. About half of the participants had a monthly income of less than 500 Ethiopian Birr (Table 1).

The magnitude of *H. pylori* infection among adult dyspeptic patients visiting Bokoji hospital about Socio-demographic factors.

The overall magnitude of *H. pylori* infection among all of the study participants was 47.7%
 The magnitude of *H. pylori* infection was assessed by considering the socio-demographic characteristics of the study participants. The study showed that the magnitude of *H. pylori* infection was higher 82 (51.9%) among study participants who were in the age group between 26 and 40 years and lower 44 (41.5%) among participants aged less than 25 years. The proportion of *H. pylori* infection in males and females was 61(46.9%) and 105 (48.2%), respectively. The infection was higher among urban dwellers 102(52.3%) and separated marital status 8(61.5%). Regarding family size, of 218 participants with family members of less or equal to five members living together 113 (51.1%) were positive for *H. pylori* (Table 2).

Table 1: Socio-demographic characteristics of adult dyspeptic patients attending Bokoji Hospital, 2019.

Characteristics	Frequency	Percent
The age group of respondents		
18 - 25 years	104	29.9%
26 - 40 years	158	45.4%

	≥ 41 years	86	24.7%
Sex			
	Male	130	37.4
	Female	218	62.6
Residence			
	Rural	153	44.0
	Urban	195	56.0
Family size			
	≤ 5 family members	217	62.4
	> 5 family members	131	37.6
Marital status			
	Single/ never married	89	25.6
	Married	238	68.4
	Others * ¹	21	6.0
Ethnicity			
	Oromo	230	66.1
	Amhara	100	28.7
	Others * ²	18	5.2
Educational Level			
	No Formal education	71	20.4
	Primary (1-8)	100	28.7
	Secondary (9-12)	97	27.9
	College and above	80	23.0
Occupation			
	Farmer	78	22.4
	House Wife	92	26.4
	Merchant	51	14.7
	Gov't Employee	66	19.0
	Student	55	15.8

Other * ³	6	1.7
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Monthly Income

less than 500 ETB	147	42.2
501- 1500 ETB	35	10.1
1501 - 3000 ETB	90	25.9
greater than 3001 ETB	76	21.0

Others- *¹- Separated, Divorced, Widowed *²- Gurage, Silte, wolayitta *³- pensioner, daily laborer

Characteristics	H. Pylori	
	Positive No. (%)	Negative No. (%)
Age Category		
18 - 25 years	44 (41.5%)	60 (59.5%)
26 - 40 years	82 (51.9%)	76 (48.1%)
≥ 41 years	40 (46.5%)	46 (53.5%)
Sex		
Male	61 (46.9%)	69 (53.1%)
Female	105 (48.2%)	113 (51.8%)
Residence		
Rural	64 (41.8%)	89 (58.2%)
Urban	102 (52.3%)	93 (47.7%)
Marital status		
Single	36 (40.4%)	53 (59.6%)
Married	118 (49.6%)	120 (50.4%)
Separated	8 (61.5%)	5 (38.5%)
Widower/ widow	4 (50.0%)	4 (50.0%)

			Table 2:
Ethnicity			
Oromo	105 (45.7%)	125 (54.3%)	
Amhara	50 (50.0%)	50 (50.0%)	
Others* ¹	11 (61.1%)	7 (38.9%)	
No family members			
≤ 5 family members	113 (51.1%)	104 (48.9%)	
> 5 family members	53 (41.2%)	78 (58.8%)	
Educational attainment			
No Formal education	34 (47.8%)	37 (52.1%)	
Primary (1-8)	46 (46.0%)	54 (54.0%)	
Secondary (9-12)	46 (47.4%)	51 (52.6%)	
College and above	40 (50.0%)	40 (50.0%)	
Occupation			
Farmer	30 (38.5%)	48 (61.5%)	
House Wife	48 (52.2%)	44 (47.8%)	
Merchant	21 (41.2%)	30 (58.8%)	
Gov't Employee	42 (63.3%)	24 (36.7%)	
Student	21 (38.2%)	34 (61.8%)	
Other* ²	4 (66.6%)	2 (33.4%)	
Monthly income (Median)			
less than 500 ETB	69 (46.9%)	78 (53.1%)	
501- 1500 ETB	19 (54.3%)	16 (45.7%)	
1501 - 3000 ETB	41 (45.5%)	49 (54.5%)	
greater than 3001 ETB	37 (48.7%)	39 (51.3%)	

