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Clinical and Audiological Outcome of Surgical Treatment in Patients with Adenoid Hypertrophy

Dr. S. M. Nafeez Imtiaz[1*], Dr. Md. Sahidur Rahman[2], Dr. Samir Mohammad Tasrif[3], Dr. Md. Mahbubul Islam[4], Md. Sha. Sakender[5], Dr. Mridul Deb Nath[6], Dr. Towfiq Mahmud[7]

[1]Assistant Registrar, Dept. of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh.
[2]Assistant Registrar, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh.
[3]Assistant Registrar, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh.
[4]Indoor Medical Officer, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh
[5]Registrar, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh.
[6]Indoor Medical officer, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh
[7]Assistant Registrar, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh

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***Corresponding author:** Dr. S. M. Nafeez Imtiaz
Assistant Registrar, Department of ENT & HNS, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh

Abstract **Original Research Article**

Background: Adenoid hypertrophy is a common condition in childhood, which may be associated with recurring acute otitis media, otitis media with effusion (OME), and obstructive sleep apnoea syndrome. There is close relationship between adenoids and possible middle ear pathology leading to conductive deafness. ***Objective:*** To find out the outcome of surgery regarding clinical features and hearing status in children with adenoids. ***Methods:*** This hospital based prospective study was conducted at the Department of Otolaryngology& Head-Neck Surgery, Shaheed Suhrawardy Medical College & Hospital, for a period of 6 months following approval from IRB. Patients having enlarged adenoids with or without OME of 3-12 years and both sex group were approached for inclusion of the study. Informed written consent was taken from the guardian. Proper surgical intervention was chosen according to condition of the child. Before and after intervention, data were collected by the researcher himself. Data were recorded into the case record form. Following collection, data were analyzed by the SPSS 26 (SPSS Inc, Chicago, IL, USA). ***Results:*** Among 100 patients, 66% were males and 34% were females. Mean age was 7.2±2.34 SD (years). Of all, 60% underwent adenoidectomy (AT), 20% underwent adenoidectomy with myringotomy (AM), and remaining 20% underwent adenoidectomy with myringotomy with grommet insertion (AMG). The PTA findings (baseline) of adenoidectomy, adenoidectomy with myringotomy, and adenoidectomy with myringotomy with grommet insertion group were 15.466±1.395, 37.8±3.349 and 38.2±3.548 db, respectively. Similarly, significant improvement was noticed in all of the three groups as evidenced by PTA value in three groups were 11.91±1.12, 18.65±.933 and 17.45±1.31 db, respectively ($p<0.05$). Improvements in PTA among different groups also showed significant changes following operation ($p<0.05$). ***Conclusion:*** Clinical improvement are noticed following surgical intervention in both adenoidectomy with myringotomy, & adenoidectomy with myringotomy with grommet insertion group. However, further studies are needed to establish and use the findings.
Keywords: Enlarge adenoid, Adenoidectomy, Myringotomy, Grommet, Impedence audiometry.

INTRODUCTION

Hypertrophy of nasopharyngeal tonsil sufficient to produce symptoms called Adenoids which occur most commonly between the age of 3 to 12 years [1]. Pathological enlargement of nasopharyngeal tonsil was first described by Meyer in 1870 who called the condition Adenoid Vegetation' [1]. By the age of 2 years' hypertrophy and hyperplasia of adenoids occurs. Rapid growth occurs from 3 to 5 years with a consequent decrease in the nasopharyngeal airway [2]. Adenoids causes nasal obstruction, mouth breathing, hearing impairment, snoring, hyponasal speech and sleep disturbance. The classical concept is that adenoids or recurrent infection adenoids causes otitis media. Adenoids causes tubal obstruction of ET's nasopharyngeal opening and causes reduction of middle ear pressure due to absorption of gas which leads to otitis media with effusion. Impedance audiometry is an objective test widely used in clinical practice and is particularly useful in children [4, 5]. It consists of tympanometry and acoustic reflex measurement. Tympanometry find out the compliance or stiffness of

the tympano-ossicular system and thus find the healthy or diseased status of middle ear [3-5].

