

## Original Research Article

# Ear infections in primary school children of south western Nigeria

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## ABSTRACT

**Background:** Prevalence of ear infections in primary school children in Nigeria is scarcely documented and available studies are mostly hospital based. The aim of this Community based study is to define the point prevalence of ear infections among school children.

**Methods:** Using a multi- staged stratified sampling technique, 630 pupils aged 6-12years, attending Government owed primary schools in two local government areas in the South Western Nigeria were recruited for the application of a structured questionnaire, single examination and classification using their socioeconomic index.

**Results:** Three hundred and seven (48.7%) were females and three hundred and twenty three (51.3%) were males. Chronic otitis media had the highest prevalence of 7.9%, followed by acute otitis media and otitis externa (3.2%) while otomycosis (1.6%) had the lowest. Majority of the infections were unilateral and more prevalent in the males. It was observed that all the ear infections were more prevalent in pupils from the low socioeconomic class although not statistically significant.

**Conclusions:** These results shows that ear infections is still common in our primary schools and that socioeconomic status and sex of the pupils did not significantly affect the occurrence of these ear infections. There is a need to incorporate health education programme in schools to prevent ear infections and the attendant disabilities.

**Keywords:** Ear, Infection, School pupils, Nigerian

## INTRODUCTION

Ear infections are known to be common in children. By the age of five, majority of children would have had about four to six episodes of ear infections especially in the presence of allergy or attendance at crèche and school. Recurrent ear infection is not without its attendant complications which include hearing impairment and subsequently impaired or lack of speech acquisition. The factors implicated in the occurrence of these diseases are race, ethnic differences, socioeconomic status, geographic location, age and sex. The prevalence of otological diseases in different age groups has been

documented in most Caucasian populations. There has been no study on the prevalence of ear infections in primary school children in Ile-Ife and most reported studies in Nigeria are based on hospital attendance. There is a need to know the prevalence of these diseases in our community for the government to be able to know the burden and to put in place appropriate policies concerning these diseases in children.

The objective is to determine the prevalence of ear infections among primary school children between the ages of 6 and 12 years in South Western Nigeria and to determine, if there is any, association between

socioeconomic status of the parent/guardian and occurrence of ear infections among these school children.

## METHODS

This community-based survey was conducted in Ife East and Ife Central local government areas (LGAs), South Western Nigeria over a three month period (December 2014 to February 2015). Forty –two pupils each were selected from 15 Government owned primary schools in two the LGAs (eight from Ife East and seven from Ife Central LGAs respectively) using a multi-staged sampling technique giving a total of 630 school children. An institutional ethical clearance was obtained from the Research and Ethics Committee of the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife. Approval was taken from the Local Education Authorities and consent was also obtained from the parents / guardians of subjects. The subjects were also informed and educated about the study and the procedures in order to obtain their personal consent and cooperation

The numbers of pupils with otological infections (both new and ongoing cases) at a specific point in time were determined by application of a pre- tested structured questionnaire on each selected pupil with clarification from the teachers and parent/guardian where necessary, single examination of pupils using standard methods and clinical criteria were used to diagnose otological infections. Socio-economic index scores were awarded to each child, based on the occupation and educational attainment of the parents or guardian. All pupils found to have otolaryngological diseases were counseled and referred to the Obafemi Awolowo University Teaching Hospitals, Ile – Ife for further management.

Data were analyzed using SPSS 17. Results were presented as appropriate using tables. Means, standard deviations, and percentages were determined as applicable. Proportions were compared using Pearson's

Chi squared ( $\chi^2$ ) tests. Fischer's exact test was used when any value less than 5 is in a cell. 'p' values of <0.05 were accepted as statistically significant.

### Main outcome measures

1. The diagnosis of acute otitis media (AOM) was made if participant had otalgia, fever and hyperaemic tympanic membrane (TM) with or without TM perforation or presence of otorrhea that is less than six weeks duration.
2. Chronic suppurative otitis media (CSOM) was diagnosed in the presence of otorrhea and tympanic membrane perforation of 12 weeks and above with no or mild otalgia.
3. Otomycosis was diagnosed based on excessive itching in the ear, presence of fungal spores, minimal discharge with or without otalgia.
4. Otitis externa was diagnosed if participant had discomfort that is limited to the external auditory canal and / or auricle with erythema and swelling of the canal with variable discharge (excluding otomycosis).

## RESULTS

Six hundred and thirty (630) primary school pupils aged 6-12 years were enrolled in the study. Three hundred and seven (48.7%) were females and three hundred and twenty three (51.3%) were males with a male to female ratio of 1.1:1 and a mean age of 9 years.

### Otitis externa

Twenty (3.2%) of the pupils had infections affecting the skin of the pinna and or auditory meatus excluding otomycosis. The male to female ratio was 1.9:1. It was more common on the left (60.0%). Out of the 20 cases, 12 (60.0%) cases were from the lower socioeconomic class ( $p=0.194$ ).

