

Analysis of Factors Affecting to the Hearing Condition of Blacksmith Workers in Sungai Pinang Village, District of Daha Selatan, South Kalimantan

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Abstract: Globally, the World Health Organization (WHO) estimates that the prevalence of hearing loss in 2000 were 250 million people, or about 4.2% of world population. Hearing loss can be caused by workers work-related or unrelated factor. Some countries in the world have established that NIHL was the greatest occupational diseases suffered. This research is quantitative with a causal relationship. This research was conducted in the village of Sungai Pinang, district of Daha Selatan, South Kalimantan in September to November 2014. The population research was all blacksmith workers amount 87 people. In this research, the sampling technique used is random sampling numbered 72 people. This research data were analyzed by using logistic regression analysis. The results of this research showed that workers decreased hearing aggregate to 62 people (86,1 %), and normal hearing to 10 people (13,9 %). Worker characteristics that influence the auditory condition blacksmith workers were age ($p = 0.031$), length of employment ($p = 0.032$), period of employment ($p = 0.040$), and the use of APD ($p = 0.002$). The conclusion of this research showed that hearing loss of blacksmith workers influenced by age, length of employment, period of employment, and the behavior of the use of APD.

Keywords: characteristics of workers, hearing condition

1. Introduction

World Health Organization (WHO) estimates that the prevalence of hearing loss in year of 2000 there were 250 million people, or about 4.2% of world population in globally (Novrial, 2010). Data from the National Institutes of Health, United States estimates that approximately 15% between the ages of 20-69 years have a hearing loss when the test is done with a higher frequency, this incident allegedly because of exposure to noise (Novrial, 2010). National of Occupational Safety and Health (NOSH) obtain data that Noise Induced Hearing Loss (NIHL) a major problem in the United States at this time. As many as 30 million workers have been exposed to noise that exceeds the threshold value. Noise which exceeds the limit, causing damage to the hair cells in the organ of corti to the organ of hearing (Permaningtyas, 2011).

The WHO in 2000 said that there are about 75-140 million people in Southeast Asia with a hearing loss, 50% of this hearing loss can be prevented with correct management and early detection of disease. Multi-center study is based on surveys in Southeast Asia in 1998, Indonesia is among four countries with a fairly high prevalence of hearing loss is 4.6%, while the three other countries namely Sri Lanka 8.8%, Myanmar 8.4% and India 6.3% (MOH, 2006). Although not the highest but the prevalence of 4.6% is quite high, so it can cause social problems in the community. Various countries in the world have established that NIHL is the largest occupational diseases suffered. 16% of hearing loss suffered by adults due to noise is occurred in the workplace. So, Noise Induced Hearing Loss (NIHL) can be a problem that needs to be addressed and special attention (Permaningtyas, 2011).

Thus, the necessary reduction of hearing loss and deafness to achieve the objectives Sound Hearing 2030 that prevention of hearing loss can be prevented by 90% in 2030 (Ministry of Health, 2006).

Hearing loss can be caused by the factors of workers working related or not related to work. Thus, it can be said that the health status of the working population is affected not only by health hazards in the workplace, the work environment and the behavior of workers, but also by a factor of occupational health services (Ministry of Health, 2013). Many factors that facilitate such a person with hearing loss due to noise exposure, among others, the higher of noise intensity, high frequency, long exposure to noise, got treatment that toxic to the ear (ototoxic drugs) such as streptomycin, kanamycin, garamisin (class of aminoglycosides), quinine, aspirin, genetic disorders, ear infections, due to earwax blockage, rupture of the membranes and others (Soepardi, 2008).

Enterprises of blacksmith is a domestic industry with technologically simple/ traditional, which is in the production process generates a lot of noise coming from the furnace burning, grinding, forging iron and the iron formation which unwittingly physically will cause hearing loss (Rusiyati, 2012). Sungai Pinang is one of the villages in the district of South Daha, Hulu Sungai Selatan, Kandungan, South Kalimantan. Sungai Pinang village is one of two villages in the district of South Daha whose inhabitants make a living from the blacksmith business (CBS, 2011). The purpose of this study to analyze the factors that affect the hearing of workers blacksmith in the village of Sungai Pinang, Kandungan, South Kalimantan.

