

Occupational Noise Exposure and Its Impact on Palm Oil Mill Workers' Health

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DOI: <https://doi.org/10.30880/rmtb.2020.01.01.018>

Received 30 September 2020; Accepted 01 November 2020; Available online 01 December 2020

Abstract: Palm oil mills are one of the noisiest industrial workplaces, whereby extreme noise poses a risk to the health of the workers and can cause severe consequences. Occupational noise exposure gradually affects auditory and non-auditory aspects of health. The set of symptoms are referred to as having fatigue, head injuries, tinnitus, trauma disease, and high blood pressure. Therefore, the objectives of this study are to determine the occupational noise exposure level among the Palm Oil Mill workers, to evaluate the occupational noise exposure level based on a prospective study among Palm Oil Mill workers, and to identify the impact of occupational noise exposure on Palm Oil mill workers' health. The study was assessed based on questionnaires, environmental noise exposure level (SLM), and personal observation. The participants were 80 workers from different selected work stations. It is reported that the effect of workplace noise exposure shows the highest noise level at Station 2 (Kernel, Press, Sterilizer station, Oil room) ranges from 90.3 dB(A) to 101.2 dB(A) while Station 1 (Ramp Station) shown the lowest noise level 82.2 to 98.1 dB(A). In addition, the quantitative results have shown that occupational noise exposure had a positive impact on worker's health. Therefore, it is highly recommended to raise awareness of workers' health and improve control of palm oil noise exposure. Generally, palm oil milling employees are exposed to high noise levels. This research briefs the outcomes and impacts of occupational noise exposure faced by the workers during the working hours and the rest of the working hours.

Keywords: Noise exposure, Health impact, Industrial noise

1. Introduction

Occupational noise is defined as “unwanted sound” at the workplace, inferring that it is humans, not physics, who actually determine whether a sound is noise. According to Oseland and Hodsman (2018), noise detection begins when sound pressure waves reach the eardrum and our physiology converts the pressure waves into a sound (perception); the brain then interprets the sound applying

meaning to it (cognition), and then determines whether the sound is considered noise. The noise of different types and intensities, including noise from transport, industry, and neighbor is perceived as a pollutant and as an environmental stressor that is a prominent feature of the urban environment (Clark & Stansfeld, 2007).

One of the most common occupational disease due to the noise pollution at the workplace is hearing loss (Loukzadeh *et al.*, 2014). According to Attarchi, Labbafinejad, and Mohammadi (2010); Fada & Osiasanya (2017), noise create physiologically, tinnitus, and psychologically negative effects on human beings. Most of the common is hearing loss. Occupational health is an important concern, group of working-age peoples bear disability burden and sickness due to workplace injuries, as noise drew a global problem which leads o permanent hearing loss (Ahmad *et al.*, 2001).

According to the National Institute for Occupational Safety and Health (NIOSH) surveillance, there is about 22 million workers are exposed to hazardous occupational noise each year. Exposure to the occupational noise hazard at the workplace might cause permanent hearing loss that cannot be treated by surgery or any kind of medicine. This can be supported by Juraj and Michaela (2012), claimed that continuously working at exposure to high levels of noise, after a period of time will cause varieties of adverse effects to health namely auditory (hearing impairment) and non-auditory (entire organism, central and autonomic nervous system). Hearing loss severely compromises the efficiency of workers and their abilities, due to loud noise, it is in non-reversible and may lead to lifetime clinical care or permanents dysfunction (Lin *et al.*, 2011). This claim can also be supported by similar research done by Cruickshanks *et al.* (2010).

1.1 Research Background

In Malaysia, palm oil industries are an integral part of the Malaysian economy. According to the Malaysian Palm Oil Council (MPOC); Asian countries produced the largest dollar value of palm oil exports in 2018 with shipments estimated at \$25.7 billion or 84.9 percent of the worldwide total (Figure 1). It also stated that Malaysia is one of the largest producers and exporters of palm oil in the world, after Indonesia. Malaysia’s exports reached almost 39 million tonnes of which Malaysia’s share was 46%.

