

# Comparison of chronic suppurative otitis media in rural and urban primary school children in Bangladesh

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## Abstract

**Objectives:** To compare chronic suppurative otitis media prevalence in rural and urban primary school children in Bangladesh, and to determine its relationship with specific sociodemographic factors.

**Methods:** In this cross-sectional survey, 681 rural primary school children from Shibpur upazilla, Narsingdi district, and 964 urban primary school children from Dhaka Metropolitan City, underwent an ENT check-up by doctors trained in ENT. Their parents or guardians were interviewed with regard to their sociodemographic status and other related issues using a pre-tested protocol.

**Results:** In this study, 6.02 per cent of the rural primary school children and 2.07 per cent of the urban primary school children had chronic suppurative otitis media. (Overall, 3.71 per cent of the children had the disorder.) The disorder was slightly more prevalent among girls than boys in both rural (6.05 vs 5.98 per cent) and urban (2.33 vs 1.82 per cent) communities. There was a significant association between the presence of chronic suppurative otitis media in children and: parents' or guardians' occupation and their annual income, housing type, family size, maternal education, and bathing habit.

**Conclusion:** Improvement of associated sociodemographic factors would reduce the prevalence and resultant complications of chronic suppurative otitis media in primary school children in developing countries.

**Key words:** Otitis Media, Suppurative; Prevalence; Rural Population; Urban Population; Child; Socioeconomic Factors; Bangladesh

## Introduction

Chronic suppurative otitis media (CSOM) is one of the most common community health disorders of childhood in many developing countries including Bangladesh.<sup>1</sup> It is typically a persistent disease, insidious in onset, often capable of causing severe destruction and irreversible sequelae of the middle ear; it manifests clinically with deafness and discharge.<sup>2</sup>

The incidence of CSOM appears to depend to some extent on certain sociodemographic factors. High rates of chronic otitis media have been attributed to: overcrowding, inadequate housing, poor hygiene, lack of breast feeding, poor nutrition, passive smoking, high rates of nasopharyngeal colonisation with potentially pathogenic bacteria, inadequate or lack of healthcare, eustachian tube dysfunction, male sex, bottle feeding, and so on.<sup>2,3</sup> Bathing in canals, rivers and ponds allows contaminated water to enter the middle ear through perforations before they have had time to heal.

The otoscopic finding of CSOM includes the presence of a perforation of the tympanic membrane with

or without otorrhoea. The disorder can be classified into tubotympanic and atticofurcal disease types; the latter type is usually associated with cholesteatoma.<sup>4</sup>

The prevalence of CSOM differs according to socioeconomic status, ranging from 1.3 to 17 per cent.<sup>5,6</sup> Okafor found that the majority of patients with chronic ear disease in a Nigerian study came from communities living in subsistence agricultural or slum areas.<sup>7</sup> About 12.44 per cent of rural school children in Bangladesh aged 4–13 years were reported to suffer from CSOM; 11.11 per cent came from the low-income group and 1.33 per cent were from the middle-income group, with none from the high-income group.<sup>8</sup> Among rural school children from Nepal aged between 5 and 15 years, 13.2 per cent appeared to have suffered from CSOM.<sup>9</sup> A recent study conducted in Bangladesh revealed that 8 per cent of the rural and 2 per cent of the urban population had CSOM.<sup>10</sup> In Nigeria, 6 per cent of rural school children had CSOM, whereas no case was found among urban school children. There was a significantly

higher prevalence of CSOM in poorer rural children in that study ( $p < 0.001$ ).<sup>11</sup> A scientific survey among primary school children in Tanzania found that 9.44 per cent of rural children and 1.3 per cent of urban children had CSOM (a significant difference,  $p < 0.001$ ).<sup>12</sup> In New Delhi, India, 19.6 per cent of school children (aged 2–5 years) of lower socioeconomic status were found to be suffering from ear diseases, compared with only 2.13 per cent of children of higher socioeconomic status.<sup>13</sup>

Two-thirds of the world's hearing impaired population is believed to be distributed among the developing countries.<sup>14</sup> When all degrees (mild, moderate, severe or profound) and types (bilateral, unilateral or fluctuating) of hearing loss are included, prevalence in children aged between 4 and 11 years ranges from 5 to 21 per cent.<sup>15</sup> In children, undetected hearing loss can significantly affect or delay speech, and cognitive, educational and psychological development.<sup>16</sup> Many of these complications could be prevented through early identification and treatment of the pre-existing CSOM.