The normal middle ear pressure is -100 mm of H2O to +50 mm of H2O and the normal middle ear compliance is 0.39 ml to 1.30 ml. In Otitis media effusion middle ear pressure usually reduces below 100mm of H2O [5, 6]. It is associated with reduction of compliance of middle ear below 0.39 ml and conductive deafness of variable degree. After adenoidectomy the eustachian tube become patent and the functions of middle ear is improved. In this study the compliance and middle ear pressure is measured in a patient of enlarged adenoid before and after adenoidectomy with myringotomy with or without grommet insertion [6, 7]. Considering fewer studies in important topics, the study was conducted to find out the clinical and audiological outcome of the patients underwent surgical intervention due to adenoid hypertrophy.

METHODOLOGY

This was a Descriptive hospital based prospective study. The patients were selected purposively. A total of 100 patients were included in this study. The study was conducted in the Department of Otorhinolaryngology and Head Neck surgery, Shaheed Suhrawardy Medical College Hospital (ShSMCH), Dhaka, Bangladesh. At March March 2020 to August 2020.

Study Procedure

This cross-sectional study was carried over a period of 6 months at a tertiary care hospital. Male and female with a diagnosis of adenoid hypertrophy with variable period of duration were enrolled in this cross-sectional study. Before final selection, all patients were screened in according to the inclusion and exclusion criteria. After selection, all patients were prepared for surgery. Pre-an aesthetic preparation was also ensured. Then surgical intervention was selected in according to the indication and best suited for the patients. Base line demographic profile and clinical characteristics were noted before surgical intervention. Adenedoidectomy, adenotonsilectomy with myringotomy with or without grommet insertion were choisen for the patients who attended in the Department of Otorhinolaryngology and Head Neck surgery, Shaheed Suhrawardy Medical College Hospital (ShSMCH), Dhaka. Relevant investigations including X-ray soft tissue of nasopharynx (L/V), pure tone audiometry and impedence audiometry were done and all this information were recorded in pre-testing standard questionnaire. In all cases, informed written consent was taken from the patient attendant/guardian. After operation first follow up on 7th postoperative day. The next follow up visit were done after 3 months to evaluate the changes of pre-operative symptoms, audio metrical changes and any complications. Then those information were recorded in the pre-testing standard questionnaire form to compare between pre-operative and post-operative findings. Finally, data analysis were done by SPSS 19.

RESULTS

100 respondents were included in the final analysis. Among the respondents 60% had adenoidectomy, 20% had adenoidectomy with myringotomy, and 20% had adenoidectomy with myringotomy with grommet insertion (Figure 1). Among 100 respondents mean age was 7.2±2.34 years with majority belonging to 4-6 years and 6-8 years age. Majority 66% of the respondents were male. Majority of the respondents 49% belonged to lower socioeconomic status.

