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DESCRIPTION OF HEARING DISORDER SCREENING IN THE POPULATION OF CHILDREN AGED 13-14 YEARS IN TEGAL

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ABSTRACT

Background: Hearing loss is a threshold value of hearing more than 40 decibels (dB) in adults or more than 30 decibels (dB) in children. Hearing loss can result in decreased learning achievement at school, problems in communication, psychological problems, and if complications have occurred, it will cost more for the treatment. **Aim :** This study aims to determine the description of hearing loss in children aged 13-14 years. **Methods :** This study is a descriptive study with a total sample of 61 students taken by simple random sampling method from a total of 599 students aged 13-14 years. The data taken are primary data from questionnaires and physical examination of the ear. As well as simple auditory function checks with a tuning fork. **Results:** The results in this study indicate that the largest group is 14 years old and male gender. Based on ear examination, it was found that 13 students (21%) of the tympanic membrane perforated 1 student (2%) of the right ear. In the hearing function, it was found that 1 student with a conductive type disorder. The questionnaire on the risk factors for hearing loss obtained the use of cotton buds for 53 students (87%), routine check-ups for 1 student (2%), use of headsets for 48 students (79%), allergic rhinitis 9 students (15%), chronic tonsillitis 17 students (28 %) and ARI 1 student (2%). **Conclusion :** The percentage of hearing loss is 2%, the type of hearing loss is CHL (Conductive Hearing Loss). Percentage of risk factors for hearing loss using cotton buds (87%), headset use (79%), allergic rhinitis (15%), chronic tonsillitis (28%), ARI (1%), routine check-ups (1%). **Keywords :** *Hearing loss, hearing function examination, risk factors for hearing loss*

INTRODUCTION

The hearing disorder is defined by the hearing threshold value is more than 40 decibels (dB) in adults and more than 30 decibels (dB) in children. There are 3 types of hearing disorder, such as conductive, sensorineural, and mixed. The conductive hearing disorder is caused by the outer or middle ear problems, while sensorineural hearing disorder is caused by the inner ear and the hearing nerve problems. The combination of conductive and sensorineural hearing disorder is called mixed type hearing disorder.^{1,2}

It is estimated that currently there are 360 million people (5.3%) having a hearing disorder in the world, and 328 million people of them (91%) are adults, consisting of 183 million men and 145 million women, and 32 million children. The prevalence of hearing disorder increases with age. A survey that has been conducted by researchers in several schools in 6 cities in Indonesia shows the prevalence of hearing disorder caused by obturan cerumen in school children

is 30-50%. In adolescence, hearing disorder is caused due to exposure to sounds above the normal threshold that is often found at certain sporting events, entertainment venues such as bars, and the use of earphones.³

Early detection of hearing disorder in developing countries still become a challenge because of the lack of socio-economic, parental education, and awareness. Screening is conducted only to show the presence or absence of a response to stimuli of a certain intensity to a person's hearing and does not measure the severity of hearing disorder or does not differentiate conductive or sensorineural hearing disorder. As many as 70.48% of children with hearing impairment were only suspected after the age of 1 year, and only 1.6% were diagnosed with hearing disorder under the age of 6 months. The universal screening program for deafness in newborns has not been evenly carried out in all hospitals in Indonesia due to the



limitations of hearing function examinations using otoacoustic emission (OAE).⁴

This hearing disorder can result in decreased learning achievement at school, communication problems, psychological disorders, and if complications have occurred, it will cost more for the treatment. At school age, hearing disorder problems can be overcome by providing optimal hearing sense health services as a curative and rehabilitative effort. Preventive and promotive efforts are also needed by conducting hearing disorder screening and education on proper ear hygiene and behavior change efforts.⁵ Based on these problems, the researcher had a purpose to conduct research on the description of hearing disorder in children aged 13-14 years in Tegal.

RESEARCH METHODS

The type and method of this research was descriptive research and using simple random sampling method and was taken according to the sample size, as many as 61 students from a total number of 599 students aged 13-14 years. This is due to a pandemic which has limited the samples taken.

Samples who were respondents in this study had met the inclusion criteria including students aged 13-14 years, male and female, willing to participate in the study and exclusion criteria including those who were not present in the study and refused to participate in the study. All samples will be recorded for their identity and fill out a questionnaire. This research used primary data based on the results of physical examination of the ear, auditory function examination with tuning fork and information on risk factor data related to hearing impairment. The tuning fork checks include the Rinne test, the Weber test and the Schwabach test. The risk factors recorded were a history of Acute Respiratory Infection, allergic rhinitis, chronic tonsillitis, cotton bud usages, routine check-ups and headset usages.

RESULTS

This study used primary data that was taken from the subject by using a questionnaire and direct physical examination at MTs N 3 Tegal in the period of July - August 2020.