Magnitude of H. pylori infection concerning socio-demographic characteristics among adult dyspeptic patients attending Bokoji Hospital, 2019.

Others- *1- Gurage, Wolayitta, Silte *2- Daily laborer, Pensioner

The magnitude of H. pylori infection concerning environmental factors among adult dyspeptic patients attending Bokoji Hospital.

The magnitude of the infection in participants who obtain drinking water from the river or rainwater was 16 (51.6%). Among study participants of 321 who had toilets about 154 (48.0%)

were infected with *H. pylori*. In participants that do have toilets without a handwashing facility nearby about 136 (47.2%) were positive for *H. pylori* (Table 3).

Table 3: Magnitude of *H. pylori* infection concerning environmental factors among adult dyspeptic patients attending Bokoji Hospital, 2019.

	H. pylori	
	Positive No. (%)	Negative No. (%)
Drinking water source		
Tap water	129 (46.7%)	147 (53.3%)
River /Rainwater	16 (51.6%)	15 (48.4%)
Well/spring	21 (51.2%)	20 (48.8%)
Availability of Toilet		
Yes	154 (48.0%)	167 (52.0%)
No	12 (42.3%)	15 (57.7%)
Handwashing Facility (n=258)		
Yes	30 (50.0%)	30 (50.0%)
No	136 (47.2%)	152 (52.8%)

The magnitude of *H. pylori* infection about behavioral factors among adult dyspeptic patients attending Bokoji Hospital.

The magnitude of *H. pylori* infection in participants who did not regularly wash their hands both before a meal and after toilet use was 11 (42.3%) and 115 (57.2%), respectively. The positivity rate for *H. pylori* infection in this study was 62 (57.9%) among those used to drink alcohol and 63.6 % among those who smoke a cigarette (Table 4).

Table 4: Magnitude of *H. pylori* infection concerning behavioral factors among adult dyspeptic patients attending Bokoji Hospital, 2019.

Characteristics	H. Pylori	
	Positive No. (%)	Negative No. (%)
Hand washing before meal regularly		
Yes	155 (48.1%)	167 (51.9%)

No	11 (42.3%)	15 (57.7%)
Hand washing after meal regularly		
Yes	158 (49.2%)	163 (50.8%)
No	8 (29.6%)	19 (70.4%)
Hand washing habit after toilet		
Yes	51 (34.7%)	96 (65.3%)
No	115 (57.2%)	86 (42.7%)
Eating uncooked vegetable habit		
Yes	76 (47.5%)	84 (52.5%)
No	90 (47.9%)	98 (52.1%)
The habit of eating spicy food		
Yes	8 (57.1%)	6 (42.9%)
No	158 (47.3%)	176 (52.7%)
Open field defecation		
Yes	25 (48.1%)	27 (51.9%)
No	141 (47.6%)	155 (52.4%)
Alcohol drinking habit		
Yes	62 (57.9%)	45 (42.1%)
No	104 (43.2%)	137 (56.8%)
Cigarette smoking habit		
Yes	7 (63.6%)	4 (36.4%)
No	166 (47.7%)	182 (52.3%)

The magnitude of H. pylori infection about biophysical factors among adult dyspeptic patients attending Bokoji Hospital.

