

Factors Associated with
Cerumen Impaction in the
Coastal Elementary Schools
(Case Study in 1st Grade of five
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Bandarharjo Health Center's
Work Area, in North Semarang)

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Factors Associated with Cerumen Impaction in the Coastal Elementary Schools (Case Study in 1st Grade of five Elementary Schools, Bandarharjo Health Center's Work Area, in North Semarang)

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ABSTRACT

Cerumen impaction on children in six cities of Indonesia is 30.5%. The case of cerumen impaction in 1st grade elementary school in the coastal area, Bandarharjo Public Health Center in 2015-2016 was significantly increased (18.34% and 32.77%). Cerumen impaction which is happened in pupils can caused hearing loss which impacted in abnormality growth, learning derivation, and difficulties in social adaptation. This study aimed to analyze the factors associated with the cerumen impaction case in 1st grade elementary students. This study was an analytic observational study with cross sectional approach conducted on 262 subjects in five elementary schools in the coastal area, Bandarharjo Public Health Center, North Semarang. The selection of the subject was done by simple random sampling to determine the name of the school and the children's name to diagnosed cerumen impaction, then parents of children interviewed using questionnaire. Around 50.8% children suffered cerumen impaction. The history of ear infections is associated with cerumen impaction ($p = 0.004$; $POR = 3.173$; $95\% CI = 1.472-6.842$). Parents need to do infection prevention by not using ear-based cleaning tools and need to be educated about cerumen characteristics and functions.

Keywords: cerumen impaction, factors associated, grade 1 elementary school, coastal, bandarharjo

INTRODUCTION

Indonesian Health Ministry in National Strategic Plan targeted hearing loss can be prevented until 90% for reaching sound hearing in 2030.¹ Cerumen impaction which is happened in pupils can caused hearing loss which impacted in growth disorder, learning derivation, and difficulties in social adaptation.²

A research in South Africa showed that 6.6% students had cerumen impaction and 7.5% was diagnosed as hearing disorder.³ Indonesia Community of

Sight and Hearing Health survey in 7 provinces revealed outer ear disease prevalence was (6.8%) which the main cause of the outer ear morbidity was cerumen impaction (3.6%) and the highest case was happened in school-age children (7–18 years old).¹ Previous studies were also showed similar results such as in Semarang amounted 21.4% were suffered cerumen impaction and 6.2% students had hearing disorder⁴ and at Pantai Bahu coastal area revealed 22.6% society had bilateral cerumen, 6.5% had perforated timpani bilateral membrane, dan 12.9% cannot be evaluated due to cerumen blocked ear.⁵

Preliminary study conducted by Community Health Center of Central Java in 2016 showed that cerumen impaction was the first rank of the top ten ear diseases which 2 until 20 patients visited every day. The highest visit prevalence was children at 5–14 years old (28.8%).⁶ Cerumen impaction prevalence in 1st grade of 24 elementary students in coastal area – Bandarharjo Public Health Center in 2015 was 18.34% then increased into 32.77% in 2016.⁷

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Mahardhika revealed that cerumen impaction could be impacted by internal factors such as age, genetic, ear canal diameter, shape and anatomy deformity of ear canal, mental retardation, down syndrome, and body mass index. External factor including socio-economic, environmental condition, knowledge about ear health, cleaning ear with cotton bud behavior, ear infection, and adrenergic drugs used.^{5,8}

In nowadays, research for knowing cerumen impaction factors were still limited and had different results.⁸ This research aimed to analyze factors which contributed to cerumen impaction case in 1st grade of coastal area elementary school, especially Bandarharjo Public Health Center working area, North Semarang.

METHOD

Study Population: A simple random sampling for elementary school name and students' name. This research used 262 of 1st grade students in 5 elementary schools as subject and their parents as respondents.

Study Design: This was an observational analytic with cross sectional approach.

Measurement: Gender was measured by direct observation. BMI was measured by children

anthropometric measurement based on WHO standard. Subject's weight used digital scale and microtoise for height. Respondent's knowledge and behavior, and ear infection history were traced by questionnaire which had been previously trusted by validity and reliability test. Cerumen impaction checkup was done by otoscopy examination method which conducted by ear, nose, and throat doctor from Agency for Hearing Disorder and Hearing Loss Central Java Province.

Statistical Analysis: Univariate and bivariate data analysis were used on this research. Relation in each variable was analyzed by chi square (X^2) test. P value < 0.05 marked as significant in statistic.

