East African Medical Journal Vol. 77 No. 12 December 2000
CAMPYLOBACTER ENTERITIS AMONG CHILDREN IN DEMBIA DISTRICT, NORTHWEST ETHIOPIA
G. Mitike, MD, MPH, Department of Community Health, A. Kassu, BSc, A. Genetu, BSc, Department of Microbiology and Parasitology and D. Nigussie, MD, Gondar College of Medical Sciences, P.O. Box 196, Gondar, Ethiopia.

Request for reprints to: Dr. G. Mitike, Department of Community Health, Gondar College of Medical Sciences, P.O.Box 196, Gondar, Ethiopia.

CAMPYLOBACTER ENTERITIS AMONG CHILDREN IN DEMBIA DISTRICT, NORTHWEST ETHIOPIA

G. MITIKE, A. KASSU, A. GENETU and D. NIGUSSIE

ABSTRACT

Objective: **To estimate the magnitude of *Campylobacter enteritis* in children below fifteen years of age.**
Design: A **cross-sectional survey.**
Setting: **Seven villages found in the outskirts of Kolla Diba town were covered. The town is located 35 kilometres away from Gondar teaching hospital.**
Participants: **Stool specimens were collected from 153 children under fifteen years of age. Caretakers of the children were interviewed using a structured questionnaire.**
Main outcome measures: **Culture result for *Campylobacter,* culture and biochemical test results for *Salmonella* and *Shigella* and direct microscopy results for parasites or ova measures.**
Results: **The prevalence of *Campylobacter* species was 16/153 (10.5%) and the frequency of isolation was twice as much as *Salmonella* or *Shigella* species (5.2% each). Contact with cats and diarrhoea-sick person in the household was associated with isolation of *Campylobacter* species.**
Conclusion: **Based on the finding and the evidence accumulated, clinical health professionals need to consider *Campylobacter* species as one of the major causes of diarrhoea in children.**

INTRODUCTION

In recent years, reports show that *Campylobacter* species are becoming one of the major causes of childhood diarrhoea(1,2).*Campylobacter* is a gram negative helically curved rod bacterium. There are 18 species of *Campylobacter* of which four *(C. jejuni, C. coli, C.laris* and *C.upsaliencies)* are known to cause enteric infections in humans. Among these species, *Campylobacter jejuni* is the most studied(3,4).

Campylobacteriosis is historically a zoonotic disease found among cats, goats, poultry, calves, lambs and dogs. Outbreaks of human infection have been reported as a result of eating and drinking contaminated food and water respectively. Although uncommon, human-to-human spread is also possible through faecal-oral route. *Campylobacter* species can cause infection in all age groups but the rate of infection is more common in children(3-5).

Because of the need of microaerophilic system and selective media, routine cultures are not available in many parts of developing countries including Ethiopia. Besides, some of the studies conducted are hospital-based and there is limited information on the prevalence of *Campylobacter* at community level. This community-based study is therefore an attempt to estimate the magnitude of *Campylobacter enteritis* among children under fifteen years in Dembia district specifically villages surrounding Kolla Diba town.

MATERIALS AND METHODS

Between April and May 1998, a cross-sectional study was conducted at seven villages around Kolla Diba town. The town is located where one of the teaching health centres of the Gondar College of Medical Sciences is found. The study was conducted to determine the prevalence of *Campyobacter enteritis.* The selection of the villages was based on convenience for transport of the stool specimens. Each village had a population of approximately 1500.

Children under fifteen years with diarrhoea residing in the villages were included in the study. Stool specimens were collected from 153 children with diarrhoea. A house to house search was made to identify children with diarrhoea. Six senior medical students collected the specimens. Diarrhoea was defined as at least three loose stools or one watery (stool) per day and dysentery as the presence of blood in stool.

Variables: The main variables included stool culture results for *Campylobacter* species; culture and biochemical test results for *Salmonella* and *Shigella* and direct microscopy results for ova or parasites. Parents were interviewed using a structured questionnaire prepared for the purpose. Data were collected on history of contact to diarrhoea-sick person in the household or among friends or playmates, exposure to animals in the household and the presence of diarrhoea in these animals. Information was also obtained on use of antibiotics in the last three days, presence of childhood illness and previous diarrhoeal diseases, immunization status, type of stools, duration and frequency of diarrhoea, presence of fever, abdominal pain, vomiting, and tenesmus.