Most previous studies investigating the prevalence and risk factors for CSOM have focused on either rural or urban primary school children. The present study aimed to compare the pattern of CSOM occurrence in rural and urban primary school children, and to determine its relationship with certain sociodemographic factors. The results of this study will help in the development of a national screening methodology and school health delivery system, which will be valuable for early detection and intervention, helping to safeguard future populations from this disease.

## Materials and methods

This cross-sectional survey was conducted during the period July 2007 to November 2010. Two primary schools in Shibpur upazilla, Narsingdi district, Bangladesh and a further two schools from Dhaka Metropolitan City, Bangladesh were selected at random by lottery; these were chosen to represent the rural and urban schools, respectively.

In total, 681 students from the rural area and 964 students from the urban area of the above-mentioned localities who were present on the day of data collection were included in this study.

After taking written informed consent from the parents or guardians, all the children underwent clinical ENT check-up and otoscopic examination by doctors trained in ENT. In addition, parents or guardians were interviewed with regard to their socioeconomic status: data on occupation, annual income, housing, family size, sanitation, maternal education, bathing habits and other related issues were collected using a pre-tested protocol. Housing of the study population was categorised as: (1) a kachha – a house with a mud floor and walls, with a non-brick roof; (2) a semi-paka – a house with brick made floor, walls are either brick or non-brick and the roof is non-brick; and (3) a paka – a house where the floor, walls and roof are mostly brick.

The collected data were coded and treated in a confidential manner. Data were analysed with an appropriate statistical test (chi-square test) using the Statistical Package for the Social Sciences software (SPSS<sup>®</sup>). A  $p$  value of  $<0.05$  was considered statistically significant, while  $p < 0.001$  was considered highly significant.

## Results

This cross-sectional study comprised 681 rural primary school children (from 2 different primary schools in Shibpur upazilla, Narsingdi district, Bangladesh) and 964 urban primary school children (from 2 schools in Dhaka Metropolitan City, Bangladesh). The results for each of the variables are presented in graphical and tabulated form in Figures 1 and 2, and Tables I–III.

Among the study population, 6.02 per cent of the rural primary school children and 2.07 per cent of the urban primary school children had CSOM. The prevalence of CSOM was statistically significantly higher among the rural children compared with the urban children (Table II,  $p < 0.001$ ). Overall, 3.71 per cent of the population had CSOM (Table II).

The sex distribution of the population showed a female prevalence in the rural group ( $n = 380$ , 55.80 per cent) and a male prevalence in the urban group ( $n = 493$ , 51.14 per cent). There was a slightly higher prevalence of CSOM among girls than boys in both rural (6.05 vs 5.98 per cent) and urban (2.33 vs 1.82 per cent) children (Table I).

## Discussion

The higher prevalence of CSOM among rural school children compared with urban primary school children is consistent with other recent studies both in Bangladesh and abroad. The results reported for CSOM in rural versus urban children were: Narayanganj, 4.3 versus 2.4 per cent;<sup>17</sup> Magura, 12.44 versus 2.22 per cent;<sup>8</sup> Dinajpur, 8 versus 2 per cent;<sup>10</sup> Kathmandu, 5.7 versus 4.8 per cent;<sup>18</sup>

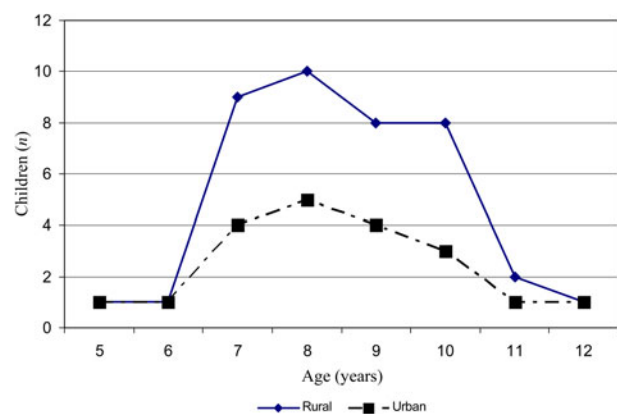


FIG. 1

Age distribution of the children with chronic suppurative otitis media ( $n = 61$ ).