Participants Characteristics

Table 1. Distribution of participants characteristics

Variabele	The Number of Students (Total N=61)	Percentage (%)
Age group		
Age 14 year	34	56
Age 13 year	27	44
Gender		
Male	32	52%
Female	29	48%
Cerumen		
Available	13	21%
Not Available	48	79%
Tympanic Membrance		
Normal	60	98%
Perforation	1	2%
Rinne Test		
Positif	60	98%
Negatif	1	1%
Weber Test		
Normal	60	98%
Lateralization	1	2%
Schwabach Test		
Normal	60	98%
Elongated	1	2%

In the table above, it was found that research data on the most age group was 13 years (56%) and males were more than females. On the results of physical examination of the ears, the presence of cerumen was found in 13 students (21%) with cerumen in part of the ear canal. In the tympanic membrane examination, one student (2%) had perforated tympanic membrane on the right ear. The three auditory function examinations with a tuning fork obtained one student with a negative right ear Rinne test, right ear elongated Schwabach test, and right side ipsilateral lateralization. In conclusion, the three examinations on one student experienced a conductive hearing disorder.



Risk Factor Questionnaire

Table 2. Distribution of risk factors

Questionnaire	Total (N)	Percentage
Cotton Bud Usage		
Yes	53	87%
No	8	13%
Routine Check up		
Yes	1	2%
No	60	98%
Headset Usage		
Yes	48	79%
No	13	21%
Allergic Rhinitis		
Ya	9	15%
Tidak	52	52%
Chronic Tonsillitis		
Ya	17	28%
Tidak	44	72%
ARI		
Ya	1	2%
Tidak	60	98%

Based on the table above, it was found that more students used cotton buds (87%) than those who did not use cotton buds (13%). There were more students who did not do routine ear check-ups (98%) than students who did routine check-ups (2%). Students who used headsets (79%) are more than those who do not (21%). Students who did not have a history of allergic rhinitis (85%) were more than those who had a history of allergic rhinitis (15%). Students who did not have a history of chronic tonsillitis (72%) were more than those who had a history of chronic tonsillitis (28%). Students who did not have a history of ARI (98%) were more than those who had a history of ARI (2%).

DISCUSSION

Research Respon

Respondents of this reserach were 7th and 8th grade students of MTs N 3 Tegal with a total sample of 61 students. In table 1, it was found that male students were more (52%) than female and the 14 year age

group was more dominant, as many as 34 students (56%).

Ear Examination

The appearance of wax that was found was that part of the ear canal. The wax is usually expelled from the ear canal spontaneously through natural jaw movements. However, in individuals who have habitual factors such as picking their ears, there can be a failure in the cleaning mechanism and an impact on the wax. Impaction of wax can close the canal or press on the tympanic membrane, potentially causing ear discomfort, conductive hearing disorder.⁶

Students with perforated tympanic membrane were 1 student (2%) on the right ear. The location of the central perforation is small (1-25%) and includes benign type CSOM.

Hearing Function

It was found that one student (2%) experienced hearing disorder type CHL in the right ear. According to the results of a survey in the United States of 12 year olds, 23% had hearing disorder type SNHL. The difference in this study lies in the type of hearing disorder. The results of the tuning fork test on these students, namely the Rinne test showed negative results on the right ear, the Weber test was found to have right ipsilateral lateralization and the Schwabach test was found to be elongated on the right ear. On examination of the ear, it was found that the tympanic membrane was perforated and a history of ear discharge. The conclusion from this examination was that right ear CHL was obtained with a history of CSOM. The type of hearing disorder caused by CSOM is generally the CHL type because it is associated with damage to the mechanical conduction of sound and can be caused by the accumulation of fluid in the middle ear space which makes sound conduction weak. The perforated tympanic membrane cannot carry the vibrations of air past the hearing bones. However, sound vibrated directly to the bone can be delivered directly to the cochlea⁷⁸

Risk Factor Questionnaire

Cotton bud usage

The habit of using cotton buds for less than 2 weeks can increase the risk of oscillating serum.⁹ The ear canal has the ability to clean its own skin through



its own removal mechanism by means of a chewing motion on the jawbone. 10 11 Using cotton buds too often can cause the layer of wax to disappear from the skin and become a loss of protective layer which can cause the skin to become dry and at risk of infection skin.¹² Movement of cleaning the ears with a cotton swab can cause the position of the wax to shift towards a deeper CAE so that it can cover the tympanic membrane.⁹

Routine Check Up

In this study, it was found that students who routinely did check-ups were 2% and those who did not routinely did check-ups as much as 98%. Those who routinely have their ears checked can find out the condition of the ears earlier if there are abnormalities and get immediate treatment.

