

# Chronic Suppurative Otitis Media and Its Association with Socio-Economic Factors Among Rural Primary School Children of Bangladesh

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**Abstract** Chronic Suppurative Otitis Media (CSOM) is a common community health disorder of children in all developing countries like Bangladesh which causes significant impact in speech, cognitive, educational and psychological development. The aim of the study was to determine the prevalence of CSOM and its association with certain socio-economic factors and health related practice and beliefs among rural primary school children of Bangladesh. The study was done among 1468 rural school going children (Boys:Girls, 1:1.23) aged between 4 and 12 years (mean  $8.8 \pm 1.66$ ) in five randomly selected rural primary school of Palash Upazilla of Narsingdi district, Bangladesh. They had underwent ENT check up by the doctors trained in ENT and their guardians were interviewed regarding their socioeconomic status, health related practices and beliefs and other related issues using a pre tested protocol. Total 77 (5.2%) cases of CSOM were detected with girl's predominance (5.7 vs. 4.7%). Our study revealed statistically significant association of CSOM with yearly income of guardian ( $P < 0.005$ ), maternal education ( $P < 0.001$ ), bathing habit ( $P < 0.001$ ), ear cleaning habit ( $P < 0.05$ ), pattern of primary medical consultation ( $P < 0.05$ ). Disease prevalence was also found higher among the dwellers of kachha house. So, this preventable burning problem of CSOM can be resolved by collective effort by incorporating primary ear care program with primary health care system among the vulnerable

children of rural area along with their socio-economic development. Thus, future citizens can be safeguarded from developing CSOM, hearing impairment and its resultant complications.

**Keywords** Chronic suppurative otitis media (CSOM) · Rural primary school children

## Introduction

Chronic Suppurative Otitis Media (CSOM) is typically a persistent disease, insidious in onset, often capable of causing severe destruction and irreversible sequel and clinically manifests with deafness and discharge [1]. This is one of the most common community health disorders of childhood in many developing countries including Bangladesh [2]. Its incidence appears to depend to some extent on race and socioeconomic factors. High rates of chronic otitis media have been attributed to overcrowding, inadequate housing, poor hygiene, lack of breast feeding, poor nutrition, impaired immunologic status, passive smoking, frequent upper respiratory tract infection, high rates of nasopharyngeal colonization with potentially pathogenic bacteria and inadequate or unavailable health care [3].

Traditionally, the prevalence of CSOM has been found as a by product of surveys for hearing loss of which it is the major cause [4]. An estimated two-third of the world's hearing impaired population are believed to be distributed among the developing countries [5]. When all degrees (mild, moderate, severe, profound) and types (bilateral, unilateral, fluctuating) are included hearing loss ranges from 5 to 21% in children between 4 and 11 years [6, 7]. In children, undetected hearing loss can impact and cause significant delays in speech, cognitive, educational and

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psychological development [8]. The World Health Organization (WHO) suggests that children should be screened at school entry in all developing countries [9]. Most of the survey done in Bangladesh and India have dealt on the problem of CSOM in relation to hearing loss [10, 11] of which it is the major cause and in every year large number of rural children undergo ear surgery for CSOM because of the various complication and squeal that result from the disease [12]. It was also found that complication of CSOM were commonest in the first two decades of life [2]. Many of these complications could probably have been prevented by early identification and treatment of the preexisting CSOM.

In developing countries there is a differential prevalence of CSOM among the different socio-economic strata of the community and it varies from 1.3 to 17.6% whereas the prevalence of CSOM is less than 1% in USA and UK [3]. It is more common in rural children where poverty, over crowding, illiteracy, ignorance, poor hygiene, malnutrition and lack of medical facilities have been suggested as a basis for the widespread prevalence of CSOM [13]. In Bangladesh, several hospital and rural studies revealed prevalence of CSOM between 7.39 and 39.50% among the study population [14–19]. Now a days, with the advent of antimicrobial therapy and the improvement of health care system the incidence and prevalence of CSOM have been markedly decreased in developing countries and that of otitis media with effusion (OME) have been increased like developed countries [3]. Reduction in the prevalence would require well planned primary care facilities, as are available in many developed countries, where prevalence of the disease is low at present point of time.

In Bangladesh, there is no national program for detection and treatment of CSOM among the children and let alone for the whole population. Even, No such broad-based rural community level study was done previously in Bangladesh. The present study was aimed to determine the prevalence of CSOM and its association with certain socio-economic factors and health related practice and believes among rural primary school children of Bangladesh.