Regarding biophysical factors, about 48.2% of participants with normal body mass index (18.5 – 24.9 Kg/m²) and 50% with underweight (<18.5 Kg/m²) were infected by H. pylori. About 58.3% of dyspeptic patients with blood group AB were found positive for H. pylori. Also, 58.9% of study participants were co-infected with H. pylori and at least one intestinal parasite (Table 5).

Table 5: Magnitude of H. pylori infection concerning biophysical factors among adult dyspeptic patients attending Bokoji Hospital, 2019.

	H. pylori	
	Positive No. (%)	Negative No. (%)
BMI (Kg/m²)		
Less than 18.5	7 (50.0%)	7 (50.0%)
18.5-24.9	133 (48.2%)	143 (51.8%)
Greater than 25	26 (44.8%)	32 (55.2%)
Blood group		
A	44 (50.0%)	44 (50.0%)
AB	21 (58.3%)	15 (41.2%)
B	42 (51.9%)	39 (48.1%)
O	59 (41.2%)	84 (58.8%)
Presence of intestinal parasites		
Yes	23 (58.9%)	16 (41.1%)
No	143 (46.3%)	166 (53.7%)

Factors associated with H. pylori infection.

In multivariable binary logistic regression analysis, after controlling for possible cofounders, the habit of handwashing after visiting toilet (AOR **2.241** 95% CI **(1.410, 3.563)**) and alcohol drinking habit (AOR **1.796**, 95% CI **(1.087, 2.968)**) were factors significantly associated with infection with H. pylori (Table 6).

Characteristics	H. pylori status		COR (95% C.I)	AOR (95% C.I)
	Positive	Negative		
Residence				
Rural	64	89	.656 (.428, 1.005)	.657 (.393, 1.100)
Urban	102	93	1	1
Marital status				
Single	36	53	1	1
Married	118	120	1.448 (.884, 2.372)	1.674 (.957, 2.929)
Separated	8	5	2.356 (.713, 7.781)	3.151(.831, 11.944)
Widowed	4	4	1.472 (.346, 6.271)	1.373 (.266, 7.095)
Family size family member				
≤ 5	113	104	1	1
> 5	53	78	.625 (.403, .970)	.626 (.372, 1.055)
Hand washing after the meal				
Yes	158	163	1	1
No	8	19	.434 (.185, 1.021)	.509 (.205, 1.262)
Hand washing habit after toilet				
Yes	51	96	1	1
No	115	86	2.517(1.621,3.907)*	2.241(1.410, 3.563)*
Alcohol drinking habit				
Yes	62	45	1.815(1.145,2.877)*	1.796(1.087, 2.968)*
No	104	137	1	1
Blood group				
A	44	44	1	1
AB	21	15	1.400 (.640, 3.064)	1.371 (.594, 3.168)
B	42	39	1.077 (.589, 1.970)	1.064 (.556, 2.035)
O	59	84	.702 (.412, 1.198)	.616 (.346, 1.097)

Presence of intestinal parasites				
Yes	23	16	1.669 (.849, 3.281)	1.854 (.894, 3.845)
No	143	166	1	1

Table 6: Bi-variable and multivariable binary logistic regression analysis of H. pylori infection with the selected variables among adult dyspeptic patients attending Bokoji hospital, 2019.

DISCUSSION

Helicobacter pylori epidemiology globally varies markedly in magnitude and associated factors from place to place and among the population. Therefore, knowing the magnitude of *H. pylori* infection is essential for intervention strategies accordingly.

In this study, the magnitude of *H. pylori* infection among adult dyspeptic patients was 47.7% (95% CI: 42.45, 52.95%) which is comparable with previous reports 46% in Dutch [18] and 52.2% in Mexico [19]. The magnitude of the infection in the current study was greater than 37.9% from Canada[20]. This could be explained by poor living conditions that favor *H. pylori* transmission in developing countries as compared to a Canadian study.