2. Materials and Methods

This study uses a quantitative research analytic survey with cross sectional study design to analyze the factors that affect hearing with a hearing loss in workers of blacksmith in Sungai Pinang village, Kandangan, South Kalimantan. This research was carried out on an industrial blacksmith located in the village of Sungai Pinang, South Daha District of Hulu Sungai Selatan, Kandangan, South Kalimantan. This study was conducted in September 2014 till March 2015 which starts from the preparation of research proposals to the research seminar. The populations of this study are all working blacksmith in the village of Sungai Pinang, District of South Daha, Hulu Sungai Selatan, Kandangan, South Kalimantan which amounts to 87 people, and obtained sample by using Slovin formula as 72 people.

The variables of this study consisted of independent variables were age, sex, type of work, duration of work per day, working period, the intensity of the noise, and the behavior of the use of PPE. The dependent variable of this study is a hearing condition. Techniques of data collection were done by questionnaires, examination of noise intensity by using a sound level meter and measurement conditions using the audiometer hearing. Data analysis used bivariate and multivariate analysis in using logistic regression.

3. Results

3.1 Characteristic description of respondents

Table 3.1: Respondents Characteristics Distribution of Blacksmiths Workers in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, 2014

Respondent Characteristic		n	%
Age	≥ 36 years old	34	47,2
	27-35 years old	24	33,4
	17-26 years old	14	19,4
Total		72	100,0
		n	%
Gender	Men	68	94,4
	Women	4	5,6
Total		72	100,0

Data from Table 3.1 shows that of the 72 people working as blacksmith in the village of Sungai Pinang, South of Daha district, aged ≥36 years of the most dominant as many as 34 respondents (47.2%), of which the youngest is 19 years old with 1 person (1.38%) and the oldest is 48 years old as many as 3 people (4.16%) of the 72 respondents. While the sex of respondents who dominate the blacksmith is the male sex as many as 68 people (94.4%) and the rest with 4 people (5.6%) were 72 respondents of female.

3.2 Characteristic of Job Description

Table 3.2: Distribution of Respondents by Job Characteristics at Blacksmiths Workers in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency 2014

Respondent Characteristic		n	%
work the longest of the day	< 8 hours/day	35	48,6
	≥ 8 hours/day	37	51,4
total		72	100
Work Period	< 5 years	8	11,1
	5-10 years	27	37,5
	>10 years	37	51,4
total		72	100
Type of work	worked as a metal smith	68	94,4
	Grinding	4	5,6
Jumlah		72	100,0
Personal Protective Equipment	use PPE	26	36,1
	no PPE	46	63,9
Jumlah		72	100

From Table 3.2 it is known that respondents who work the longest of the day, like ≥8 hours per day are 37 people (51.4%), the rest are 35 people (48.6%) of the 72 respondents who work less than 8 hours per day. While the 72 respondents, for the period of the most dominating is the tenure ≥10 years by 37 people (51.4%) and the longest tenure is 30 years as many as four people (5.55%). And the remaining 27 people (37.5%) were the work period between 5-10 years.

Data from Table 3.2 shows the 72 respondents who dominate worked as a metal smith that 68 people (94.4%) and the remaining 4 (5.6%) of workers as grinding, while out of 72 respondents of this study, workers who used to using (wearing) personal protective equipment such as ear protective equipment in the form of cotton amounted to 46 people (63.9%), and the remaining 26 people (36.1%) of respondents did not wear personal protective equipment such as ear protection tool.