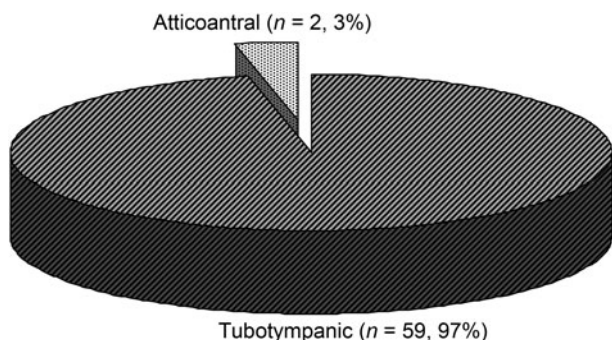


FIG. 2

Types of chronic suppurative otitis media among the children (n = 61).

Nigeria, 6 versus 0 per cent,<sup>11</sup> and Tanzania, 9.44 versus 1.3 per cent.<sup>12</sup>

Although male sex has been reported to be one of the risk factors for CSOM,<sup>2,3</sup> in our survey CSOM was more prevalent in girls than in boys. The relatively higher prevalence rate of CSOM among girls can be explained by social and familial attitudes to the female sex in our community.

In the rural group, most of the parents or guardians of children with CSOM were manual labourers, and in the urban group, most were service holders and businessmen. Statistically, the distribution of CSOM varied significantly with occupation ( $p < 0.001$ ) (Table III). Moreover, most of the children with CSOM (39 out of 61, 63.9 per cent) were from the low-income group (less than Tk 60 000 per year). In the rural group, 33 out of 41 children with CSOM (80.5 per cent) were from the low-income group (Table III). There was a strong association between annual income of the parents or guardians and children with CSOM ( $p < 0.001$ ). Manual labourers and farmers earn a lower income and are less conscious of their health than those with other occupations. Furthermore, income has a direct relationship with health access, nutrition and overall well-being. This may explain the higher prevalence of CSOM among the children of manual labourers and those in the low-income group. The findings of this study are in agreement with those of other studies conducted in Bangladesh<sup>8,17</sup> and elsewhere.<sup>13</sup>

In the rural group, 36 out of 41 children with CSOM were from large families (with more than 6 members).

However, in the urban group, 15 out of 20 children with CSOM were from small families (with up to 6 members). Statistically, the size of the family had a strong impact on the occurrence of CSOM among the children ( $p < 0.001$ ) (Table III). In rural areas, children of large families have to share all of their essential belongings with other family members, hampering nutrition, healthcare and accommodation; these are recognised risk factors for CSOM.<sup>3</sup>

In the rural group, 30 out of 41 children with CSOM were kachha house dwellers (73.2 per cent), compared with 5 of 20 children in the urban group (25 per cent) (Table III). In the rural community, most of the lower socioeconomic group live in kachha houses. These are less ventilated, more humid and less hygienic, and this increases the risk of the transmission of pathogens for upper respiratory tract infection and subsequent CSOM.<sup>3</sup>

In the rural group, 24 out of 41 children with CSOM (58.5 per cent) had illiterate mothers, compared with 5 out of 20 children with CSOM in the urban group (25 per cent) (Table III). The relationship between maternal education and CSOM prevalence was statistically significant ( $p = 0.027$ ). This finding supports the results of studies conducted among children in the slum area of Dhaka city<sup>19</sup> and in India.<sup>20</sup> Level of maternal education has previously been related to personal hygiene, health consciousness, healthcare access, nutrition and other factors that influence the overall health of the child. Diet and general health are recognised risk factors for CSOM.<sup>4</sup>

Most of the children in both the rural and urban groups (77.05 per cent) used safe sanitation facilities (enclosed, slabbed or paka sanitary latrines) (Table III). Although safe sanitation is an important factor for the prevention of diarrhoea, worm infestations and malnutrition, there was no statistically significant relationship with CSOM prevalence in our study ( $p = 1.00$ ).