RESULTS AND DISCUSSIONS

Cerumen Impaction Case: The proportion of gender of 262 1st grade students in 5 elementary schools was slightly different. The age ranged from 6 until 9 years old. Subject's parents were about 25-45 years old. Most of the parents had graduated from senior high school (SHS). Majority of father worked as private sector employees (41.6%) and most of mothers were housewife (50.8%). The cerumen impaction case proportion was more than a half from total sample (50.8%) (Table 1).

Table 1: Frequency Distribution of Cerumen Impaction Case

Elementary School Name	Cerumen Impaction Case				Total	
	Positive		Negative		f	%
	f	%	f	%		
Tanjung Mas	37	14.1	10	3.8	47	17.9
Kusuma Bhakti	24	9.2	30	11.5	54	20.6
Bandarharjo 2	29	11.1	15	5.7	44	16.8
Dadapsari	33	12.6	22	8.4	55	21.0
Sultan Agung 2	20	7.6	42	16.0	62	23.7
Total	133	50.8	129	49.2	262	100.0

Table 2: Variables of Gender, BMI, parents knowledge, parent behaviour, and infection with cerumen impaction case

Variables	Subvariables	Cerumen Impaction				Test of Significance
		Positive		Negative		
		f	%	f	%	
Gender	Female	58	49.2	60	50.8	P value : 0.728 POR : 0.889
	Male	75	52.1	69	47.9	

Conted...

BMI	Fat-obesity	33	45.8	39	54.2	P value : 0.399 POR : 0.762
	Thin-normal	100	52.6	90	47.4	
Parents Knowledge	Lack	64	51.6	60	48.4	P value : 0.891 POR : 1.067
	Good	69	50.0	69	50.0	
Parents Behaviour	Risky	42	57.5	31	42.5	P value : 0.221 POR : 1.459
	Safe	91	48.1	98	51.9	
Ear Infection History	Available	28	73.7	10	26.3	P value : 0.004 POR : 3.173
	Not available	105	46.9	119	53.1	

More Than 50% Cerumen Impaction Case: This result is similar with previous studies mentioned the high score cerumen in the children group was caused by cerumen production increase due to sebaceous glands production starting to increase in 7 years old children and continuing by ages, cerumen score will decrease in middle age, adult, and elder, and will rise again in the late elder age.^{9,10}

No Relation Between Gender and Cerumen Impaction Case: Substances which consisting cerumen are variative depend on gender, age, and menstruation phase. Cerumen sample which is taken on follicular stage from 19-40 years old women having higher cholesterol and squalene level, in the same age men's cholesterol level were lower than women's.¹¹

This result might happen because the subject were 1st grade students (7-9 years old) (Table 2), which not enter puberty phase yet, so at their age there is no differences in ester and cholesterol level either in girls or boy. In cerumen subject, the highest ester and cholesterol level was placed by 1-10 years old children (for girls and boys).¹¹

Cerumen impaction is commonly happened in men rather than women, it was impacted by hair in men's ear hole was thicker and rougher can disturb natural cerumen cleaning.¹² There was also relation between seasonal diet and triglyceride cerumen production, sexual hormone contributed only in small part in lipid substance and cerumen production level.¹³ Cerumen sebum production decrease in men and women correlated with age, cerumen sebum level rise peaked in age 15-35 and slumped along adult age.^{14,15}

No Relation Between Body Mass index and cerumen Impaction Case: The obese person having metabolism disturbance tendency—over lipogenesis, so can increase free fatty acid level (major compound of cerumen) in the body.¹⁶

That no relation can be caused by homogeneity of the samples or imbalance total number of samples which were compared; cerumen impaction case mostly happened in children with thin-normal BMI (52.6%) rather than happened in samples with fat-obesity BMI (45.8%) (Table 2).

Previous study revealed no remarkable relation between BMI and cerumen impaction case number (p = 0.803) caused imbalance of samples compared, patients with weight less than standard until normal (71.9%) were higher than upper standard weight patients (28.1%).¹⁷

However, other research showed relation between seasonal diet and triglyceride production.¹³ Research differences can be caused by the more accurate laboratory testing method in her research for identifying the availability of triglyceride decrease in respondent who did seasonal diet. Meanwhile BMI measurement on this research used direct height and weight measurement.