## Materials and Methods

In this cross sectional study, five randomly selected primary schools from five union parishad of Palash upazilla of Narsingdi district, Bangladesh represented of the whole upazilla. The study was done during the calendar year 2008. All the students of the selected primary schools starting from pre-primary to class V who matched the inclusion criteria were the sample. Prior permission from the appropriate authority was taken before the study. After taking written informed consent from the parents/guardians, the entire study sample under went clinical ENT check up and otoscopic examination by

doctors trained in ENT and their parents (Father/Mother/Guardian) were interviewed regarding their socio-economic condition (Income, Housing, Total family members, Sanitation, Maternal education), health practices and beliefs regarding CSOM (Bathing pattern, Ear cleaning habit, Previous treatment seeking pattern), EPI (Expanded Program for Immunization) vaccination status and other related issues. The pre tested questionnaire was filled up by the interviewing physicians. All the collected data were coded and was analyzed by standard software.

## Results

Total 1468 primary school children (657 boys and 811 girls, 1:1.23) age ranged from 4 to 12 years (mean 8.8 years  $\pm$  1.66) of five different rural primary schools of different parts of Palash upazilla of the Narsingdi district was the study sample. Total 77 children (5.2%) cases of CSOM were detected. Among them 75 (97.4%) were tubotympanic type and only 2 (2.6%) were atticointral type. Girls (5.7%) were sufferer than the boys (4.7%) (Tables 1, 2).

**Table 1** Age and sex distribution of the children: ( $n = 1468$ )

Variables	Groups (% count within group)		Total (%)
	No CSOM (%)	CSOM (%)	
Age			
<6 years	12 (84.6)	2 (15.4)	14 (100.0)
6–8 years	586 (95.4)	28 (4.6)	614 (100.0)
>9 years	793 (94.4)	47 (5.6)	840 (100.0)
Sex			
Boy	626 (95.3)	31 (4.7)	657 (44.75)
Girl	765 (94.3)	46 (5.7)	811 (55.25)
Total	1391 (94.8)	77 (5.2)	1468 (100.00)

<sup>a</sup> Mean age 8.8 years with Standard Deviation (SD)  $\pm$  1.66

<sup>b</sup> Between Boys and girls  $\chi^2 = 0.486$  with 1 df ( $P = 0.486$ )

<sup>c</sup> Between <8 and >8 age group  $\chi^2 = 0.333$  with 1 df ( $P = 0.564$ )

**Table 2** Distribution of different type and site of CSOM among the affected children: ( $n = 77$ )

Side of CSOM	Type of CSOM		Total (%)
	Tubotympanic (%)	Atticointral (%)	
Left	41(53.25)	1 (1.30)	42 (54.55)
Right	29 (37.65)	1 (1.30)	30 (38.96)
Both	5 (06.50)	0 (00)	5 (06.50)
Total	75 (97.40)	2 (2.60)	77 (100.0)

Between two sides  $z = 1.178$ ;  $P = 0.239$

There is no significant difference in the proportions of CSOM with the right & left side within the two groups ( $P = 0.239$ )

The study population was from different familial and socioeconomic background. The common occupations of the guardians were business man (26.1%), daily laborer (25.1%) and farmer (23.7%). CSOM was more among the children of the farmers and the business men (6.3% within the group). Total member of each of the family was found from 3 to 15 persons (mean 5.42, SD  $\pm$  1.499). Most of the subjects are from the medium sized family (87.8%). CSOM cases were also more (88.3%) on that group. The range of the yearly income of the guardians were 18,000–8,00,000 Tk (mean 59331.74 Tk, SD  $\pm$  45782.10). Maximum students (52.3%) were from less income group (<50,000/year). Total 49 (63.6% of CSOM) students with CSOM were from this less income group. These income groups had significant statistical association ( $P = 0.006$ ) with the prevalence of CSOM. The level of maternal education of the students was from the Illiterate to more than HSC (Higher Secondary Certificate) level. It had been shown that CSOM was more prevalent (7.4%) among the children of the illiterate mother than literate one. The relation between the maternal education and the prevalence of CSOM was found statistically significant ( $P = 0.007$ ). Most of the children lived in kachha house (77.31%) and though CSOM was found more prevalent

among the Kachha house dwellers (76.6% of CSOM group), association of housing and CSOM was statistically insignificant in this study (Table 3).