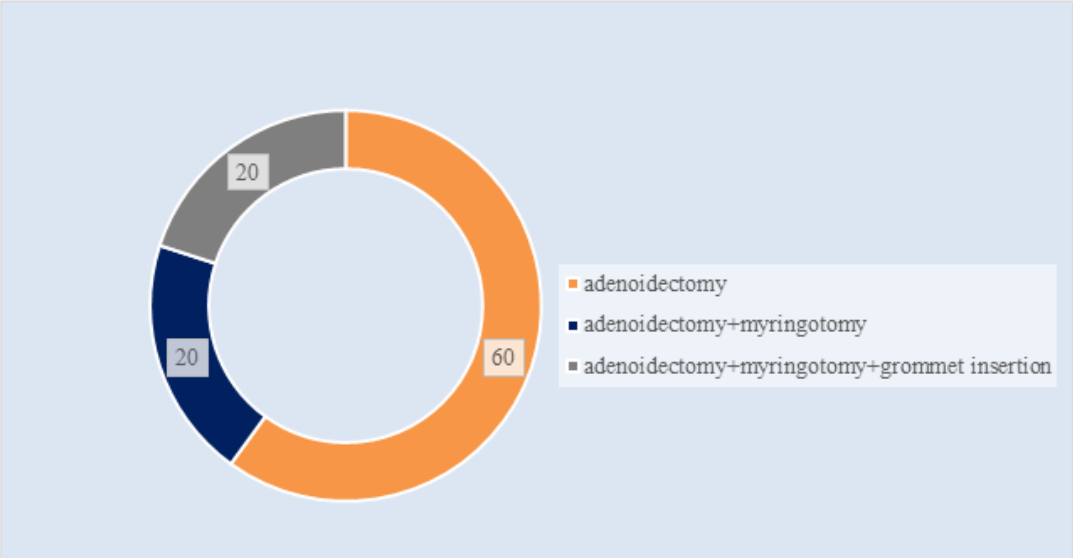

Figure I: Ring chart showed distribution of respondents based on type of surgery done, (N=100)

Figure II showed among 100 respondent's majority 89% respondents presented with nasal obstruction, 30% also had adenoid facies, 68% had history of mouth breathing, 66% had snoring, 41% also had recurrent common cold and 40% had hearing loss.

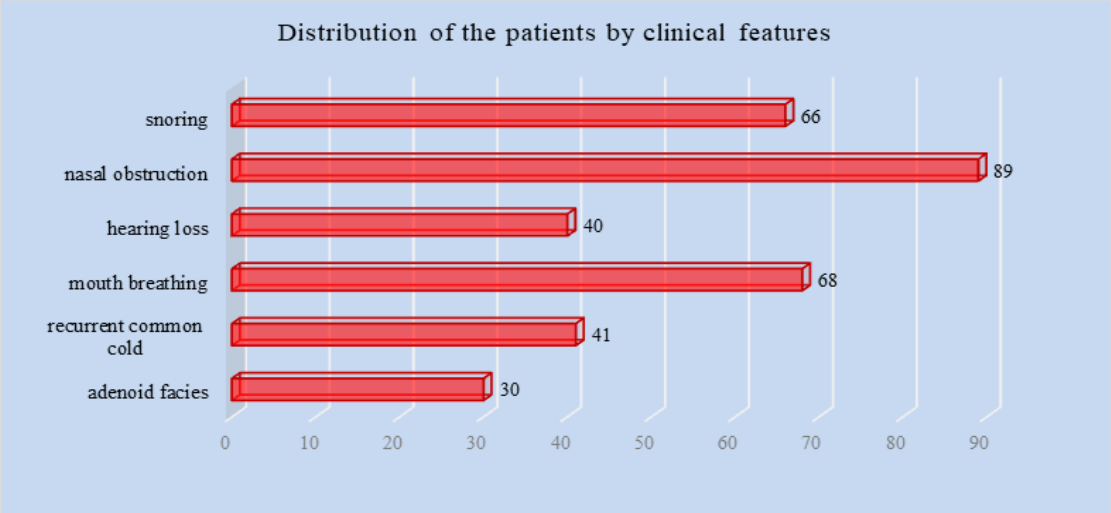

Figure II: Bar chart showed distribution of respondents according to clinical features, (N=100)

Table 1: Appearance of Tympanic Membrane on Otoscopy, (N=100)

Appearance	Number of ears	Percentage
Normal	46	23
Dull and retracted	144	72
Air bubbles present	4	2
Thin and retracted	6	3
Total	200	100

Table 1 showed appearance of TM on otoscopy before operation, dull and retracted finding was the prevalent finding 72% cases.

Table 2: PTA audiometry findings before operation, (N=100)

Type of operation	PTA	Minimum	Maximum
	Mean±SDdb	db	db
Adenoidectomy	15.466±1.395	14	18
Adenoidectomy+ Myringotomy	37.8±3.349	34	44
Adenoidectomy+ Myringotomy+ Grommet insertion	38.2±3.548	33	44

Table 2 showed preoperative findings of PTA among groups that went under different surgical procedure. Among the respondents who had hearing impairment underwent adenoidectomy with myringotomy, and Adenoidectomy with myringotomy with grommet insertion.

