

# Pathological and clinical profile of hearing loss among Sudanese children attending the Khartoum Teaching Hospital

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## ABSTRACT

**Background:** Hearing loss is a common disability affecting nearly 360 million people in the world and 75% of cases live in developing countries. Many children are vulnerable to diseases causing hearing loss that often go untreated. The aim of this study is to identify the possible etiological factors and clinical presentations of children who presented with hearing loss at the Khartoum Teaching Hospital. **Materials and Methods:** a descriptive, cross-sectional hospital-based study. A total of 100 (response rate of 94%) children aged 5-15 who presented with hearing loss at Khartoum Teaching Hospital were included in this study. A detailed structured, pretested, and pre-coded questionnaire was used. After data collection, hearing examination was performed by an E.N.T specialist, then audiometry performed to diagnose hearing loss and for classification of the hearing loss type. Descriptive Statistics frequencies and cross-tabulation were done. A Chi-square test was used for proportions. A *P* value of less than 0.05 considered significant. **Results:** Out of 100 patients, 68 patients (68%) belonged to the 5-10 years age group. The mean age was 8.5 years. The male to female ratio was 1.00-1.13. Conductive hearing loss was found in 66% of the studied group, sensory-neural hearing loss in 23% and the mixed type in 11%. Regarding the etiology, otitis media was found in 41 of patients (41%), congenital hearing loss in 22% (22 patients), traumatic hearing loss in 4%, sickle cell anemia in 2%, mumps in 14%, diabetes mellitus in 3%, and measles in 8% of the patients. In conclusion, a number of preventable causes were shown to contribute significantly to the etiology of hearing loss. **Conclusion:** The commonest factors associated with hearing loss among participants were otitis media and hereditary causes, respectively. Further community-based studies of hearing-impaired children are necessary for planning effective preventive and curative programs.

**Keywords:** Children, hearing loss, Otitis media

## Introduction

Hearing loss in children is a public health problem.<sup>[1]</sup> More than 360 million around the world suffer from hearing loss, according to new global estimates by the World Health Organisation (WHO). Hearing loss is defined as a total or partial

inability to hear in one or both ears. Many studies indicate that different degrees of hearing loss are common among African children.<sup>[2-4]</sup> In many sub-Saharan countries, the disease is more prevalent than in developed countries. Many children are vulnerable to diseases that cause hearing loss. The most common factors associated with sensorineural deafness are consanguinity, infectious diseases, and ototoxic drugs, generally speaking, meningitis, measles, otitis media, and different febrile illnesses such as bacterial infections are the major causes of childhood hearing loss. Those diseases often go untreated in these regions.<sup>[5]</sup>

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The loss of hearing 15 dB can cause hearing disability in children and can disturb their mental growth.<sup>[6]</sup> These disabilities can cause several behavioral complications in different functional areas like mental maturity, perception, speech, cognition and general intelligence, academic performance, and interpersonal behaviors. For the sequel of unilateral hearing loss on children's academic performance, it was found that almost one-third (30%) of children with unilateral hearing loss lag at least 1.2 years in comparison to their normal peers.<sup>[6]</sup> The unilateral hearing impairment, if not treated it will impact on language and speech development.<sup>[7]</sup> Also, impaired hearing leads to psychological and social disturbances. Greater than 40 dB in the better hearing ear in adults is considered disabling hearing loss (15 years or older) and greater than 30 dB in the better hearing ear in children (0 to 14 years).<sup>[6]</sup> The aim of this study is to assess the possible etiological factors and clinical presentation of children who presented with hearing loss at the Khartoum Teaching Hospital.

## Methods

A descriptive cross-sectional hospital-based study was carried out in the Khartoum ENT Teaching Hospital which is the reference Hospital in Sudan. Children between 5–15 years of age with hearing loss were the study population; a sample of 105 with a response rate of 94% giving 100 children were included in the result of this study, detailed structured, pretested, and pre-coded questionnaire was filled for each respondent after consent from guardian or parents. The questionnaire covered different clinical presentations and types of hearing loss. It was designed specifically for the purpose of this study after having consulted the medical literature of similar studies. Before being used in the field, the questionnaire was reviewed by experienced local researchers, dental academics, and health administrators. Following data collection, a hearing examination was performed by an E.N.T specialist. Then, the children were subjected to audiometry using pure tone audiogram, by which hearing loss and its type was diagnosed. Data were entered into a Microsoft Excel spreadsheet and statistical analysis was conducted using SPSS (Version 17). Statistical analysis was carried out using descriptive and analytical statistics. Simple frequencies and cross tabulation were done. Chi-square test was used for proportions. Stratification for the children's sex was done when relevant. *P* value of less than 0.05 was considered statistically significant. **Limitations of the study:** our study has the limitations, the study design being cross-sectional study, gives low evidence. Approved on 15.06.2019.

## Results

Table 1: Illustrates the demographics of the respondents. A total number of 100 patients included in this study, all of them suffered from hearing loss. 43 patients (43%) were males while 57 patients (57%) were females. The male to female ratio was 1.00-1.13.