Most (84%) of the study population used safe sanitation (closed slab, isolated sanitary latrine) and bath in clean tube well water (83.6%). Only a few children (15.4%) used to bath in the pond, canal or river. The prevalence of CSOM were more (9.3%) in later group than that of tube well users (4.5%). The result was statistically significant ( $P = 0.005$ ). 49.2% had no ear cleaning habit, 36.6% had cleaning habit with feather or wood and vegetable sticks. Ear cleaning habits showed statistically significant effect on occurrence of CSOM ( $P = 0.017$ ) (Table 4).

Maximum (93.3%) student completed the schedule of EPI (Expanded program for immunization). Most of the children (91%) seek primary medical treatment from quack medical practitioner (mostly the village medicine shop-keepers) of their own locality. Only a few numbers (12.3%) attended the qualified doctors. The distributions of CSOM had statistically significant relation with the primary medical consultation seeking practice between qualified doctors and other form of practitioners ( $P = 0.035$ ) (Table 4).

**Table 3** CSOM and socio-economic status of the children: ( $n = 1468$ )

Socio-economic variables	Groups (% count within group)		Total (%)	$\chi^2$	P value
	No CSOM (%)	CSOM (%)			
Yearly income of guardian (taka)					
<50,000/-	719 (92.9)	54 (7.1)	773 (52.6)	10.089	0.006
50,000–100,000/-	524 (96.9)	17 (3.1)	541 (37.8)		
>100,000/-	148 (96.2)	6 (3.8)	154 (9.6)		
Family size (members)					
Small (< 4)	57 (95.0)	3 (5.0)	60 (4.08)	0.0195	0.990
Medium (4–7)	1221 (94.7)	68 (5.3)	1289 (87.80)		
Large (>7)	113 (95.0)	6 (5.0)	119 (8.12)		
Maternal education					
Illiterate	562 (92.6)	46 (7.4)	608 (41.3)	12.274	0.007
Primary	439 (95.9)	19 (4.1)	458 (31.2)		
SSC	302 (97.4)	8 (2.6)	310 (21.1)		
HSC & above	88 (95.7)	4 (4.3)	92 (06.3)		
Housing					
Kachha	1076 (94.9)	59 (5.1)	1135 (77.31)	0.0479	0.976
Semipakka	222 (94.5)	13 (5.5)	235 (16.01)		
Pakka	93 (94.9)	5 (5.1)	97 (6.67)		
Guardian's occupation					
Farmer	326 (93.7)	22 (6.3)	348 (23.7)	5.406	0.248
Daily laborer	355 (96.5)	13 (3.5)	368 (25.1)		
Service	245 (96.1)	10 (3.9)	255 (17.4)		
Business	359 (93.7)	24 (6.3)	383 (26.1)		
Other	106 (93.0)	8 (7.0)	114 (7.7)		
Total	1391 (94.8)	77 (5.2%)	1468 (100.00)		

SSC secondary school certificate, HSC higher secondary certificate  
Kachha floor of the house is mud and wall and roof is non brick; Semipakka floor of the house is brick/concrete and wall and roof is non brick; Pakka floor, wall and roof of the house is brick/concrete

**Table 4** CSOM and health related practices & beliefs of the children: ( $n = 1468$ )

Variables	Groups (% count within group)		Total (%)	$\chi^2$	P value
	No CSOM (%)	CSOM (%)			
<b>Sanitation</b>					
Unsafe latrine	200 (94.8)	11 (5.2)	211 (14.38)	0.0208	0.885
Safe latrine	1191 (95.4)	66 (4.6)	1257 (85.62)		
<b>Bathing habit</b>					
River/Canal/Pond	206 (90.7)	21 (9.3)	227 (15.46)	7.855	0.005
Tube well & supply water	1185 (95.5)	56 (4.5)	1241 (84.64)		
<b>Ear cleaning habit</b>					
No ear cleaning	691 (96.3)	27 (3.7)	718 (48.9)	5.663	0.017
Regular/habitual ear cleaning with cotton bud/clothing/feather wooden stick/vegetable stick	700 (93.3)	50 (6.7)	750 (51.1)		
<b>EPI (Expanded program for immunization) vaccination</b>					
No	23 (88.5)	3 (11.5)	26 (1.8)		
Incomplete	67 (97.1)	2 (2.9)	69 (4.7)		
Complete	1298 (94.7)	72 (5.3)	1372 (93.5)		
<b>Pattern of primary medical consultation</b>					
(a) Kabiraz <sup>a</sup>	6 (85.7)	1 (14.3)	7 (0.5)		0.035 <sup>b</sup>
(b) Homeopathy	35 (92.2)	3 (7.8)	38 (2.5)		
(c) Quack	1174 (94.4)	70 (5.6)	1244 (84.7)		
(d) MBBS & specialist	176 (98.3)	3 (1.7)	179 (12.3)		
<b>Total</b>	<b>1391 (94.8)</b>	<b>77 (5.2)</b>	<b>1468 (100.00)</b>		