**Table1: Distribution of ear infections among primary school pupils.**

Ear infections	Number of pupils affected			Total number of participants affected (n=630)	P value
	Right ear only Number, (%)	Left ear only Number, (%)	Both ears Number, (%)		
<b>CSOM</b>	20 (3.2)	18 (2.8)	12 (1.9)	50	7.9
<b>AOM</b>	5 (0.8)	7 (1.1)	8 (1.3)	20	3.2
<b>Otitis externa</b>	8 (1.3)	10 (1.6)	2 (0.3)	20	3.2
<b>Otomycosis</b>	3 (0.5)	6 (1.0)	1 (0.1)	10	1.6

**Table 2: Sex distribution of ear infections among primary school pupils.**

Ear infections	Sex distribution		Overall prevalence (%)	Statistical difference between male and female
	Male number (%)	Female number (%)		
<b>CSOM</b>	28 (4.4)	22( 3.5)	7.9	0.841
<b>AOM</b>	9 (1.4)	11 (1.8)	3.2	0.469
<b>Otitis externa</b>	13 (2.1)	7 (1.1)	3.2	0.714
<b>Otomycosis</b>	6 (1.0)	4 (0.6)	1.6	0.754

**Table 3: Frequency of ear infections among primary school pupils from different socio-economic class.**

Infections of the ear	Socio-economic status			Overall prevalence (%)	P value
	Upper numbers affected (%)	Middle numbers affected (%)	Lower numbers affected (%)		
<b>CSOM</b>	13 (2.0)	17 (2.7)	20 (3.2)	7.9	0.441
<b>AOM</b>	5 (0.8)	7 (1.1)	8 (1.3)	3.2	0.486
<b>Otitis externa</b>	4 (0.6)	4 (0.6)	12 (2.0)	3.2	0.194
<b>Otomycosis</b>	3 (0.5)	2 (0.3)	5 (0.8)	1.6	0.825

### Otomycosis

A total of 10 (1.6%) cases of otomycosis were seen. Male to female ratio was 1.5: 1. Nine (90.0%) were unilateral and only one (10.0%) was bilateral. The left ears (60.0%) were more commonly affected. There was no significant difference in the prevalence of the disease in the various socioeconomic classes ( $p=0.825$ ).

### Acute otitis media

There were 20 (3.2%) cases of AOM. The male to female ratio was 1:1.2. Twelve (60.0%) out of the cases were unilateral and eight (40%) were bilateral (Table 1). The lower socio-economic class had the highest prevalence of 1.3% with the lowest (0.8%) in the upper class.

### Chronic suppurative otitis media

There were 50 (7.9%) participants with CSOM. Twenty (40.0%) occurred in the right ear only, 18 (36.0%) in the left ear only and 12 (24.0%) were bilateral. Twenty-eight (8.5%) of the males and 22 (7.3%) of the females had chronic suppurative otitis media. The male to female ratio was 1.3:1. The prevalence rate in the upper, middle and lower socioeconomic classes are 2.1%, 2.7% and 3.2% respectively ( $p=0.441$ ).

## DISCUSSION

### Chronic suppurative otitis media (CSOM)

CSOM is one of the common ear infections particularly in childhood. Chronic suppurative otitis media (CSOM) is a major health problem throughout the world. In developing countries including Nigeria, it is the most common cause of persistent mild to moderate hearing impairment in children and young adults.<sup>1,2</sup> High rates of CSOM have been attributed to overcrowding, and inadequate or unavailable health care. Poverty is a major risk factor in developing countries and certain neglected populations. The prevalence of CSOM in this study was 7.9%. It is similar to the 6% prevalence quoted by Rupa et al, Ologe and Nwawolo.<sup>3,4</sup> It is however lower than the 13.2%, 12.4%, 15.0% reported by Maharjan et al, Biswas et al and Morris et al respectively and higher than the prevalence of 2.3% reported by Olatoke et al and 2.5% by

Amusa et al.<sup>5-9</sup> Akinpelu and Amusa study showed a very high prevalence (33.9%) of CSOM in Nigerian children.<sup>1</sup> This could be due to the fact that the study was in a tertiary and referral centre and patients with ENT complaints are referred to the centre. Based on WHO classification of countries according to CSOM prevalence, Nigeria was placed on high level with CSOM prevalence between 2-4%. The prevalence of 7.9% from this study falls into the highest level (>4%) therefore urgent attention is needed to deal with what is becoming a massive public health problem.