3.3 Description of examination results audiometric and intensity noise

Table 3.3: Distribution of Respondents by audiometric Examination Results and Intensity Noise on Blacksmiths Workers in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, 2014

Respondent Characteristic		n	%
the results of audiometric examination	decrease	62	86,1
	Normaly	10	13,9
total		72	100,0
Noise intensity	< 85 dB	2	2,8
	≥ 85 dB	70	97,2
total		72	100,0

Data Table 3.3 shows the results of audiometric examination (examination hearing threshold) to 72 respondents, which decreased the threshold of hearing as many as 62 people (86.1%) and 10 men (13.9%) were normal. While the results of the examination conducted noise intensity in RT 01 and RT 02, Sungai Pinang as many as 60 points, showed that of the 72 respondents who dominate exposed ≥ 85 dB noise

intensity is 70 people (97.2%), and the remaining 2 (2, 8%) were exposed to noise intensity <85 dB.

3.4 Analysis of Factors Influencing the Hearing Conditions

Effect of Respondent Age by Hearing Conditions

Table 3.4: Effect of Respondent Age with Hearing Loss Conditions at the Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014

age	Hearing condition				Total		p
	Normal		decrease		n	%	
	n	%	n	%			
17 – 26	5	35,7	9	64,3	14	100	0,031
27 – 35	2	8,3	22	91,7	24	100	
≥ 36	3	8,8	31	91,2	34	100	
Total	10(13,9 %)		62(86,1 %)		72(100%)		

Table 3.4 shows that respondents who have a hearing loss at the most in the age of ≥36 years old that a number of 31 people (91.2%). While respondents in the age range 27-35 years old decreased hearing number as 22 people (91.7%). And respondents in the age range 17-26 years old decreased hearing number as 9 (64.3%). Based on statistical test showed the value of $p=0.031$ showed a significant influence between the variables of age with hearing conditions ($p < 0.005$)

3.5 Influence of gender respondents with hearing conditions.

Table 3.5: Effects of Gender Respondents with Hearing Loss Conditions at the Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014

Regency, 2014							
gender	Hearing condition				Total		p
	Normal		decrease		n	%	
	n	%	n	%			
men	9	13,2	59	86,8	68	100	0,508
women	1	25	3	75	4	100	
Total	10	(13,9 %)	62	(86,1 %)	72	(100%)	

Table 3.5 shows that respondents who have a hearing loss of at most is the male sex with 59 people (86.8%), While female respondents who experienced hearing loss number as 3 (75%). This is reinforced by the results of statistical test showed the value of $p=0.508$ ($p > 0.05$), which indicates that there is no significant influence between the sexes to hearing condition.

3.6 Effect of Length Work to Respondents with Hearing Conditions.

Table 3.6: Effects of Long Working Conditions Respondents with Hearing on Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014

Long work	Hearing condition				Total		P
	Normal		decrease		n	%	
	n	%	n	%			

< 8 hours	8	22,9	27	77,1	35	100	0,032
≥ 8 hours	2	5,4	35	94,6	37	100	
Total	10 (13,9%)		62 (86,1%)		72 (100%)		

Table 3.6 shows that respondents who have a hearing loss of at most are respondents who work ≥ 8 hours a day, the number of 35 people (94.6%). While respondents who work <8 hours a day, which decreased hearing is number 27 people (77.1%). Based on statistical test showed the value of $p=0.032$, indicating a significant influence between the variables length of work with hearing conditions ($p < 0.005$).

3.7 Work Period influence Respondents with Hearing Conditions.

Table 3.7: Effect of Work Period Respondents with Hearing Condition on Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014.

Long work	Hearing condition				Total		P
	Normal		decrease		n	%	
	n	%	n	%			
< 5	3	37,5	5	62,5	8	100	0,040
5 – 10	5	18,5	22	81,5	27	100	
> 10	2	5,4	35	94,6	37	100	
Total	10 (13.9%)		62 (86.1%)		72 (100%)		

Table 3.7 shows the respondents who have a hearing loss of at most the respondents who have a service life of >10 years of which 35 (94.6%). While respondents have a working period in the range of 5-10 years, which decreased hearing are 22 people (81.5%). And respondents who have tenure <5 years who suffered hearing loss is a number of 5 people (62.5%). Based on statistical test showed the value of $p = 0.040$ this indicates a significant influence between the variables of tenure with hearing conditions ($p < 0.005$).