<sup>a</sup> Kabiraz: practices non formal medicine

<sup>b</sup> Between qualified (d) and non qualified traditional practitioners (a, b, c)  
 $\chi^2 = 4.439$  with 1 df  $P = 0.035$

**Table 5** Distribution of different type ear disease among the children: ( $n = 1468$ )

Ear diseases <sup>a</sup>	Total count (%)
No ear disease	838 (57.1)
Wax	387 (26.4)
Otitis externa	8 (0.5)
OME	144 (9.8)
CSOM	77 (5.2)
Others	14 (1.0)
<b>Total</b>	<b>1468 (100)</b>

<sup>a</sup> During data collection a child with more than one ear disease was included in the more severe disease group

In this study total 838 (60.2%) student were found no clinically detectable ear problem or diseases. Ear wax (26.4%) and otitis media with effusion (OME) (9.8%) were the other commoner form of ear diseases detected among those children (Table 5).

## Discussion

Chronic Suppurative Otitis Media (CSOM) is one of the common community health disorders of childhood in all developing countries. The prevalence of CSOM in children

from developing countries varies from 1.3 to 17% [3, 13, 20–22]. It is more common in rural children where poverty, over crowding, illiteracy, ignorance, poor hygiene, malnutrition and lack of medical facilities have been suggested as a basis for the widespread prevalence of CSOM. In the context of Bangladesh, in the absence of any national program for the detection and treatment of CSOM, almost all these factors are likely to be a contributor to overall high prevalence. The majority children with CSOM came from the communities living in subsistence agricultural or slam areas [13].

In this cross sectional study among the 1468 rural primary school children, total 77 cases of CSOM were detected and the prevalence of CSOM was 5.2%. Prevalence of CSOM was more among girls 46 (5.7%) than the boys 31 (4.7%). This result is consistent with other studies done recently at home, Naraynganj 4.3% [23], Dhaka 7.3% [18] and abroad Kathmando 5.7% [24], Nigeria 6% [25], and India 6% [13]. However, the present study showed lower prevalence than some other Bangladeshi studies done previously Magura 12.4% [19], Rajbari [17], and Dhaka 15.06% [14]. This lower prevalence of CSOM in our study can be explained by the gradual improvement of the socioeconomic factors of our rural community. The relative higher prevalence rate of CSOM among the girls can be explained by the social and familial indifference to them.

According to our study, 52.6% of the samples were from low income group where CSOM were also more prevalent (7.1%). 71.4% of total CSOM cases were detected from this group. The yearly income of the guardians had significant association with the prevalence of CSOM ( $P = 0.006$ ). The findings of this study simulates with such studies done in our country [17, 19] and abroad [24–27].

Most of the subjects were from the medium sized family (87.8%). CSOM was also more prevalent among the students from that group (5.3%). Though the overcrowding is a recognized risk factors for CSOM, but in our study the size of the family had no impact on the occurrence of the CSOM ( $P = 0.990$ ).

Regarding the maternal education of the subjects, 41.3% of their mothers were Illiterate followed by Primary (31.2%) and Secondary (21.1%) education. It was shown that CSOM was more prevalent (7.4%) among the children of the illiterate mothers. CSOM was absent among the children of the mothers educated above HSC level. The relation between the maternal education and the prevalence of CSOM was statistically significant ( $P = 0.007$ ). This finding mimics with a study done among the children of the slum area of Dhaka city [18] and in India [10]. More over, maternal education has got direct relation with personal hygiene, health consciousness, and treatment seeking practice, nutrition and other factors that influence overall health of the child.