The patients' age range was (5-15 years) and the mean age was 8.5 years. Participants are from different Sudanese states.

Table 2: Reveals the fact that the etiology, history of otitis media was found in 41 patients (41%), congenital hearing loss in 22 patients (22%), traumatic hearing loss in 4 patients (4%), sickle cell anemia in 2 patients (2%), mumps in 14 patients (14%), diabetes mellitus in 3 patients (3%) and easles in 8 patients (8%) of studied group.

Table 3: shows the fact that the conductive hearing loss was found in 66 patients (66%), sensory-neural hearing loss in 23 patients (23%) and the mixed type in 11 patients. There is a statistically significant relationship between the history of otitis media and conductive hearing loss.

## Discussion

In Sudan, there have been no national surveys on the prevalence of hearing loss and deafness. However, there are hospital-based and academic studies that give a reflection of the magnitude of the problem.

There are no statistically significant differences in gender distribution among the children involved in the study. Thus, sex had no effect on the occurrence of hearing loss in this age group.

**Table 1: Demographic data**

Personal Data	Frequency	Percent
Age		
mean	8.5	
Gender		
Male	43	43%
Female	57	57%
Residence		
Khartoum State	52	52%
Gezira State	24	24%
Eastern States	7	7%
Western States	5	5%
White Nile State	12	12%
		<i>n</i> =100

**Table 2: The pathological profile of hearing loss among the study group**

Diseases	Frequency	Percent
Otitis Media	41	0.41
Congenital	22	0.22
Mumps	14	0.14
Measles	8	0.09
Meningitis	6	0.06
Trauma	4	0.04
Diabetes mellitus	3	0.03
Sickle cell disease	2	0.02
Total	100	100
		<i>n</i> =100

**Table 3: Type of hearing loss in relation to history of OM among the study group**

Type of hearing loss	History of OM					
	Yes		No		Total	
	Count	Percentage	Count	Percentage	Count	Percentage
Sensory-neural	3	0.03	20	0.2	23	0.23
Conductive	34	0.34	32	0.32	66	0.66
Mixed	7	0.07	4	0.04	11	0.11
Total	44	0.44	56	0.56	100	1

*P* value =0.001 < 0.05 significant relationship

In Sudan, previous studies pointed out genetic factors and infection as the main etiologies of hearing loss. while in the Western literature arrangement of one quarter to forty per cent of the cases of hearing loss are attributed to genetic factors.<sup>[4,8]</sup> On the contrary, this study pointed out the commonest cause was otitis media which accounted for almost half of cases (forty-one percent) with hearing loss. In Egypt, previous studies have revealed that hereditary and infections are the main etiologies of hearing loss.<sup>[9,10]</sup> Sickle cell anemia is a global disease, especially in countries with black and mixed populations.<sup>[11]</sup> In this study, two cases of sickle cell anemia are presented with bilateral sensory-neural hearing loss. This finding implies that the majority of hearing loss cases among Sudanese children is preventable through proper diagnosis and treatment of otitis media in primary health care level.

The relation between diabetes mellitus and hearing loss is disputed, but it is observed in several studies to co-exist. Most of these reports indicated the presence of a marked hearing loss in patients with either type of diabetes. A previous study done in Sudan concluded that hearing loss occurs early in diabetic children and is related to the duration of the disease and the degree of metabolic control.<sup>[12]</sup> In this study, we had three diabetic patients presented with bilateral sensory-neural hearing loss.

Quinine remains an indispensable anti-malarial drug almost 400 years after its effectiveness was first documented. However, its continued use is challenged by its poor tolerability, poor compliance with complex dosing regimens. A recent African study found that Quinine, a commonly prescribed malaria medication, is the second most common cause of hearing loss among children.<sup>[13]</sup> In this study, 7 patients presented with sensory-neural hearing loss after receiving quinine.

Mumps is considered as the commonest cause of unilateral acquired sensory-neural deafness in children.<sup>[14]</sup> The danger of mumps related hearing loss is not well known in public. Mumps virus affects the structures within the cochlear duct and saccule but there is no satisfactory explanation as to why the deafness in mumps is usually unilateral. In this study, 14 patients with unilateral hearing loss have a history of mumps.

Measles infection is hypothesized to cause otosclerosis, which causes stapes fixation and subsequent sensory-neural hearing loss due to the formation of abnormal foci of bone remodeling in the middle and inner ear.<sup>[15]</sup> Measle antigens

have been identified within otosclerotic lesions and histological and polymerase chain reaction studies of otosclerotic stapes footplates are suggestive of measles infection.<sup>[15]</sup> In our study, we had 8 patients with a history of measles presented with the sensory-neural hearing loss.

## Conclusion

A number of preventable causes were shown to significantly contribute to the incidence of hearing loss. The most common factors associated with hearing loss among Sudanese children are otitis media and hereditary causes. Conductive hearing loss was found in the majority of the studied group. Most of these causes are preventable if appropriate action in the appropriate time was taken.

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## Conflicts of interest

There are no conflicts of interest.

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