Stool specimen collection and transport: Fresh stool specimens were collected from each under fifteen year old child with diarrhoea on the day of the visit. The specimens were added to vials containing 2 ml of saline and then put in a cold box with icepacks. The cold boxes containing the specimens were transported to the Kolla Diba health centre. The stool specimens were kept in a refrigerator at the health centre until they were transported to the department of microbiology and parasitology of the Gondar College of Medical Sciences by a car.

Stool specimen processing: In the department of microbiology, two experts (staff members) received and processed the stool specimens. Upon arrival the specimens were inoculated on Salmonella -Shigella agar and Campylobacter agar plates. The inoculated Campylobacter agar plates were kept in a gas jar containing Campylobacter gas pack system (CampyPakPlus, Microaerophilic System Envelop with Palladium Catalyst, H_2 + CO_2, Becton Dickinson Microbiology Systems, USA) to maintain the microaerophilic condition. The jar was incubated at a temperature of 42°C for 72 hours. Then suspected *Campylobacter* colonies were picked up using wire loop and smeared on glass slides for gram staining. Identification was made when curved or spiral gram-negative rods were seen in the preparation.

The inoculated Salmonella-Shigella agar plates were incubated aerobically at a temperature of 37°C in an incubator for 24-48 hours. The plates were then examined for the presence of suspected Salmonella or Shigella-like colonies. Suspected colonies were subcultured onto another Salmonella-Shigella agar plates and incubated for 24-48 hours. Pure non-lactose fermenting colonies were inoculated on Nutrient broth (for indole test), Triple sugar iron agar, Simmons citrate agar, Lysine decarboxylase agar, Urase, Manitol and Motility medium and incubated at 37°C for 24 hours. Biochemical characteristics identified *Salmonella* or *Shigella* species.

Ova or larvae of parasites were identified through direct microscopy. Thin smears were prepared on a slide and examined under the microscope using 10X and 40X objectives.

RESULTS

Out of one hundred and fifty three children under fifteen years of age with diarrhoea, twenty three (15%) and ninety five (62%) were under one year and under five years of age respectively. Eighty (52.3%) were females. The mean duration of diarrhoeal episodes was 9.5±SD 10.9 days.

Among the stool specimens cultured, sixteen (10.5%) were positive for *Campylobacter* species. Eight (5.2%) of the specimens were positive for *Salmonella* and eight (5.2%) for *Shigella* species. Seventy nine (52.3%) of the specimens revealed the presence of parasites. *Ascaris lumbricoides*, *Schistosoma mansoni* and hookworm parasites were recovered from thirty eight (24.8%), nineteen (12.4%) and fourteen (9.2%) stool specimens respectively (Table 1). More than one parasite was identified from sixteen (10.5%) specimens.

Table l

Distribution of parasites and enteric bacteria

Laboratory results	No.	%
Campylobacter species		
Positive	16	10. 5
Negative	137	89.5
Shigella		
Positive	8	5.2
Negative	145	94.8
Salmonella		
Positive	8	5.2
Negative	145	94.8
Parasites		
Positive	79	52.3
Negative	74	47.7
Type of parasite		
Ascaris lumbricoides	38	24.8
Schistosoma mansoni	19	12.4
Hookworm	14	9.2
Hymenolopsis nana	4	2.6
Others*	4	2.6

*=Others includes strongyloides (3), *Trichuris trichura* (1)
Note: Sixteen (10.5%) children had more than one parasite.

Table 2 compares selected factors with culture result of *Campylobacter* species. The distribution of *Campylobacter* was not different in males and females ($\chi 2=2.3$, P=0.12). Culture positivity was similar in the different age categories ($\chi 2=2.09$, p=0.83). Although not statistically significant, children less than three years of age had a higher percentage of culture positivity than those above three years of age (12.7% versus 8.0%). History of the presence of previous diarrhoea was similar in those who were positive and negative for *Campylobacter* species ($\chi 2=1.4$, P=0.23). Those who reported contact with animals gave similar findings with those who did not (Fisher exact: l-tailed p value=0.61). However, those who had contact history with cats had more positive cultures for *Campylobacter* species than those without ($\chi 2=5.23$, p=0.02). History of diarrhoea in the family was significantly higher in those who were positive for *Campylobacter* species than those without ($\chi 2=5.23$, p=0.02). The duration of diarrhoea was not associated with culture positivity for *Campylobacter* ($\chi 2$ (3) = 1.26, p=0.73).

