**THE INFLUENCE OF NOISE FROM TRAIN ROAD TRAFFIC ON LISTENING FUNCTION OF ELEMENTARY SCHOOL STUDENTS**

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**ABSTRACT**

Background:

Train is a type of transportation that can have a negative impact in the form of air pollution due to noise. Noise is one factor in relation to physiological, psychological, pathological disorders and communication health disorders. The disturbance is very likely to occur in people who live around the railway. The purpose of this study was to determine the effect of noise from railway toward on the listening function of elementary school students who attend school on the outskirts of railroad tracks.

Method: This study used an observational analytic method with a cross sectional approach. The study population was students at elementary school 01 Rajabasa Raya and elementary school 02 Kampung Baru. The samples were as many of 57 respondents calculated using the Lameshow formula. The sampling technique uses stratified random sampling. Data analysis used univariate analysis, bivariate with chi square formula and multivariate analysis with multiple logistic regression formula.

Results: There showed that 55.6% of respondents experienced noise intensity ≥55dB and 44.4% experienced noise intensity <55 dB. The respondents who experienced hearing dirsorder were as much as 42.9% while 57.1% did not experience hearing disorders. Chi Square statistical test results prove the influence of noise intensity (p = 0,000), residence (p = 0.039), heredity (p = 0.002), earphone use (p = 0.042) on hearing impairment in elementary school students. The variable duration of exposure (p = 0.118), history of ear infection (p = 0.070), school building construction materials (p = 0.212) and barrier (p = 0.071) did not affect the hearing impairment of elementary school students. The results of multivariate analysis showed that there was a significant influence between noise from railway on the hearing function of elementary school students (p = 0,000) without being controlled by the variable duration of exposure, residence, hereditary history, history of previous hearing ailments, the use of earphones or headsets, school building construction materials and school environment barriers.

Conclusion: Based on this study it can be concluded that Train noise exposure with noise intensity ≥55 dB received by students of Public elementary school 01 Rajabasa Raya and 02 Kampung Baru who attend school on the outskirts of railway causes hearing disorder in students.

1. **PRELIMINARY**

The sense of hearing is one of the human senses that functions to recognize various kinds of sounds and is not only needed for communication between fellow humans but also to recognize conditions around the body. While the sound is a vibration originating from an object that causes a wave that produces a high pitch or low pitch. The human sense of hearing can hear sounds between 20 Hz-20 thousand Hz. Based on the value of the frequency of noise due to noise can be divided into 3 categories (Occupational noise, Audible Noise, Impulse Noise) which are distinguished based on the source of the noise.

Noise is defined as unwanted sound originating from natural activities such as speech and man-made activities such as transportation equipment, whether land, sea or air. Sometimes the noise that is around us is a common disturbance, but loud noise that lasts for a long time can cause health problems. The main influence of noise on health is the effect on the listener's senses which can cause progressive deafness. Based on the Decree of the Minister of Environment No. 48 of 1996 defines it as an unwanted sound from a business or activity at a certain time and level that can cause human health problems and environmental comfort. The decree stipulates that the maximum noise level standard in the environment of activities such as hospitals, places of worship, and schools is 55dB, as well as the standard level in residential areas. Noise levels that exceed the established standard level allow the public who are exposed to health problems.

Health problems arising from exposure to noise in a certain time and intensity such as: sleep disorders, stress reactions, communication disorders, fatigue, hearing disorders in children, mental health disorders, to hearing loss (Hanum, 2007). On the other hand, hearing loss is not only caused by noise, but is also influenced by several other factors, namely: duration of exposure, residence distance from sources of noise, hereditary hearing loss, history of previous ear infections, use of earphones or headphones, school building materials and barrier in the school environment (Marisdayana, 2016)

The railroad world has positive impacts on society, among others, cheap, fast, low pollution, mass, and adaptive to technological changes but at the same time has a negative impact that can cause air pollution such as noise and vibrations produced which will affect public health especially those that are often exposed (Rusli, 2009). Research by Rahayu (2016) regarding the level of traffic noise to the comfort level of students when teaching and learning states that the average noise level in exposed schools is 66.4 dBA with a maximum noise of 71.3 dBA and a minimum of 61.1 dBA.

Based on data obtained from monitoring, it can be seen that schools close to the railroad tracks will potentially cause noise and possibly affect the hearing function of students. Some of these schools include Public Primary School 01 Rajabasa Raya and 02 Kampung Baru which are located at a distance of less than 100 meters from the railroad crossing. Based on these descriptions, the authors are interested in analyzing the relationship of noise originating from trains toward the hearing function of elementary school students who attend school on the outskirts of the railroad tracks.