Headset Usage

In the group of students who used a headset, the results of the hearing function examination were still normal. Long-term noise exposure through wearing a headset can increase the risk of sensorineural-type hearing disorder. Long-term exposure to high levels of sound carries a significant risk of sensorineural-type hearing disorder. When using a headset, the threshold value can reach 110 dB. This is dangerous if the ear is exposed for a period of more than 1 hour.¹³

Noise with more than 85 dB intensity results in damage to the cortiary organ receptors in the cochlea.¹⁴ Excessive sound can cause temporary and permanent hearing disorder by damaging structures inside the cochlea, including the outer hair cells, stria vascularis, and supporting cellular structures.¹⁵

Allergic Rhinitis

Students who experienced allergic rhinitis showed no hearing disorder. The questionnaire given could not determine the degree of allergic rhinitis. Allergic rhinitis is a chronic inflammation that affects the condition of the nasal mucosa and can progress to the middle ear mucosa. The middle ear mucosa originates from the same ectoderm lining as the epithelium of the upper respiratory tract and was also found to have the same intrinsic immune response to allergen stimuli as in the nasal passages, sinuses, and bronchi.¹⁶

Allergic rhinitis is caused by an allergen which

responds to the emergence of proinflammatory cytokines, these cytokines causing excess mucin production. IgE is produced by B lymphocytes and plays a role in type I allergic reactions. IgE found in mast cells can cause degranulation if there is an interaction with antigens, so that various types of chemical substances that play a role in various inflammatory conditions will be released. This suggests that IgE is produced locally by the middle ear. The condition of cleaning the mucus in the middle ear is not good and the problems in the fallopian tubes can cause effusion otitis media. Patients with moderate-severe persistent allergic rhinitis usually result in mucosal hypertrophy and edema which can lead to tubal dysfunction and progress to effusion otitis media. The important function of the auditory tube itself is to protect against infection, middle ear viruses and regulation of air pressure. If there is an obstruction in the eustachian tube that is unable to balance the middle ear, it can cause CHL-type hearing disorder. This makes the conduct of sound vibrations not maximally to the cochlea.^{17 18}

Chronic Tonsillitis

Chronic tonsillitis can increase bacterial colonization in the upper respiratory tract, if the mucociliary defense is weak, the bacteria can rise up through the eustachian tube to the middle ear and cause acute otitis media. Chronic tonsillitis can cause complications of effusion otitis media (OME). The main pathophysiology of OME is due to obstruction of the eustachian tube due to enlargement of the tonsils, but it could be due to the percontinuous spread of microorganisms from the oral cavity to the ear cavity through the eustachian tube by immunity.¹⁹

ARI

Previous studies have suggested that ARI can develop into acute otitis media (AOM). Aetiology AOM can be caused by respiratory viruses such as Respiratory Syncytial Virus (RSV) infection. If there is an infection of the nasopharynx and pharynx, the protective system and fine hairs of the eustachian tube become malfunctioning. However, ARI is only a risk factor for hearing disorder. Patients with ARI do not necessarily experience hearing disorder, and vice versa.¹² In this study, it was found that one student had CHL type hearing disorder. The student had a history



of risk factors in the form of the use of cotton swabs which could cause the kerumen layer to disappear from the skin and become a loss of the protective layer which could cause the skin to become dry and at risk of skin infections. ¹² When using a headset, the threshold value can reach 110 dB. This is dangerous if the ear is exposed for a period of more than 1 hour. ¹³ Noise more than 85 dB in intensity results in damage to the cortiary organ receptors in the cochlea. ¹⁴

Excessive sound can cause temporary and permanent hearing disorder. A history of allergic rhinitis, a history of chronic tonsillitis, and no routine check-ups to an ENT specialist. Based on the findings of risk factors, these students are at high risk of hearing disorder. The provisional diagnosis from the student's physical examination was OMK (chronic otitis media) in the right ear, because there were no secretions that came out of the sore ear and at the time of the interview, a history of discharge from the right ear canal was obtained. There was also a small perforated tympanic membrane with a small central location (less than 25%). Currently, children found risk factors in the form of exposure to cigarette smoke, dense environment, low economic income, and lack of parental attention to children's ear health.

The limitation of this study is that the research was carried out during a pandemic so that the number of samples was limited because it could not collect data for all students and could not perform an optimal physical examination. And the risk factors are still using a simple questionnaire.

CONCLUSIONS AND SUGGESTIONS

a. Conclusions

The prevalence of hearing disorder was 2%, the type of hearing disorder is CHL (Conductive Hearing Loss). Percentage of risk factors for hearing disorder using cotton buds (87%), headset use (79%), allergic rhinitis (15%), chronic tonsillitis (28%), ISPA (1%), routine check-up (1%)

b. Suggestions

Further research is needed on the description of hearing disorder with a larger sample in order to determine hearing disorder at school age. In addition, further research is needed by submitting information using a complete ENT physical examination and

supporting audiometric examinations and further research by collecting information on risk factors in more detail.