Table 2

Selected factors and Campylobacter positivity

Factor	Campylobacter Positive (%)	Campylobacter Negative (%)	P values
Sex			
Male	11 (15.1)	62 (84.9)	
Female	5 (6.3)	75 (93.7)	0.12
Previous diarrhoea			
Yes	11 (13.9)	68 (86.1)	
No	5 (6.8)	69 (93.2)	0.23
Contact with animal			
Yes	14 (10.6)	118 (89.4)	
No	2 (9.5)	19 (90.5)	0.61*
Contact with cats			
Yes	11 (18.3)	49 (81.7)	
No	5 (5.4)	88 (94.6)	0.02**
Age in months			
<12	3 (13.0)	20 (87.0)	
12-23	2 (9.5)	19 (90.5)	
24 -35	4 (14.8)	23 (85.2)	
36-47	1 (6.3)	15 (93.7)	
48-59	0 (0.0)	8 (100.0)	
≥60	6 (9.4)	58 (90.6)	0.83
Contact with sick person in family			
Yes	11 (18.3)	49 (81.7)	
No	5 (5.4)	88 (94.6)	0.02**
Duration of diarrhoea			
1-3 days	5 (11.1)	40 (88.9)	
4-7 days	5 (7.6)	61 (92.4)	
8-13 days	1 (14.3)	6 (85.7)	
≥14 days	5 (14.3)	30 (85.7)	0.73

*=Fisher exact: 1-tailed P value; **=statistically significant

Table 3

Comparison of Campylobacter culture positivity with stool consistency and reported symptoms

	Culture Positive (%)	Culture Negative (%)	P values
Stool consistency			
Bloody	4 (25.0)	32 (23.3)	
Mucoid	6 (37.5)	39 (28.5)	
Watery	1 (6.2)	12 (8.8)	
Mixed	5 (31.3)	54 (39.4)	0.85
Fever			
Yes	11 (68.8)	84 (61.3)	
No	5 (31.2)	53 (38.7)	0.75
Vomiting			
Yes	4 (25.0)	59 (43.1)	
No	12 (75.0)	78 (56.9)	0.26
Tenesmus			
Yes	13 (81.3)	118 (86.1)	
No	3 (18.7)	19 (13.9)	0.70*
Abdominal pain			
Yes	12 (75.0)	110 (80.3)	
No	4 (25.0)	27 (19.7)	0.74*

* = Fisher exact: 2-tailed P value

As shown in Table 3, stool consistency was not associated with culture positivity for Campylobacter species ($\chi 2=0\ 77$, $P=0\ 85$). Similarly, reported symptoms such as fever, vomiting, tenesmus and abdominal pain were not different in those who were culture positive and negative.

DISCUSSION

In this community-based study, the prevalence of *Campylobacter* species was 10.5%. This finding was twice the isolation of *Salmonella* or *Shigella* separately. Hospital-based studies conducted at Gondar and Addis Ababa teaching hospitals revealed slightly higher figures, 13.8% and 15.3% respectively(1,2). Considering the differences in the settings and designs of the studies, our finding is considerably high especially at a community level. It was also comparatively high in contrast to a report from Spain, 4.5%(5). In Kenya, prevalence of *Campylobacter* in malnourished children was reported as five per cent(6). In Britain there were early reports which ranged between five to eight per cent especially in people consuming unpasteurised milk(7,8).

Although the finding was not statistically significant, higher rates were observed in the age groups <12 (13.0%) and 24-35 (14.8%) months. There were similar reports from Spain showing higher magnitude in the age group <1 and <3 years of age than older age groups(5). The distribution of *Campylobacter* species was not different in males and females. This finding was in agreement with a recent report from Addis Ababa, Ethiopia(9) and earlier report from Sweden(10).

In this study, it was found out that there was a statistically significant association between the presence of cat(s) in a household and isolation of *Campylobacter* species. The presence of cats has been reported as a risk factor from Colorado(11). However, there was no statistically significant association between isolation of *Campylobacter* and contact with other domestic animals. This may be explained partly by the relatively homogeneous characteristics of our study population. Since the study population was a rural one, domestic animals were present in almost all of the households.

As reported by other authors, contact with a sick person in the family was associated with isolation of *Campylobacter* species from the diarrhoea stools (5). Person- to -person transmission has been reported as one of the risk factors in studies conducted previously(5,12). Others have reported transmission through contaminated water and raw milk(7, 12).