1. **METHODOLOGY**

This research uses quantitative methods with a cross-sectional comparative research design. The purpose of the cross-sectional method is to describe the characteristics of the target population based on observations on the sample. The principle of representation is very important, so that the description is accurate. Therefore, in cross-sectional studies the selection of subjects is recommended using a simple random sampling procedure. This method is used to describe the disease and its causes. Data generated from this cross-sectional study design are prevalence data (Murti, 2011). In this study, researchers will look at the relationship between noise generated by the train with the hearing function of elementary school students in grades 3 and 5 at Public Primary School 02 Kampung Baru and Public Primary SchooL 01 Rajabasa Raya in Bandar Lampung by conducting an audiometry examination. Noise measurements are carried out tentatively according to the train schedule

The method used to collect data is done in 3 ways, namely by field studies (observations), interviews and questionnaires. Observations were carried out to obtain noise data in and in classrooms of PUBLIC Primary School 02 Kampung Baru and Public Primary School 01 Rajabasa Raya. Audiometry measurements performed by certified experts from the Adventist hospital. While interviews with respondents were elementary school students which included data on habits of being in school after hours of study, the use of earphones / headsets and data on symptoms of ear disorders. Other data such as home demographics, school history, hereditary history, and previous disease history were answered by parents by filling out a questionnaire that was provided by researchers and filling it out at home. School building data and school environment barriers are answered by teachers by filling out questionnaires and matched through direct observation by researchers

This research was conducted at an elementary school in the city of Bandar Lampung and near the railroad crossing. After searching through Google Maps, the location of the elementary school is close to the railroad crossing. The distance between the railroad crossing railroad and the elementary school is less than 100 meters. This study uses primary data that will be carried out in June 2019. From the results of the above sample size calculation, a minimum sample of 36 people was obtained by calculating the number of samples for this study using the total population of the two schools was 291. After the calculation, a minimum sample size is obtained 57 samples. To anticipate a sample coming out of this study, the number of samples was added by 10%, so there were 63 samples.

The number of respondents in each school is based on proportions. Calculation of the proportion obtained for Public Primary School 02 Kampung Baru and Public Primary School 01 Rajabasa Raya is 1: 4.2. Based on these calculations, the number of respondents obtained from Public Primary School 02 Kampung Baru was 12 students and Public Primary School 01 Rajabasa Raya was 51 students.

Selected respondents must meet the following inclusion criteria:

1. Respondents are students in grades 3 and 5 both male and female.
2. Respondents are students who attend Public Primary School 02 Kampung Baru and Public Primary School 01 Rajabasa Raya Bandar Lampung.

Measurements are made by taking data when the train crosses a predetermined measurement point. Leq, Max, and Min data will be obtained from the reading of the Sound Level Meter tool directly by looking at the display / LCD screen sound level meter. The measurement time is adjusted to the train's departure and arrival schedule. The data obtained is processed through the editing and coding process with the help of a computer using the SPSS program as follows:

1. Univariate Analysis

This analysis was conducted descriptively with frequency distribution of variables of duration of exposure, residence, hereditary history, history of previous hearing ailments, use of earphones or headsets, school building construction materials and school environment barriers.

1. Bivariate Analysis

This analysis was conducted to see the effect of the independent and dependent variables using the Chi Square test at a 95% confidence level (α = 0.05).

1. Multivariate Analysis

The analysis used is multiple logistic regression, because the types of data are independent variables and the dependent variable in this study is categorical. In this study multivariate analysis was conducted to see the independent variables together with the dependent variable.

1. **RESULTS AND DISCUSSION**

Noise measurements are carried out in order to determine the value of noise during ongoing school activities or activities. After measuring noise in each class using a Sound Level Meter then data collection is carried out for the variable duration of exposure, residence, hereditary history, history of previous hearing ailments, the use of earphones or headsets, school building construction materials and school environment barriers. measurement results as follows:

