Prevalence of middle ear effusion among children with adenoid hypertrophy at a national referral hospital in Tanzania

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ABSTRACT

Introduction: Middle ear effusion (MEE) is a common childhood disorder that causes hearing impairment due to the presence of fluid in the middle ear which reduces the middle ear's ability to conduct sound. Temporary or persistent hearing loss as a result of MEE causes speech, language and learning delays in children. There are few studies on MEE in Tanzania despite the huge burden of hearing loss among children with adenoid hypertrophy which is a known risk factor for MEE.

Method: A cross-sectional study was conducted among 420 children aged nine years and below having adenoid hypertrophy with or without MEE. The diagnosis of adenoid hypertrophy was confirmed with a lateral view x-ray of the nasopharynx and tympanometry for cases with MEE. The primary objective of the study was to assess the prevalence of MEE among children with adenoid hypertrophy.

Results: The prevalence of MEE among children with adenoid hypertrophy was 61.7%, with 218 (51.9%) males and 202 (48.1%) females. The most affected age group was 2-4 years with an incidence 193 (46%) and in this age group, males (53.9%) were more affected than females (46.1%). Generally, males, 134 (51.7%) were more affected by MEE than females, 125 (48.3%) of all 259 children with MEE. In terms of age group predominance by MEE, children aged 3-4 years, 107(41.3%) were more affected than all other age groups. Additionally, 4 (1.5%) children with MEE presented with hearing loss.

Conclusion: There is a high prevalence of MEE among children with adenoid hypertrophy but no significant association with hearing loss.

Keywords: Adenoid hypertrophy, middle ear effusion, prevalence, Tanzania

INTRODUCTION

Middle ear effusion (MEE) is a common childhood disorder characterized by the presence of fluid in the middle ear which causes hearing impairment due to reduced ability of the middle ear to conduct sound. This necessitates prompt and appropriate management to avoid the associated complications of speech and learning delay which is detrimental to the quality of life of affected children who are mostly of pre-school age. Globally, the prevalence of MEE is 1.3 to 31.3% among primary school children[1-3] but there are two peaks of incidence, at 6 months-2 years and 5-6 years.[4]

At least 90% of children experience a single episode of MEE before starting school.[5] MEE is common in preschool children because of their poorly developed immune system, the anatomy of their eustachian tube that appears more horizontal and wider compared to those of adults and also the fact that the eustachian tube of pre-school children is surrounded by lymphoid follicles and adenoids.[4] There

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are more than thirty documented risk factors for MEE, and including cigarette smoking, poor socio-economic status, climatic changes, day-care attendance, race, sex, adenoid tissue hypertrophy, eustachian tube dysfunction in genetic conditions like Down's syndrome, cleft palate, congenital immunodeficiencies and allergic disorders.[6-8]

A systematic review and meta-analysis on the prevalence of otitis media with effusion and associated factors in Africa found a prevalence of 6% in Africa and 2% in East Africa. The most common associated childhood factors in the meta-analysis were age, cleft palate, adenoid hypertrophy and allergic rhinitis.[9] On the other hand, a recent study that was conducted in Tanzania found the prevalence of MEE among pre-school children to be 24% in one or both ears and higher (24.5%) among children aged 5 to 6 years as compared to 22.5% among children aged 2-4 years.[10]

Despite the burden of paediatric MEE being high in Tanzania there are no annual or national paediatric screening programmes that offer opportunities for diagnosing MEE and thus preventing associated hearing impairment and poor school performance. This study was conducted to address such gaps.

METHOD

This was a hospital based cross sectional study that was conducted in the Department of Otorhinolaryngology at Muhimbili National Hospital where 420 children aged nine years and below and with confirmed diagnosis of adenoid hypertrophy were recruited using convenience sampling technique. The diagnosis of adenoid hypertrophy was established by a lateral view x-ray of the nasopharynx. A clinical audiologist conducted tympanometry and type B tympanogram with normal ear canal volume was regarded as diagnostic for MEE. After approval by Muhimbili University of Health and Allied Sciences (MUHAS) research ethics committee, the study protocol was fully explained to guardians/carers and written informed consent was obtained from each guardian/carer

Data were analysed using Statistical Package for Social Sciences (SPSS) version 23 and a p value <0.05 was considered to be statistically significant.

RESULTS

Age and sex distribution of study participants

In this study, a total of 420 children aged nine years and below, with confirmed diagnosis of adenoid hypertrophy, were recruited where majority, 218 (51.9%) males and 202 (48.1%) females. The predominant age group was 3-4 years accounting for 46% and the least affected age was 9 years (2.4%). (Table 1)

Prevalence of middle ear effusion among children by their sex (n=420)

Out of 420 children with adenoid hypertrophy, 259 (61.7%) had MEE in at least one ear and there were slightly more males, 134 (51.7%) with MEE than females 125 (48.3%). The p-value was significant at 0.00. (Table 2)

Prevalence of middle ear effusion among children by age (n=420)

Majority of children with MEE, 107 (41.3%) were aged 3-4 years and the least 5 (1.9%) affected age group was 7-8 years with a p-value of 0.00. (Table 3)

Lateralization of middle ear effusion among children (n=259)

The majority of children with MEE, 216 (83.4%) had bilateral involvement while the left ear was affected by effusion in 24 (9.3%) patients and the right ear was affected by effusion in 19 (7.3%) patients. The age group, 3-4 years, exhibited bilateral predominance in 98 (91.6%) patients. The p-value was 0.00. (Table 4)

Prevalence of hearing loss among children with middle ear effusion

In this study, out of 259 children with MEE, hearing loss was found in only 4 (1.5%) patients.