REFERENCES

1. Iskandar N, Soepardi E, Bashiruddin, J. Gangguan pendengaran dan kelainan telinga. In : Buku Ajar Ilmu Kesehatan Telinga Hidung Tenggorokan Kepala dan Leher. Edisi ke-6. Jakarta: Balai Penerbit FKUI. 2007. 10-22
2. Pelealu OCP, Palandeng OI. Kesehatan telinga siswa di SMP negeri 4 Pineleng. *Jurnal e-Clinic*. 2016; 4(2):4-8
3. Sheriman EGM, Mengko SK, Palandeng OI. Kesehatan telinga pada siswa sekolah menengah pertama negeri 8 Manado. *Jurnal e-Clinic*. 2016; 4(2) 105-10
4. Widuri A, Susyanti EB, Supriyatiningih. Hubungan antara tingkat pendidikan orang tua dengan kesadaran untuk deteksi dini gangguan pendengaran pada bayi baru lahir. *Jurnal Kedokteran dan Kesehatan*. 2019; 19(1):13-6
5. Martini E. Skrining dan edukasi gangguan pendengaran pada Anak Sekolah. *Indonesia Journal Medical Science*. 2017; 4(1):110-8
6. Wright T. Ear wax. *Journal Clinical Evidence*. 2015;2015(July 2014):1-24
7. Toari MA, Naftali Z. Lama sakit, letak perforasi dan bakteri Ppnyebab omsk sebagai faktor resiko terjadinya jenis dan derajat kurang pendengaran pada penderita omsk. *Jurnal Kedokteran Diponegoro*. 2018;7(2):1322-33
8. Thornton JL, Chevallier KM, Koka K, Gabbard SA, Tollin D. Conductive hearing loss induced by experimental middle-ear effusion in a chinchilla model reveals impaired tympanic membrane-coupled ossicular chain movement. *Journal of the Association for Research Otolaryngology*. 2013;14(4):451-64
9. Hobson JC, Lavy JA. Use and abuse of cotton buds. *Journal of the Royal Society of Medicine*. 2005;98(8):360-1
10. Husni T. Komplikasi tindakan ear candle. *Fakultas Kedokteran Syiah Kuala* 2015; 8(3) 51-5
11. Asri P, Naftali Z, Marliyawati D. Hubungan antara penggunaan cotton bud dengan serumen obsturan.



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12. Khan NB, Thaver S. Self-ear cleaning practices and the associated risk of ear injuries and ear-related symptoms in a group of university students. *Journal of Public Health in Africa* 2017;8(2):10
 13. Laoh A, Rumampuk JF, Lintong F. Hubungan penggunaan headset terhadap fungsi pendengaran pada mahasiswa angkatan 2012 fakultas kedokteran universitas sam ratulangi. *Jurnal Kedokteran Komunitas dan Tropik*. 2015: 3(3): 142-147
 14. Wongso L, Danes VR, Supit W. Perbandingan dampak penggunaan headset terhadap fungsi pendengaran pada penyiar radio dan yang bukan penyiar radio di kota Manado. *Jurnal Biomedik*. 2013;5(1):53–9
 15. Mazlan R, Saim L, Thomas A, Said R, Liyab B. Ear infection and hearing loss amongst headphone users. *Malaysia Journal Medical Science*. 2002;9(2):17–22
 16. Diana F, Haryuna TSH. Hubungan rinitis alergi dengan kejadian otitis media supuratif kronik. *Majalah Kedokteran Bandung*. 2017;49(2):79–85
 17. Dewi Kusuma MA, Suprihati, Dharmana E. Hubungan antara rinitis alergi dengan infeksi saluran pernafasan atas akut berulang pada anak. *Media Medika Muda*. 2016: 1(2): 75-80
 18. Rambe AYM, - F, Munir D, Haryuna TSH, Eyanoe PC. Hubungan rinitis alergi dan disfungsi tuba eustachius dengan menggunakan timpanometri. *Oto rhino laryngologica Indonesia*. 2013: 43(1): 81-89
 19. Kartika II, Eldawati, Margeni. Faktor-faktor yang berhubungan dengan angka kejadian tonsilitis pada anak usia 5-18 tahun di poliklinik THT RSUD Karawang tahun 2015. *Jurnal Kesehatan Bhakti Husada*. 2015: 1-10
 20. Husni T. Komplikasi tindakan ear candle. *Jurnal Kedokteran Syiah Kuala* 2015; 8(2):51–5