Table 1. Univariate Analysis Results

|  |  |  |  |
| --- | --- | --- | --- |
| Variabel | Kategori | Frekuensi | Persentase |
| Intensitas Kebisingan | ≥55 dB  <55 dB≥ | 35  28 | 55,6  44,4 |
| Lamanya paparan | <5 jam  ≥5 jam | 40  23 | 63,5  36,5 |
| Tempat tinggal | < 50 m  ≥50 m | 36  27 | 57,1  42,9 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variabel | Kategori | Frekuensi | | Persentase | |
| Riwayat keturunan | Tidak ada  Ada | | 29  34 | 46,0  54,0 |
| Riwayat penyakit pendengaran | Tidak ada  Ada | | 37  26 | 58,7  41,3 |
| Penggunaan *earphone* | Tidak  Ya | | 31  32 | 49,2  50,8 |
| Bahan konstruksi bangunan sekolah | Sesuai  Tidak sesuai | | 34  29 | 54,0  46,0 |
| *Barrier* lingkungan sekolah | Ada barrier  Tidak ada barrier | | 25  38 | 39,7  60,3 |
| Gangguan Fungsi Pendengaran | Tidak ada  Ada gangguan | | 36  27 | 57,1  42,9 |
|  | Total | | 63 | 100,0 |

The proportion of respondents who experienced noise intensity was 55.6%. As many as 63.5% of respondents felt that the duration of noise exposure was <5 hours, there were 57.1% who had a residence with a distance of <50 m. Distributed respondents who have a hereditary history of 54.0%, there are as many as 58.7% have a history of hearing ailments. 50.8% of respondents have the habit of wearing earphones. Respondents stated that the category of school construction materials was 54.0%, 60.3% of respondents said there were no barriers in the school environment. The results also showed the proportion of respondents who experienced hearing loss as much as 42.0%.

Chi Square statistical test results prove the influence of noise intensity (p = 0,000), residence (p = 0.039), heredity (p = 0.002), earphone use (p = 0.042) on hearing impairment in elementary school students. The variable duration of exposure (p = 0.118), history of ear infection (p = 0.070), school building construction materials (p = 0.212) and barrier (p = 0.071) did not affect the hearing impairment of elementary school students.

Multivariate analysis was carried out through the interaction test and confounding tests. After *confounding analysis*, there is no confounding variable on the effect of noise from railroad crossings on the hearing function of elementary school students (p = 0,000) where the effect of noise shows the main effect on the hearing function disorder without being controlled by the variable duration of exposure, residence, hereditary history, disease history previous hearing, use of earphones or headsets, school building construction materials and school environment barriers. This multivariate final model can explain that respondents who feel noise intensity ≥55 dB from a railroad crossing risk 10 times experiencing hearing impairment compared to respondents who feel noise intensity <55 dB.

The effect of students' hearing function is not only obtained from the intensity of train noise that reaches <55 dB, but also comes from sound sources, other that are obtained by students when and after students have finished school, including the sound of children who are studying in in the classroom, the voice of the teacher teaching in the classroom, the sound of children playing outside the classroom, and the sound of motor vehicles, listening to music with earphones, watching TV, etc., which reaches 30%.

The results of a study conducted by Purnanta et al (2008) explained that the noise intensity in primary schools located far from the highway was already close to the maximum allowable value, while for primary schools that were located close to the highway the value had exceeded the maximum threshold allowed. Purnanta et al (2008) also continued, if a generalization or equalization is made it is likely that around 85% of elementary schools in the city of Yogyakarta have noise levels that exceed the allowable environmental noise threshold. Research conducted by Croskey & Devens (1975) in Purnanta et al (2008) also states that there are only 1 in 9 schools that meet the noise level criteria of 40-50 dB.

Based on the results and concordance of the theories described above, it can be concluded that the noise level generated at Public Primary School 02 Kampung Baru and Public Primary School 01 Rajabasa Raya Bandar Lampung has exceeded the threshold value set by the Minister of Environment Decree No. 48 / MNLH / 11/1996 concerning the limitation of noise level values ​​for school areas and the like.

1. **CONCLUSIONS AND RECOMMENDATIONS**

From the results of the research that has been carried out the following conclusions can be obtained: Noise produced by the train is above the threshold value to a distance of 100 meters from the railroad tracks (> = 55 dB to <55 dB) even though in school hours there are 10 trains that pass <15-> 15 minutes mean that approximately local residents are exposed to noise between 100 minutes to more than 150 minutes per time they enter school. There is a significant influence between noise on hearing impairment in students of Public Primary School 02 Kampung Baru and Public Primary School 01 Rajabasa Raya Bandar Lampung. Based on the results of research that has been done and observations during the study, it can be put forward some suggestions as follows:

1. For PT KAI: Currently PT. Kereta Api (Persero) has not made concrete fences along the tracks around the school and it is hoped that PT KAI can utilize vacant land along the railroad tracks for vegetation planting such as Japanese bamboo, angsana trees, etc. to reduce the intensity of the noise generated from the trains passing by.
2. For District and District Health Offices: For health workers / sanitarians to arrange counseling programs due to noise for public health, especially schools on the outskirts of the railroad tracks

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