DISCUSSION

Middle ear effusion is one of the most common causes of paediatric hearing impairment and needs prompt diagnosis and treatment to prevent the accompanied psychosocial impact and poor school performance. This

Table 1. Age and sex distribution of the children

Sex	Age groups (years) n (%)					Total n (%)
	0-2	3-4	5-6	7-8	9	
Female	39 (9.3)	89 (21.2)	55 (13.1)	14 (3.3)	5 (1.2)	202 (48.1)
Male	44 (10.5)	104 (24.8)	51 (12.1)	14 (3.3)	5 (1.2)	218 (51.9)
Total	83 (19.8)	193 (46)	106 (25.2)	28 (6.6)	10 (2.4)	420 (100)

Table 2. Prevalence of middle ear effusion by sex of children

Sex	Middle ear effusion present n (%)	Middle ear effusion absent n (%)	Total n (%)
Female	125 (48.3)	77 (18.3)	202 (48.1)
Male	134 (51.7)	84 (20)	218 (51.9)
Total	259 (61.7)	161 (38.3)	420 (100)

Table 3. Prevalence of middle ear effusion by age of children

Age group (years)	Middle ear effusion present n (%)	Middle ear effusion absent n (%)	Total n (%)
0-2	68 (26.2)	15 (9.3)	83 (19.8)
3-4	107 (41.3)	86 (53.4)	193 (46.0)
5-6	69 (26.7)	37 (23)	106 (25.2)
7-8	5 (1.9)	23 (14.3)	28 (6.7)
9	10 (3.9)	0 (0)	10 (2.4)
Total	259 (61.7)	161 (38.3)	420 (100)

Table 4. Lateralization of middle ear effusion by age group

Age group (years)	Bilateral MEE n (%)	Left-sided MEE n (%)	Right-sided MEE n (%)	Total n (%)
0-2	48 (70.6)	15 (22.1)	5 (7.3)	68 (26.3)
3-4	98 (91.6)	4 (3.7)	5 (4.7)	107 (41.3)
5-6	60 (87)	5 (7.2)	4 (5.8)	69 (26.6)
7-8	5 (100)	0 (0)	0 (0)	5 (1.9)
9	5 (100)	0 (0)	5 (1.9)	10 (3.9)
Total	216 (83.4)	24 (9.3)	19 (7.3)	259 (100)

study serves to highlight the burden of MEE among children with adenoid hypertrophy at a national referral hospital in Tanzania.

The prevalence of MEE among children with adenoid hypertrophy in our study was 61.7%. Such findings correlate with that found in Nigeria where the prevalence of MEE was 55.9%.[11] Dissimilar findings appeared in a study that was conducted in India where the prevalence of MEE was 4.3%.[12] Such discrepancy may be attributed by the fact that the Indian study was conducted in an urban area and with good health care seeking behaviours favouring a reduction in the prevalence of MEE.

Regarding gender and MEE, our study found a slight male predominance (51.7%) compared to females (48.3%). This finding is similar to findings in Turkey where males (63%) were more affected than females (37%).[12] Dissimilar findings appeared in a study conducted in Nigeria where the proportion of males with MEE was not significantly different from that of the females in both the adenoid hypertrophy and control groups with p values of 0.69 and 0.33 respectively.[13]

With regards to the laterality of MEE, most of the children (83.4%) had bilateral MEE while 9.3% had left sided MEE and 7.3% had right-sided MEE. Such findings are similar to those from Iran among pre-school children where bilaterality of MEE predominated followed by involvement of the right side (33.9%) and left side (25.0%).[4]

Children aged 3-4 years were found to be the most commonly affected by MEE (41.3%) and the least affected age group was 7-8 years (1.9%). This finding correlates to what has been established in a study conducted in Israel where 3-6 years was the peak age group for adenoid hypertrophy, and which corresponds to the age at which MEE tends to peak in children.[4]

Pertaining to hearing loss in children with MEE, our study found a prevalence of 1.5% hearing loss. Such findings are in line with findings from a study in the United States of America where upon comparing hearing loss over time, 2% of children had hearing loss at both 3 and 8 years, 5% had hearing loss at 3 but not at 8 years and 3% had hearing loss at 8 but not at 3 years.[15]

CONCLUSION

Middle ear effusion was found to be prevalent among children with adenoid hypertrophy in this study. It is important to identify children with hearing loss due to MEE or any other causes to avoid its associated lifetime consequences. Despite the remarkable prevalence of MEE, hearing loss among the studied children was found to be uncommon and there was a bilateral predominance in the pattern of ear involvement by effusion.

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