3.8 Work influence with Hearing Conditions Respondents

Table 3.8: Effects of Respondents by Job Loss Conditions at the Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014

South Bada, Hulu Sungai Selatan Regency, 2014							
Job	Hearing condition				Total		P
	Normal		decrease		n	%	
	n	%	n	%			
worked as a metal smith	9	13,2	59	86,8	68	100	0,508
Gerinding	1	25	3	75	4	100	
Total	10(13.9%)		62 (86.1%)		72 (100%)		

Table 3.8 shows that respondents who have a hearing loss most of respondents who worked as punch that a number of 59 people (86.8%). While respondents who worked as grinding with hearing loss are number of 3 people (75%). This is reinforced by the results of statistical test showed the value of $p = 0.508$ ($P > 0.05$), which means that there is no significant relationship between the type of work with a hearing condition.

3.9 Influence of Behavior use of PPE with Hearing Conditions

Table 3.9: Effect of Behavior use of PPE to the Hearing condition on Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014

PPE usage behavior	Hearing condition				Total		p
	Normal		decrease		n	%	
	n	%	n	%			
Use	8	30,8	18	69,2	26	100	0,002
No use	2	4,3	44	95,7	46	100	
Total	10 (13,9%)		62 (86,1%)		72 (100%)		

Table 3.9 shows that respondents who have a hearing loss of at most are respondents who do not wear PPE when working, the number of 44 people (95.7%). While respondents who work wear PPE when working, which decreased hearing is number 18 (69.2%). Based on statistical test $p = 0.002$ showed a significant influence between the variables of PPE usage behavior with hearing conditions ($p < 0.005$).

3.10 Effect of Intensity Noise with Hearing Conditions

Table 3.10: Effect of Noise Intensity with Hearing Loss Conditions at the Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014

Noise intensity	Hearing condition				Total		p
	Normal		decrease		n	%	
	n	%	n	%			
< 85 dB	0	0	2	100	2	100	0,565
≥ 85 dB	10	14,3	60	85,7	70	100	
Total	10 (13,9%)		62 (86,1%)		72 (100%)		

Table 3.10 indicates that respondents who have a hearing loss with the most of respondents who are exposed to noise ≥ 85 dB when the work that a number of 60 people (85.7%). While respondents were exposed to noise < 85 dB when the work and decreased hearing is number 2 (100%). This is reinforced by the results of statistical test showed the value of $p = 0.565$ ($p > 0.05$), which indicates that there is no significant relationship between the intensity of noise with a hearing condition.

3.11 Analysis of factors affecting the condition of Hearing on Blacksmiths Workers in Sungai Pinang, District of South Dahanu, Hulu Sungai Selatan

To analyze the factors that affect workers' hearing at the blacksmith in the village of Sungai Pinang, District of South Dahanu, Hulu Sungai Selatan conducted statistical analysis using logistic regression test with LR Backward method to seek the influence of several independent variables simultaneously. Logistic regression analysis test methods Backward LR performed between the independent variables (age, sex, length of employment, length of employment, type of work, the behavior of the use of PPE and intensities of noise) on the dependent variable (the auditory condition) as follows:

Table 3.11: Logistic Regression Test Results Backward LR method, like factors affecting the condition of Hearing on Workers of Blacksmiths in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, 2014

Independent Variable	Hearing condition			R
	B	Exp (B)	Sig.	
Long work (1) ≥ 8 hours/day	1,535	4,643	0,078	0,301
use of PPE behavioral (1)/ no use PPE	2,204	9,060	0,010	
Constant	0,279		0,579	

Table 3.11 shows that of all independent variables, put it together and get the coefficient of independent variables affect the dependent variable is the only variable PPE usage behavior has an influence on hearing conditions ($p < 0.05$). R-square value (coefficient) obtained was 0.301 this means the use of PPE behavioral variables able to explain or predict the dependent variable value that is the condition of the hearing in this case is a hearing loss of 30.1% and 69.9% were influenced by other factors.