Table 3: PTA Findings after operation among different groups, (N=100)

Type of operation	PTA	Minimum	Maximum
	Mean±SDdb	db	db
Adenoidectomy	11.91±1.12	10	14
Adenoidectomy + Myringotomy	18.65±.933	17	20
Adenoidectomy + Myringotomy+ Grommet insertion	17.45±1.31	16	20

Table 4 showing PTA findings after operation among different groups (n=100)

Table 4: Before and after operation among different groups, (N=100)

Type of operation	PTA Before operation	PTA After operation	P value
	Mean±SDdb	Mean±SDdb	
Adenoidectomy	15.466±1.395	11.91±1.12	0.000
Adenoidectomy + Myringotomy	37.8±3.349	18.65±.933	0.000
Adenoidectomy + Myringotomy+ Grommet insertion	38.2±3.548	17.45±1.31	0.000
P value obtained by paired sample t test			

Table 4 Showed difference of Mean PTA findings of the different groups before and after operation, P<0.01.

Table 5: Improvements in PTA among different groups, (N=100)

Type of operation	Mean PTA difference of before and after OT	P value
Adenoidectomy	3.55±1.76	0.00
Adenoidectomy + Myringotomy	19.15±3.51	0.00
Adenoidectomy + Myringotomy+ Grommet insertion	20.75±3.68	0.00
P value determined by one-way ANOVA test		

Table 5 Showed the mean difference was significant. Bonferroni test was done between adenotonsillectomy, Adenoidectomy with myringotomy, and Adenoidectomy with Myringotomy with Grommet insertion. Difference between the second group and the third was insignificant. P determined by one-way ANOVA test.

Table 6: Impedance audiometry findings among different groups before operation, (N=100)

Type of operation	Impedance audiometry graph
Adenoidectomy	Type A
Adenoidectomy + Myringotomy	Type B
Adenoidectomy+Myringotomy+Grommet insertion	Type B

Table 6 showed impedence audiometry findings before operation among different groups.

Table 7: Impedance audiometry findings after operation among different groups, (N=100)

Type of operation	Impedance audiometry graph
Adenoidectomy	Type A
Adenoidectomy + Myringotomy	Type A

Table 7 showed Impedance audiometry findings after operation among different groups. Those who underwent adenoidectomy with myringotomy showed improvement of hearing in impedance audiometry graph.

Among 100 respondents 08% had complications. Out of this 08%, 01% had respiratory complications, 03% fever, 1% reactionary haemorrhage, 03% had otorrhoea.