No Relation Between Parent Knowledge and Cerumen Impaction Case: Good ear cleaning knowledge will give good result in hearing disturbance prevention. Majority of people think that cerumen is a dangerous waste for the body. It affects manual individual ear cleaning.^{18,19} Hubson observed in 325 people then resulted that majority of people cleaning their ears using cotton buds routinely and did not know their drawback effect from this activity.²⁰

The no relation might be because knowledge was not direct influence factor in cerumen impaction case. Proportion of parents who have good knowledge in this study is more than half the number of respondents, merely (52.7%) (Table 2). This result also can be caused by good knowledge parent had probability to not applied their knowledge in their daily live. It can be showed by parent who knew that cleaning cerumen with cotton

buds can push cerumen entering deeper into the ear (66.8%), and (55%) parent knew that cleaning cerumen with cotton buds can injure ear-hole-skin (Table 2). Meanwhile majority of parent (85.1%) used cotton buds for cleaning their children ear. Moreover, on site research found 9.2% parent used hard material for cleaning ear, such as stainless (Table 2). The habit to clean ear with cotton buds or hard material tools for ear cleaning can disturb natural cleaning mechanism and can push skin cells death and cerumen into eardrum, so the earwax accumulated which can caused cerumen impaction.²¹

No Relation Between Ear Cleaning and Cerumen Impaction Case: Cotton buds that used uncarefully can impacted tympanic membrane damage and damaging ear canal epithelium skin, so cerumen migration outside was disturbed.^{22,23,24} This result similar with previous study which presented that swabs of cotton was not influence in right ear samples examined (p value=0.270), while connected with 75% cerumen impaction case of children's left ear (p value=0.02), this difference can be caused by different technique in left or right ear cotton buds used.²⁵

This research result can be impacted by other factor that can influenced, such as outer ear infection history. It means that even majority of parent had safety behavior (not risky) merely 72.1%, but if children had infection history in multiple time can caused inflammation reaction in ear, in consequence cause over apocrine glands production in ear canal as body defense to protect ear canal so produced accumulated product which blocked ear.^{23,26}

Ear canal (*canalis acusticus externus*) diameter size was also predicted as a caused of no relation both these two factors in 1st grade students. First two decades of young age groups were founded having externa canal auditory diameter relatively smaller rather than adult.⁹ Cerumen score decrease in adult until elderly age due to ear canal has met its maximum size and does not grow anymore.⁹ On site research found that one of cerumen impaction children suffered bilaterally and cerumen extraction could not be taken due to the left ear canal was narrow.

Relation Between Ear Infection History and Cerumen Impaction Case: Multiple ear infection or allergy can cause inflammation reaction in the ear, so impacted in over apocrine glands production on ear canal as body defense to protect ear canal which caused blocked ear by product accumulation.^{23,26}

This research showed that ear infection history associated with cerumen impaction case with p value=0.004 (p<0.05). This correlation was reflected by 14.5% children who had outer ear infection history, cerumen impaction children proportion was 73.7%, it was higher than children without cerumen impaction (26.3%). In addition, association strength could be seen from POR value=3.173 (CI 95%=1.472-6.842), it means that children with outer ear infection history had bigger risk in suffering cerumen impaction 3.172 times than children who never had outer ear infection history (Table 2).

Predisposing factors which contributed in outer ear infection including minor trauma when prying ear, trauma due to scratches by hair clip, matchstick, or others tools which not supposed to cleaning ear, frequently cleaning ear after swimming when canal skin had macerated.²⁷ The suitable ear caring can be done by simple steps such as cleaning external ear using clean wet fabric, then if cerumen accumulation is founded should be handled by doctor.²⁸ The parent's behavior (Table 2) can impact in canal ear lipid layer skin loose. Lipid layer in ear canal skin aims to skin macerate prevention and block bacteria when entering skin by apopilosebacea skin. If lipid layer loose due to multiple ear cleaning, so pathogen organism which embedded in ear canal can grow then make easier ear infection.

CONCLUSIONS

Cerumen impaction case proportion were more than a half of total samples (50.8%). Gender (p value=0.728), body mass index (p value=0.399), parent knowledge (p value=0.891), parent behavior (p value=0.221) did not have significance relation with cerumen impaction case. Meanwhile, ear infection history (p value=0.004) had significance relation with cerumen impaction case. Need parent's education on how to prevent cerumen impaction.

Conflict of Interest: The authors declare that we have no conflict of interest.

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GRADEMARK REPORT

FINAL GRADE

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GENERAL COMMENTS

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