Most of the study population lived in kachha house. CSOM was also found more among the Kachha house dwellers (76.6% of total CSOM group). In the Kachha house most of the lower socioeconomic group of rural community lives which are less ventilated, humid and less hygienic. These are the predisposing factors for URTI and subsequent CSOM. In a recent study regarding CSOM, housing also revealed significant association with the prevalence of CSOM between rural and urban residents [18, 28]. This was also supported by WHO/CIBA foundation workshop 1996.

Most of the children (85.62%) used safe sanitation (closed slab, isolated sanitary latrine). Only a small number (14.38%) of student used unsafe sanitation systems (open or trench latrine). Though, safe sanitation is important factor for prevention of diarrhoea, worm infestations, malnutrition and for overall wellbeing but statistically in this research, the safe sanitation habit showed to have no relation with the prevalence of CSOM.

Most of the children in this series used to bath in the fresh water of the tube well (84.1%) whereas only a few (15.4%) used to bath in the pond, canal or river. It was shown that children used to bath in the pond or river water were affected more by CSOM (9.3%) than that of tube well users (4.5%). There was a statistically significant association between bathing habit and the CSOM ( $P$  value 0.005).

Bathing in the polluted water of the ponds, river or canals allows the contaminated water to the nose and nasopharynx and frequently infect the middle ear cleft and also enter the middle ear through the pre existing pathology or perforation of the tympanic membrane which cause the ear chronically infected before it had time to heal [12].

Among the students, 48.9% had no ear cleaning habit. Others had some forms of ear cleaning habit with cotton bud (10%), feather/wooden stick/vegetable stick (36.6%) and clothing (4.7%). The patterns of ear cleaning habit in rural children in Bangladesh were found more or less similar with another study [19]. These forms of habits proved statistically significant effect on occurrence of CSOM ( $P = 0.017$ ) in our study.

Most of the student completed their EPI vaccination schedule (93.5%). 4.7% had the history of incomplete vaccination and only 1.8% were never vaccinated. Though the EPI vaccination had not shown any relation with the occurrence of CSOM but our study reflected the real EPI coverage in rural Bangladesh [29].

Most of them (84.7%) seek their primary medical treatment from Quack medical practitioners (mostly the village medicine shopkeepers) of their own locality. Only a few numbers (12.3%) attended the qualified doctors (MBBS & specialist). In a study done in the rural area of Rajbari, Bangladesh (1994) revealed that only 8.49% cases attended qualified physician [17]. Prevalence of CSOM had statistically significant relation with the medical consultation seeking practice between qualified doctors (MBBS and above) and non qualified medical practitioners ( $P$  value 0.035). The continued reliance of the guardian on traditional and unqualified practitioners leading to inadequate and inappropriate treatment may explain this.

In this study, 838 (60.2%) students had no detectable ear problem or diseases. Ear wax (26.4%) and otitis media with effusion (OME) (9.8%) were the other commoner form of ear disorder detected among those children. Regarding CSOM, 97.4% of CSOM were tubotympanic type and rest of other had atticofacial type. 42 (54.5%) children had right sided, 30 (38.9%) had left sided CSOM and 5 (06.5%) had bilateral CSOM (Table 2). This result is consistent with other studies done in rural areas of the Dinajpur, Bangladesh [30], and Nepal [24] and mimic well with different texts [12]. It should be noted that in every year large number of rural children undergo ear surgery for CSOM because of the various complication and squeal that result from the disease [12]. It was also found that complication of CSOM were commonest in the first two decades of life [2]. Many of these complications could probably have been prevented by early identification and treatment of the preexisting CSOM.

Thus in our study, children from lower socio economic strata were found more vulnerable to CSOM. Potential loss



of hearing due to CSOM has important consequence on speech, cognition and academic performance of the children [5]. Thus the gap between the fortunate and less privileged is further widened by an innate difficulty in learning caused by CSOM.

### Key Messages

The results of this study reflected an overall status of CSOM in rural primary school going children of Bangladesh and how it was affected by the related socioeconomic factors. Primary ear care education to students, teachers and guardians by school based program as well as early diagnosis and prompt treatment of the diseases can prevent the vulnerable children from developing hearing impairment and its resultant complications. Thus, this preventable burning problem can be resolved by collective effort of incorporating primary ear care program with primary health care system among the vulnerable children of rural community along with their socio-economic development and thus develop future productive and healthy citizens.

**Conflict of Interest** None.

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