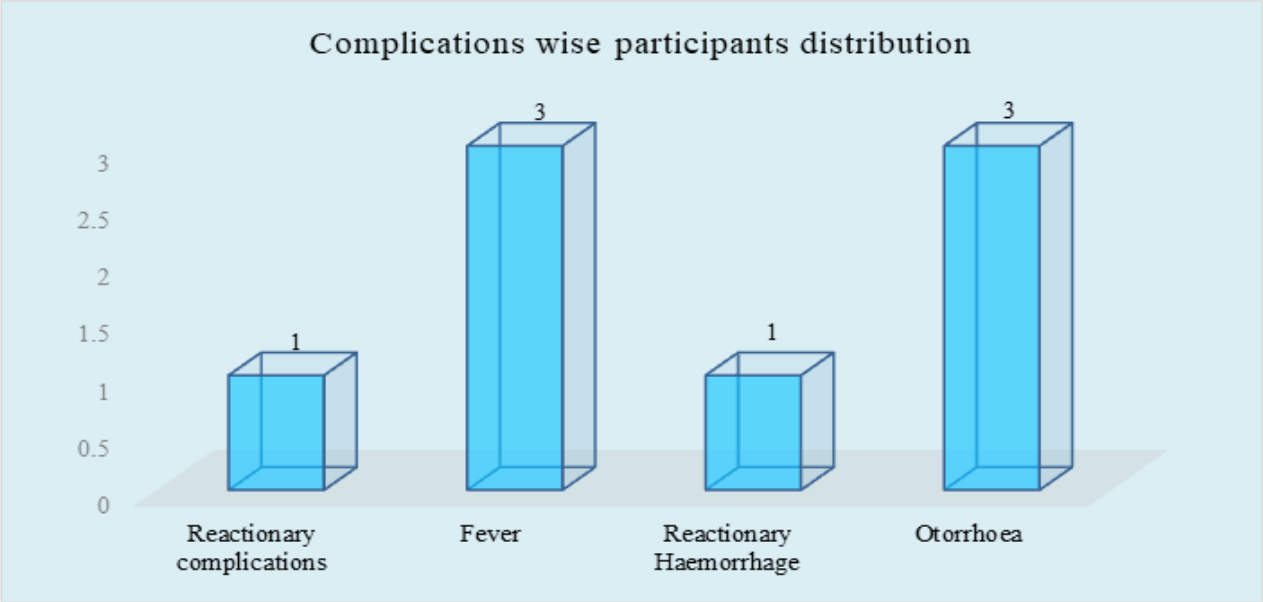

Figure III: Column chart showed distribution of respondents according to complications (N=100)

DISCUSSION

Adenoid hypertrophy is an otorhinolaryngological disorder common in our environment. Obstructive hypertrophy results from increase in immunologic activity while infection leads to inflammation of the adenoid tissue. Hypertrophic adenoid may be acute or chronic. Adenoid hypertrophy is found to be most predominant among children of 1–7 years. Adenoids are subject to physiological enlargement in childhood. Certain children have a tendency to generalized lymphoid hyperplasia in which adenoids also take part. Infection is the main cause of adenoid hypertrophy. It has been reported to be due to persistent inflammation of adenoid tissue with resultant hyperplasia. Deep crypts in the palatine and pharyngeal tonsils are reservoirs of viruses and bacteria, which are potential causes of adenotonsillar tissue hypertrophy and Eustachian tube dysfunction. Among symptoms Difficulty breathing through the nose due to nasal obstruction resulting in breathing through the mouth, Snoring, obstructive sleep apnoea, chronic middle ear infections, fluctuating hearing loss, Cough, Hyponasal and toneless voice, Headache, lack of concentration, Earache, Dribbling of saliva. And among common signs are Adenoid facies, Rhinorrhea, Chronic maxillary sinusitis, Conductive hearing loss which is secondary to recurrent otitis media or persistent middle ear effusions. Posterior rhinoscopy, X-ray lateral view of nasopharynx, Nasal endoscopy, MRI can help to diagnose adenoid hypertrophy. Among other investigations Otoscopy, Puretone audiometry, Impedance audiometry can be done to evaluate hearing loss [8, 9]. 100 respondents were included in the final analysis. Among the respondents 60% had adenoidectomy, 20% had adenoidectomy with myringotomy, and 20% had adenoidectomy with myringotomy with grommet insertion. Among 100 respondents mean age was 7.28±2.34 years with majority 42% belonging to 4-6 years, 14% was 8-10 years age, 23% belonged to 6-8 years age, 13% belonged to 10-12 years and 8% belonged to 3-4 years age. In a retrospective study in, Thuringia, in Germany by Thomas *et al*., reported majority 24% were age 3 years, 22% were age 2 years, 18% were age 4 years, 10% were age 5 years, 8% were age 7-10 years, 8% were 0-1 years age, 6% were 6 years age, 3% were 11-14 years age, 1% between 15-17 years age. In a prospective study in kerala, India by Ajayan *et al*., reported majority 13(37.2%) of the respondents age was between 4-6 years, followed by 11(31.4%) respondents age was between 7-9 years, and 8 respondents age was 10-12 years, and 3 respondents age was 13-15 years. In another study by Choi *et al*., reported. Mean age of the respondents was 8.6 ±3.2 years. In a prospective study in the Department of ENT, Aarupadai Veedu Medical College, Pondicherry by James *et al*., reported most prevalent age group was 5-7 years (34.78%) followed by 7-9 years (30.43%). Timna *et al*., reported significantly higher number of patients belonged to the age group of 5-7 years. Of 30 patients 59.5% were in the age group 5-7 years [10-14]. Out of 100 respondents sex distribution 66% were male and 34% were female. Male to female ratio was 1.94:1. Male prevalence was observed. Thomas *et al*., reported in his study 57% male and 43% female. Ajayan *et al*., reported among 35 respondents 63% (22) were male and 37% (13) were female. James *et al*., reported among 46 respondents there were 26 (56.52%) males and 20 (43.47%) females. Timna *et al*., reported among 30 respondent's majority 18 were male and 12 were female, male prevalence was seen. Sharma *et al*., reported among 300 respondents 62% respondents were males and 38%