On the other hand, the magnitude found in this study was lower than studies in Portugal 84.2% [21], in Turkey 82.5% [22], in Korea 54.4% [23], in China 63.4% [24], in India 58% and 62% [25, 26], in Kazakhstan 76.5% [27] and in Bhutan 73.4% [28].

Similarly, the magnitude of the infection in the current study was lower than those reported from African countries such as 75.5% in Morocco [29], 65 % Tanzania [30], and 80% in Nigeria [31] and comparable with finding 56.5% reported from Libya [32]. On the contrary, the higher magnitude was observed than 12.5% reported from another study in Nigeria [33].

The variation in the magnitude of *H. pylori* might be due to differences in diagnostic methods used and risk factors across the geographic location.

The current study showed a lower magnitude of *H. pylori* infection when compared with most studies conducted in different parts of Ethiopia. Among these in Debretabor 72.2% [34], in Bahir Dar 63% [35], in Gondar 65.7% to 85.6% [36, 37] and in Asosa 58.3% [38]. While comparable with results in Butajira 52.4% [14], in Jinka 50.7 % [39] and in Bahir Dar 41.6% [40].

The effect of proton pump inhibitor or antibiotic drugs used by the dyspeptic patients as a treatment might have influenced the results. It seemed that patients might have the difficulty of recalling the past 2 weeks of drug intake which might have influenced the stool antigen test results. In this study, the test kits used for the diagnosis of *H. pylori* were coated with a monoclonal antibody which is specific to a single epitope of the bacterial antigen. This could have reduced the positivity of the test contributing to the magnitude of *H. pylori* in this study. The other possible explanation for the

lower magnitude of *H. pylori* infection found in the current study might be due to the diagnostic test method used. Most studies used the detection of *H. pylori* in serum, which might show overestimation of the actual frequency since serology cannot differentiate current infection from past infection or antibody against *H. pylori* may circulate in the blood for a longer time.

Another major finding of the current study was the magnitude of *H. pylori* infection among participants was independently predicted by the habit of hands washing after visiting the toilet. Thus individuals who did not have handwashing habits after toilet use were almost two times more likely to have *H. pylori* infection. This finding was similar findings with that reported from Asosa in Ethiopia [38]. The significant association between habits of hand washing after toilet use and *H. pylori* infection suggest that transmission of *H. pylori* can result from the fecal-oral route that can relate to poor hygienic practices (handwashing).

The magnitude of *H. pylori* infection two times more likely among participants who used to drink alcohol which is consistent with other studies reported that regular alcohol drinkers are to be infected by *H. pylori* [22, 41]. In contrast, in one study, regular alcohol drinking was observed as a protective factor for *H. pylori* infection, which suggests all of those who never drink alcohol, those who had only tried in the past and the occasional drinkers had a higher risk than regular alcohol consumers [22]. On the other hand, the consumption of little alcohol might protect infected against *Helicobacter pylori* bacteria [39].

Conclusion and recommendation

The magnitude of the *H. Pylori* infection among patients with dyspepsia in this study was 47.5% and associated with handwashing habits after visiting the toilet and alcohol drinking habit. This implies that it is a public health problem.

Health professionals should promote the importance of personal hygiene including regular hand washing after visiting the toilet to combat the fecal-oral transmission.

The Woreda Health Office could plan and strengthen awareness creation programs on the transmission routes and prevention mechanisms of *H. pylori* infection to reduce the burden. Other researchers could conduct community-based studies in the general population to understand the burden of the infection since the infection is mostly asymptomatic.

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Authors' contributions

All Authors were contributed to the study design, writing original draft, reviewing and editing paper, data entry, analysis and interpretations, read and approve the final manuscript.

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Ethical Approval and consent form

Official Ethical Clearance was secured before the commencement of the study from Research ethical Review Board of Arsi University College of Health Science. All Participants of the study were given full information about the objective of the study and signed written informed consent in this study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

All data and material will be available upon requests to the corresponding author.

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