Those children who regularly bathed in ponds, canals or river water were more prone to develop CSOM, both in rural (36 out of 41, 87.8 per cent) and urban (5 out of 20, 25 per cent) areas, than those with access to a piped water supply ( $p < 0.001$ ) (Table III). This finding is in line with that of a similar study where 80.75 per cent of the population with CSOM bathed in rivers, canals or ponds.<sup>10</sup> Bathing in the polluted water of ponds, rivers or

TABLE I  
DISTRIBUTION OF CSOM AMONG STUDY POPULATION\*

Parameter	Rural (n)			Urban (n)			Total (n)		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
CSOM	18	23	41	9	11	20	27	34	61
No CSOM	283	357	640	484	460	944	767	817	1584
Total	301	380	681	493	471	964	794	851	1645

\*Total n = 1645. CSOM = chronic suppurative otitis media

TABLE II  
DISTRIBUTION OF CSOM AMONG RURAL AND URBAN CHILDREN\*

Parameter	Rural (n (%))	Urban (n (%))	Total (n (%))
CSOM	41 (6.02)	20 (2.07)	61 (3.71)
No CSOM	640 (93.98)	944 (97.93)	1584 (96.29)
Total	681 (100)	964 (100)	1645 (100)

There was a significant difference in the prevalence of chronic suppurative otitis media (CSOM) between rural and urban primary school children (chi-square test = 16.314 with 1 degree of freedom;  $p < 0.001$ ). \*Total  $n = 1645$

TABLE III  
ASSOCIATIONS BETWEEN CSOM AND SOCIODEMOGRAPHIC FACTORS\*

Factor	Rural (n (%))	Urban (n (%))	Total (n (%))	<i>p</i>
Parents' or guardians' occupation				<0.001
– Manual labourer	37 (60.66)	5 (8.20)	42 (68.85)	
– Service, business & others	4 (6.56)	15 (24.59)	19 (31.15)	
Parents' or guardians' annual income				<0.001
– Up to Tk 60 000	33 (54.10)	6 (9.84)	39 (63.93)	
– Over Tk 60 000	8 (13.11)	14 (22.95)	22 (36.07)	
Family size				<0.001
– Small (<6)	5 (8.20)	15 (24.60)	20 (32.79)	
– Large (>6)	36 (59.02)	5 (8.20)	41 (67.21)	
Housing type				<0.001
– Kachha	30 (49.18)	5 (8.20)	35 (57.38)	
– Semi-paka	9 (14.75)	7 (11.48)	16 (26.23)	
– Paka	2 (3.28)	8 (13.11)	10 (16.39)	
Maternal education				0.027
– Illiterate	24 (39.34)	5 (8.20)	29 (47.54)	
– Primary school	12 (19.67)	8 (13.11)	20 (32.79)	
– Secondary school & above	5 (8.20)	7 (11.48)	12 (19.67)	
Sanitation				1.000
– Safe	32 (52.46)	15 (24.59)	47 (77.05)	
– Unsafe	9 (14.75)	5 (8.19)	14 (22.95)	
Bathing habit				<0.001
– River, pond or canal	36 (59.01)	5 (8.20)	41 (67.21)	
– Tube well or supply water	5 (8.20)	15 (24.59)	20 (32.79)	
Total	41 (67.21)	20 (32.79)	61 (100.00)	

\*Total  $n = 1645$ . CSOM = chronic suppurative otitis media

canals allows the contaminated water to infect the mucosa of the nose and nasopharynx, and thereby the middle-ear cleft. Contaminated water may also enter the middle ear directly via a pathology or perforation of the tympanic membrane, leading to CSOM and the consequent complications.<sup>4</sup>

- **Chronic suppurative otitis media (CSOM) prevalence is higher among rural than urban primary school children in Bangladesh**
- **The disorder is more prevalent among primary school children of lower sociodemographic status**
- **Presence of CSOM was associated with: parents' or guardians' occupation and income, housing type, family size, maternal education, and bathing habit**
- **Improvement in the identified sociodemographic factors would reduce CSOM prevalence among children in developing countries**

Among the 61 CSOM cases in both rural and urban school children, otoscopy revealed that 59 (96.72 per cent) were of the tubotympanic type and only 2 (3.26 per cent) were of the atticofacial type (Figure 2). This is consistent with other studies carried out in Bangladesh,<sup>10</sup> Nepal<sup>9</sup> and India,<sup>21</sup> and is in agreement with other reports.<sup>4,22</sup>

In summary, children in rural primary schools were found to be more vulnerable to CSOM than urban school children. Moreover, lower sociodemographic status proved to be an important contributing factor to CSOM among both rural and urban school children.

### Acknowledgements

We would like to acknowledge the primary school children, parents and guardians, school authorities, education departments, data collectors, and statisticians for their kind cooperation and generous support during the study. We are also indebted to the Faculty of Medicine, University of Dhaka, for their kind permission to publish this study.

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Dr. M M Shaheen takes responsibility for the integrity  
of the content of the paper  
Competing interests: None declared

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