4. Discussion

4.1 Effect of Age against Loss Condition Blacksmiths Workers in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, South Kalimantan.

Based on the chi-square test (Pearson chi-square) between age and hearing conditions in this study shows that the significance value of 0.031 which means there is a significant relationship between the variables of age with hearing loss ($p < 0.05$).

This study fits with previous research conducted by Ulandari (2014) in which the data obtained in this study respondents who experienced hearing loss at the age of 22-38 years of 38.9%, 18.5% aged 39-54 and ages 55- 70 years at 3.7%. Spearman rank correlation test between age and hearing loss was obtained $p = 0.019$ and $r = 0.508$. In this study found a relationship between noises with hearing loss at hospital laundry workers in Makassar.

4.2 Effect of Sex Workers against to the Loss Condition of Blacksmiths in Sungai Pinang village, District of South Dahanu, Hulu Sungai Selatan Regency, South Kalimantan.

Based on the chi-square test (Pearson chi-square) between sexes with hearing conditions in this study shows that the significance value of 0.508 which means there is no significant relationship between the variables of sex with hearing loss ($p < 0.05$).

These findings are consistent with research done by Olivia, which in this study did not obtain the relationship between the sexes with hearing loss. These results were confirmed by Philips (2010), quoted by Olivia (2014), who mentions gender effect, was not significant compared with the group not exposed to noise.

4.3 Influence Older Workers Working Against Loss Condition Blacksmiths in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, South Kalimantan.

Based on the chi-square test (Pearson chi-square) between the length of work with hearing conditions in this study shows that the significance value of 0.032, which means there is a significant relationship between variable length of work with hearing loss ($p < 0.05$).

The results are consistent with previous studies conducted by Susetya (2004), which in this study stated that there is a relationship between the lengths of work with hearing function. The statistical test used in this study is the correlation test double. This study looked at the relationship between noise intensity and length of work with workers hearing function section mill of tapioca industry such as Ngemplak village and Pati district, where two independent variables have a significant relationship with the dependent variable is a decrease in the threshold of hearing.

4.4 Influence Future Work against Loss Condition Blacksmiths Workers in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, South Kalimantan.

Based on the chi-square test (Pearson chi-square) between the years of service with the hearing on the conditions of this study indicate that the significance value of 0.040, which means there is a significant relationship between the variables working lives with hearing loss ($p < 0.05$).

The results are consistent with previous studies conducted by Sari (2012) which in this study stated that based on the statistical test Chi-squared error of 15.250 at the level of 5% with degrees of freedom=1 obtained value of 5.991 criticism appears that the value of Chi-squared amounted to $15.250 > 5.991$ so that there is a relationship between tenure with hearing loss in labor PT. PLN (Persero) region of East Kalimantan Mahakam sector which amounted to 36.7%. This research is also consistent with research Ulandari (2014) which in this study found a significant association between working periods with hearing loss. In this study mentioned period of employment with a value of $p = 0.002$ and $r = 0.408$.

4.5 Effect of Type of Work against Loss Condition Blacksmiths Workers in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, South Kalimantan

Based on the chi-square test (Pearson chi-square) between the type of work with hearing conditions in this study shows that the significance value of 0.508 which means there is no significant relationship between the variables of the type of work with hearing loss ($p < 0.05$).

4.6 Behavior Influence Use of Personal Protective Equipment (PPE) Workers against Loss Condition Blacksmiths in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, South Kalimantan.