The prevalence of CSOM in this study was not affected by sex or socioeconomic status (SES). Kim et al had similarly reported that prevalence of CSOM in Korea did not vary by sex or urban-rural habitat.<sup>10</sup> Shaheen et al reported a significantly high prevalence in girls and children from low socioeconomic class.<sup>11,12</sup> Other studies have shown that CSOM is strongly associated with low socio-economic status. Adhikari et al reported that 5.7% of children from government school and 4.8% of children from private school in Kathmandu valley had CSOM.<sup>13</sup> Biswas et al in a study of 225 pupils aged 4-13 years from primary and junior high schools reported a CSOM prevalence of 12.44% (28) with twenty-five (11.1%) out of the 28 being from the lower income group families.<sup>6</sup> Ologe and Nwawolo also reported a significantly higher prevalence of CSOM (6.0%) in poorer rural population compared to the urban (0.0%) primary school children.<sup>4</sup> Minja and Machemba reported a prevalence of 9.44% among the rural school children and 1.3% among the urban school children, the difference also being statistically significant, corroborating that low socioeconomic status is associated with increased incidence of middle ear infections.<sup>14</sup> This study also recorded a higher occurrence of CSOM in the pupils from the lower socioeconomic class; however, this association was not statistically significant.

### Acute otitis media (AOM)

Our study revealed that 3.2% of school going children of Ile- Ife had AOM. It was the second most common ear infection in our study. ASOM was the third most common ear diseases in a study done by Akinpelu and Amusa, which accounted for 7.0% of the cases seen.<sup>1</sup> Olubanjo found a hospital prevalence of 1.0%, which is lower than the 2.4% reported by Ako-Nai et al in a

similar study conducted in a comprehensive health center.<sup>15,16</sup> The difference may have been due to the higher denominator of patients using the health facility where Olubanjo's study was conducted compared to that of Ako-Nai. Amusa et al found a prevalence of 11.8% in a community survey in South western Nigeria while Zakzouk et al reported a prevalence of 1.05% amongst Saudi Arabian children in a nationwide survey.<sup>9,17</sup> The reason for this difference could be as a result of the different environmental factors and social status. Based on the fact that most CSOM develop from improperly treated AOM, it could be that most of the participants' AOM were not treated adequately therefore progressing to CSOM. This line of thought will require further studies. The presentation was mostly bilateral and there was no significant sex preponderance. Olubanjo in his study found a slight female preponderance while Homoe et al found no sex differences.<sup>17,18</sup> Other workers found a male preponderance.<sup>19,20</sup> The reason for this gender difference is not known. The prevalence in this study was higher in school pupils from the lower socioeconomic class; however, this observation was not statistically significant. In literature, the effect of social status is variable. Pukander et al found AOM to be most common in the higher social class and urban areas, while other workers reported a higher prevalence in children belonging to the low socioeconomic status.<sup>9,15,21,22</sup>

Children are more predisposed because of the anatomical difference in the eustachian tubes, conditions such as adenoids, and bottle feeding of infants while lying supine which make it easier for milk to flow into the middle ear, increasing the risk of bacterial colonization.

### Otomycosis

The most common otitis externa seen was otomycosis with a prevalence of 1.6%. Although mostly, only one ear was affected, bilateral disease was observed in only one subject. Various factors could predispose a subject to otomycosis, including a humid climate, presence of cerumen, instrumentation of the ear, immunocompromised host, and increased use of topical antibiotic/steroid preparations. The relatively higher prevalence (0.8%) in the lower socioeconomic class compared to 0.5% in the upper class might be due to differences in personal hygiene that may exist between these groups. Future work needs to be done on this.

### Otitis externa

The prevalence of otitis externa in this study was 3.2% (Otomycosis was separated from this group in this study) and more prevalent in males. Rowland et al survey using the UK general practice research database of more than 40,000 cases in 30,000 persons over a year showed prevalence in females of 1.3%, and males 1.16%.<sup>23</sup> Cervoni in another community survey involving 108,378 randomly selected subjects found a prevalence of diagnosed otitis externa to be 3.6% in males and 4.2% in

females with a total prevalence of 3.9% affecting all ages with a peak incidence in children aged 5-16 years.<sup>24</sup> They both agreed on the fact that there is a female preponderance

Otitis externa is an inflammation or infection of the external auditory canal and/or auricle.<sup>25</sup> It is a common clinical problem in general practice and yet there are remarkably few data available on the demographic characteristics of patients with this condition. Several factors can contribute to the development of otitis externa. Absence of cerumen, high humidity, increased temperature, and local trauma due to the use of cotton swabs or hearing aids can result in infection of the canal and this condition is also common in tropical areas.<sup>25,26</sup> It can present in different forms which include furunculosis, otomycosis, diffuse otitis externa, 'malignant' otitis externa and myringitis bullosa. Causative agents may be bacterial, viral or fungal. Gram negative microorganisms such as *Pseudomonas Aeruginosa* were the most frequently isolated pathogenic microorganisms.<sup>23,24</sup> Other bacteria commonly isolated are proteus and staphylococcus.<sup>27</sup>

Pain is the most common symptom (82.0%) and erythema, the most common sign (65.0%) while edema (42.0%) was the least common.<sup>27</sup> Treatment is by treating underlying cause, keeping the ear dry and wick dressing with antibiotic drops or antifungal cream/drops.

### CONCLUSION

Ear infections still remain a problem among Nigerian primary school children. Although, the prevalence of ear infections were higher in the subjects from the low socioeconomic class, the effect was not statistically significant.

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