were females. These findings support the findings of this study [10-16]. In this study of 100 respondent's majority of the respondents 49% belonged to lower socioeconomic status, 41% were from middle class and 10% were from upper class. Ajayan *et al*., reported Lower class comprised of 48.57%, middle class 42.86% and upper class 8.57%. Which is supportive to the findings of this study [16]. Of 100 respondent's majority 89% respondents presented with nasal obstruction, 30% also had adenoid facies, 68% had history of mouth breathing, 66% had snoring, 41% also had recurrent common cold and 40% had hearing loss. In a prospective study in a tertiary care center among 40 pediatric cases (age 3–14 years) by Sarin *et al*., reported Nasal obstruction was the most common complaint, with an incidence of 100%, followed by nasal discharge (75%), post- nasal discharge (70%) and snoring (50%), earache and impaired hearing both had an incidence of 32.5%. Delayed defective speech and sleep apnoea both showed an incidence of 2.5% each. Adenoid facies were the most consistent and constant feature on general examination in the study, accounting for 75% incidence. Satish *et al*., also reported among presenting features snoring or nasal obstruction was the most prevalent and seen in 100% cases, and aural fullness seen in 62% cases. In another prospective study in the Department of ENT, Aarupadai Veedu Medical College, Pondicherry, among 50 children of both genders by James *et al.*, reported majority of the respondents 91.3% had mouth breathing, Nasal obstruction was in 86.95% snoring in 77.08% cases, recurrent cold in 71.73% cases, recurrent sore throat in 60.86% cases, hard of hearing in 34.78% cases, ear ache in 19.56% cases. In another prospective study by Ajayan *et al*., on 35 children between the age group 4-15 years, in Government Medical College, Thrissur, Kerala, India reported majority 91.4% respondents had nasal obstruction, 82.9% had nasal discharge, 97.1% had mouth breathing, 68.6% had hard of hearing, 71.4% had ear pain, 60% also had recurrent sore throat. These findings are supportive to the findings of this study [11, 13, 16, 17]. Among 100 respondents Otoscopy examionation finding of Tympanic membrane, majority 72% had dull and retracted tympanic membrane, 23% had normal tympanic membrane, 3% had thin and retracted tympanic membrane, 2% had air bubbles prenent. Study by Ajayan *et al*., reported among 70 respondents' findings 55(78.57%) had dull and retracted tympanic membrane, 7(10%) had colour change, 8(11.42%) had air fluid level. In another study by Sarafoleanu *et al*., reported tympanic membrane findings of the respondents 22.23% had normal aspect tympanic membrane, 28.57% had retracted membrane, and 49.2% had middle ear effusion. In a study by Sharma *et al*., reported tympanic findings of the respondents 126(21%) respondent's tympanic membrane finding was normal, 444(74%) respondents had dull and retracted tympanic membrane, 12(2%) had air bubbles, and 18(3%) had thin and retracted tympanic membrane. These findings support the findings of this study [13, 16, 18]. Out of 100 respondent's PTA audiometry before operation, in case of the respondents those underwent Adenoidectomy their Mean±SD PTA was15.466±1.395 db with minimum 14 and maximum 18, those underwent Adenoidectomy with myringotomy their Mean±SD PTA beofre operation was 37.8±3.349 db with minimum 34 and maximum 44, and those underwent Adenoidectomy with myringotomy with grommet insertion their Mean±SD PTA before operation was 38.2±3.548 db with minimum 33 and maximum 44. And PTA audiometry after operation, in case of the respondents those underwent Adenoidectomy their Mean±SD PTA was 11.91±1.12 db with minimum 10 and maximum 14, those underwent Adenoidectomy with myringotomy their Mean±SD PTA after operation was 18.65±.933 db with minimum 17 and maximum 20, and those underwent Adenoidectomy with myringotomy with grommet insertion their Mean±SD PTA after operation was 17.45±1.31 db with minimum 16 db and maximum 20 db. The mean difference was significant $p<0.05$. Bonferroni test was done between adenotonsilectomy, Adenoidectomy with Myringotomy, and Adenoidectomy with Myringotomy with Grommet insertion. Difference between the second group and the third was insignificant. P was determined by one-way ANOVA test. In a prospective observational study of 170 patients in the ENT Department at Sree Gokulam Medical College and Research Foundation by Benjamin *et al*., reported patients who underwent adenoidectomy alone had a pre-treatment mean conductive hearing loss of 20.7 dB before treatment which as recorded to be 19.7 dB after treatment. P value was found to be 0.010. Patients who underwent adenoidectomy with myringotomy had a pre-treatment mean conductive hearing loss of 21.3 dB before treatment which as recorded to be 20.0 dB after treatment. P value was found to be 0.006. Patients who underwent adenoidectomy with grommet insertion had a pre-treatment mean conductive hearing loss of 23.1 dB before treatment which as recorded to be 20.8 dB after treatment. P value was found to be < 0.001 [19]. In 100 respondents Impedance audiometry findings among different groups before operation, those underwent Adenoidectomy their Impedance audiometry graph before operation was Type A, those underwent Adenoidectomy with myringotomy their Impedance audiometry graph before operation was Type B, those underwent Adenoidectomy with myringotomy and grommet insertion their Impedance audiometry graph before operation was Type B. And impedance audiometry findings among different groups after operation, those underwent Adenoidectomy their Impedance audiometry graph after operation was Type A, those underwent Adenoidectomy with myringotomy their Impedance audiometry graph after operation was Type A, those underwent Adenoidectomy with myringotomy and grommet insertion their Impedance audiometry graph after operation was Type A. In a study of 300 patients in the age group 3–12 years in the