Based on the chi-square test (Pearson chi-square) between the behavior of the use of PPE with hearing conditions in this study shows that the significance value of 0.002, which means there is a significant relationship between behavioral variables PPE use with hearing loss ($p < 0.05$). From the findings of this study required hearing conservation program efforts of related agencies such as the Department of Health, Office of Manpower and Transmigration and the Department of Industry and Trade to provide efforts promoting, preventive, curative and rehabilitative and protection of informal workers like having a card JKN (Health Insurance National).

These findings are consistent with research conducted by Nurmia, which in this study showed a significant association between the uses of ear protection (APT) with hearing loss. In this research is based on statistical analysis of the results obtained Correction Continuity test p value = $0.021 < 0.05$.

4.7 Effect of Intensity Noise against Loss Condition Blacksmiths Workers in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, South Kalimantan.

Based on the chi-square test (Pearson chi-square) between the intensity of noise with hearing conditions in this study shows that the significance value of 0.565 which means there is no significant relationship between the variable intensity of noise with hearing loss ($p < 0.05$).

This study fits with previous research conducted by Ghani (2002) which in this study stated that the intensity of the noise was not associated with hearing loss in which the multiple logistic regression analysis test p value = 0.84 ($p < 0.05$) and OR = 1.9. Research also according to research conducted by Nurmia, which in this study did not found a relationship between the intensity of noise with hearing loss. This is in contrast with the theory that the higher the intensity of noise in industrial environments and the longer the exposure time of workers experienced the more severe hearing loss will also be felt workers.

4.8 Analysis of factors affecting the condition of Hearing Blacksmiths Workers in Sungai Pinang village, District of South Daha, Hulu Sungai Selatan Regency, South Kalimantan

To analyze the factors that affect the hearing on workers carried out statistical analysis using logistic regression test is aimed to explore the influence of several independent variables simultaneously. Logistic regression analysis was conducted between the variables of age, sex, length of employment, length of employment, type of work, the behavior of the use of PPE and noise intensity on auditory conditions.

Of the seven independent variables were analyzed by using logistic regression test showed that the only variable behavior of the use of personal protective equipment (PPE) which has an influence on hearing loss of workers blacksmith in the village of Sungai Pinang, Kandangan, South Kalimantan

obtained significance value of 0.010 ($p < 0,05$) which shows there is a relationship between the behavior of the use of PPE with hearing loss as well as the value of R square (correlation coefficient) is 0.301, it means that the behavior of PPE use can affect hearing in this case a hearing loss of 30.1% while the remaining 69.9 % influenced by other factors.

5. Conclusion and Acknowledgements

Based on the results of the research of the factors that affect workers' hearing at the blacksmith in the village of Sungai Pinang, Kandangan, South Kalimantan In 2014, it can be concluded as follows:

1. Five factors characteristics of the respondents like age, gender, length of employment, length of employment, and only 3 types of jobs that affect the auditory condition of the age, length of employment, length of employment.
2. The intensity of the noise factor does not affect the hearing conditions of blacksmith workers in the village of Sungai Pinang, Kandangan, South Kalimantan.
3. Behavioral factors use personal protective equipment (PPE) effect on auditory conditions blacksmith workers in Sungai Pinang, South Kalimantan.

6. Suggestion

Advice can be given to the parties concerned with the results of this study are as follows:

1. To health Department of Hulu Sungai Selatan district in order to enable the function Program promoting, preventive, curative and rehabilitative to provide information more widely to workers both formal and informal workers, particularly informal workers about occupational diseases and diseases caused by working relationship. From the findings of this study are expected all workers to have health insurance in the form of JKN (National Health Insurance) cards to ensure their health, particularly related to work, whether occupational accidents, occupational diseases and diseases caused by work relationships.
2. To Sungai Pinang sub-district public health centre of South Daha in order to enable the function of the Health Promotion Program in particular concerning occupational health, prevention of occupational diseases and diseases caused by working relationship.
3. To Department of Manpower and Transmigration and the Department of Industry and Trade of Hulu Sungai Selatan district in order to provide care and protection to labor, especially in informal workers, would be able to provide information about the requirements for a worker to work in a certain companies.

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