In contrast to the study conducted in Gondar hospital previously, the duration of diarrhoea was not statistically associated with culture positivity to *Campylobacter*(1). This may be due to the small sample size in our case. On the other hand, the report from Addis Ababa did not reveal significant association between persistent diarrhoea and isolation of *Campylobacter* species(9). In support of this, decreased isolation of *Campylobacter* through culture after 12-13 days was reported elsewhere(12).

The finding that reported symptoms such as fever, vomiting, abdominal pain and tenesmus were not associated

with isolation of *Campylobacter* species showed that it would be difficult to diagnose Campylobacter using clinical symptoms alone. However symptoms such as fever, bloody stool and in older children, abdominal pain were reported as early symptoms due to *Campylobacter* enteritis(13,14).

In conclusion, based on our finding and the supportive evidence from different studies, it is quite relevant for clinical health professionals to consider *Campylobacter* species as one of the major causes of enteritis in children.

ACKNOWLEDGEMENTS

We thank Dr. Abarham Assefa, Head Department of Microbiology and Parasitology of the Gondar College of Medical Sciences for facilitating the study. We also appreciate the support given by the department of community health and Kolla Diba health centre Drs. Azanaw Melesse, Ababayehu Assefa, Firehiwot Eshetu, Mekonnen Gizachew and Addisu Bekele are acknowledged.

REFERENCES

1. Gedlu E. and Assefa A. Campylobacter enteritis among children in Northwest Ethiopia: a one-year prospective study. *Ann. trop. Paediat.* 1996; **16**: 207-212.
2. Asrat D.A., Hathaway A., Sjögren, Ekwall and E. Kaijser. The stereotype distribution of *Campylobacter jejuni* and *C. coli* isolated from patients with diarrhoea and controls at Tikur Anbessa hospital, Addis Ababa, Ethiopia. *Epidem. Infect.* 1997; **118**:91-95.
3. Brooks G.F., Butel J.S. and Morse S.A. (Eds.) Jawetz Melnick and Aadelberg's Medical Microbiology, 21st Edition, Appleton and Lange, 1998.
4. Joklick W.K., Willett H.P., Amos D.B. and Wilfert C.M. (Eds.) Zinsser Microbiology Textbook, 20th edition, Appleton and Lange, 1992.
5. Brea M.L., Molina D. and Baquero M. Campylobacter enteritis in Spain. *Trans. roy. Soc. trop. Med. Hyg.* 1979; **73**:374 -375.
6. Kakai R., Womola I.A., Bwayo J.J. and Ndinya-Achola J.O. Enteric pathogens in malnourished children with diarrhoea. *East Afr. Med. J.* 1995; **72**: 288-89.
7. Robinson D.A., Jones D.M. Milk-borne *Campylobacter* infection. *Brit. Med J.* 1981; **282**:1374-6.
8. Skirrow M.B. *Campylobacter enteritis* a 'new" disease. *Brit. Med. J.* 1977;.**2**:9-11.
9. Asrat D., Hathaway A. and Ekwall E. Studies on Enteric Campylobacteriosis in Tikur Anbessa and Ethio-Swedish Children's Hospital, Addis Ababa, *Ethiop. Med. J.* 1999; **37**:71-84.
10. Svedhem A. and Kaijser B. Campylobacter fetus subspecies jejuni: A common cause of diarrhoea in Sweden. *J. Infect. Dis.* 1980; **142**: 3 53-59.
11. Hopkins R., Olmsted R., Istre G., Endemic *Campylobacter jejuni* infection in Colorado: Identified risk factors. *Amer. J. Publ. Hlth.* 1984; **74**: 249-50.
12. Vogt R.L., Sours H.E., Barrett T., Fieldman R.A., Dickinson R.J. and Whiterell L. *Campylobacter enteritis* associated with contaminated water. *Ann Intern Med.* 1982; **96:**292-6.
13. Karamali M.A., Fleming P.C. Campylobacter enteritis in children. *J. Paediatrics* 1979; **94**: 527-533.
14. Blaser M.J., Berkowitz I.D., Laforce M., Cravens J., Reller B. and Wang W.L.L. *Campylobacter enteritis*: clinical and epidemiologic features. *Ann. Intern. Med*. 1979; **91**:179-85.

ACKNOWLEDGEMENT

The Editor-in-Chief wishes to thank the authors, reviewers, advertisers, readers and subscribers for the support rendered to EAMJ in the year 2000. He looks forward to continued support and co-operation in future.

Have a merry Christmas
and a prosperous year 2001.