Department of ENT, in a Government Medical College in India, by Sharma *et al*., reported 50.17% patients Impedance audiometry graph was type B, 34.50 % patients Impedance audiometry graph was type A, and 15.33% patients Impedance audiometry graph was type C. In another study by Spremo *et al*., reported Type B graph in 66.15% and Type C in 33.85% cases [16, 20]. Among 100 respondents 8% patients had postoperative complications. Out of this 8%, 1% had respiratory complications, 3% fever, 1% reactionary haemorrhage, 3% had otorrhoea. In a study by Konstantinopoulou *et al*., reported of 221 respondents 16 (7%) were identified with post-operative complications. Three (1.4%) had respiratory complications. Thirteen (5.9%) had non-respiratory complications, including dehydration requiring medical evaluation and/or treatment (4.5%), hemorrhage (2.3%) and fever (0.5%). In another study by Ragab *et al*., reported the most common problem observed was the thick mucoid discharge in 22 (5.8%) ears [21]. Out of all the treatment modalities used in this study, the most statistically significant management modality was found to be group that underwent treatment, adenoidectomy with grommet insertion.

CONCLUSION

In this study, it is observed that almost half of the child suffering from enlarged adenoid at the age of 4-6 years of age with variable presentation. Male predominance is also noticed among the participants. Irrespective of presentation, surgical intervention either adenoidectomy, Adenoidectomy with Myringotomy & Adenoidectomy, Myringotomy along with Grommet insertion improved hearing. However, further larger cohort study is needed to finalize the findings and before provide any recommendation.

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