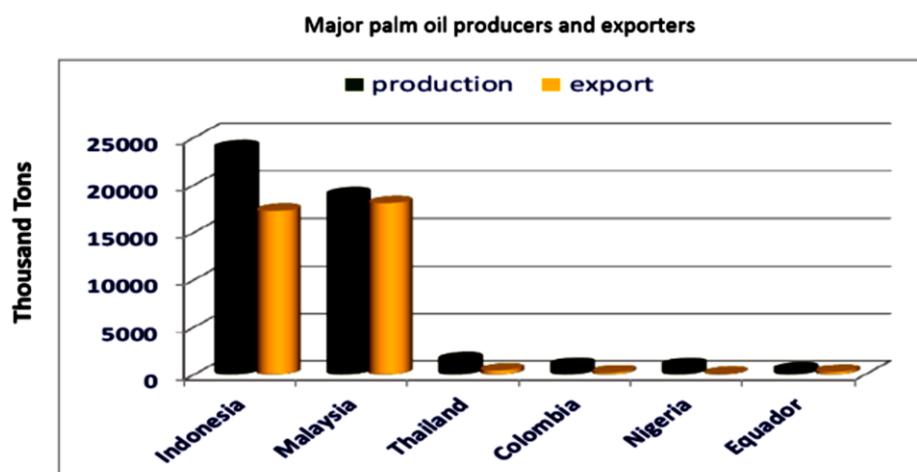


Figure 1: Statistic of major palm oil producers and exporters (MPOB, 2019)

Palm oil milling in Malaysia is one of the world’s leading producers and exporters of palm oil and has 24.97 million tonnes of crude palm oil per year produced by the 426 active mills that claimed by (Lim *et al.*, 2015). Thus, it makes the palm oil mill in Malaysia are among the noisiest industrial

workplace, whereby the workers are more exposed to high levels of noise. It can cause people to lose the ability to concentrate on certain activities in daily life such as conversations. Baltr *et al.* (2007) claimed that excessive noise exposure is commonly encountered in a great variety of industrial processes.

Previous research in India found that the workers are presented to a high level of noise exposure and the noise was ruled by a low recurrence of noise (Kumar *et al.*, 2008). Then again, Naeini & Shamsul (2014) uncovered that occupational noise level is one of the critical components that add to the expanding the feeling of anxiety among workers at palm oil factories.

Some locally owned organizations have less awareness and consistent with occupational noise things as contrasted and the huge organizations possessed by global financial specialists (Ismail, 2013). It appeared that the safety culture in Malaysia still has spaces for improvement.

1.2 Problem Statements

Nowadays in Malaysia, occupational noise exposure is one of the major occupational diseases across sectors including the palm oil industry. According to the latest Workplace Safety and Health released by the Ministry of Manpower (MOM), the top three occupational diseases in 2018 were noise-induced deafness (NID), work-related musculoskeletal disorders (WRMSD), and occupational skin diseases (Ang, 2018). Occupational noise exposure is one of the physical hazards that can threaten the safety and health of workers.

Besides, according to The American Journal of Industrial Medicine, that higher rates of hypertension and high cholesterol were attacking the people who were regularly exposed to loud noises at work (Kerns *et al.*, 2018). Meaning that for 4 or more hours a day, several days a week, the workers needed to raise their voice or shout to be heard by someone standing a few feet away. This kind of action can easily damage the workers' hearing.

The director of the Department of Occupational Safety and Health Malaysia (DOSH) said, approximately 60 to 70 percent of the 700 occupational-related cases recorded since the beginning of this year have been associated with hearing loss and have been caused by excessive noise pollution at workplaces. Following the cases, hearing issues in Johor have been identified as one of the main health problems reported in the state, and the cases have continued to rise over the last four months of 2018 (Dass, 2018).

In addition, DOSH also reported that there has been an increase in the number of cases involving the hearing problem of staff. The increase in the number of recorded hearing problems among employees may be attributed to the growth of machinery in manufacturing goods that generated high noise levels. This represents the need for more input from the new occupational safety management in the palm oil mill to make it firm.

On the other hand, one worker dies every 15 seconds from a work-related accident or disease, according to the International Labor Organization (ILO, 2015), and 153 workers have a work-related accident in every 15 seconds. Safety and health management is, of course, important in reducing the chances of unwanted accidents happening. To order to ensure the condition of equipment, information of staff about safety and daily inspection as well as maintenance should be carried out (Ying, 2016).

Thus, this study focuses on determining the level of noise exposure and identifying the awareness of the worker's palm oil mill on the level of worker noise exposure. Moreover, this study will also focus on identifying the impact of occupational noise exposure on Palm oil mill workers' health.

1.3 Research Questions

- (i) What is the occupational noise exposure level among the Palm Oil Mill workers?
- (ii) What is the evaluation of occupational noise exposure level based on perspective study among Palm Oil Mill workers?
- (iii) What is the impact of occupational noise exposure among Palm Oil Mill workers' health?

1.4 Research Objectives

- (i) To determine the occupational noise exposure level among the Palm Oil Mill workers
- (ii) To evaluate the occupational noise exposure level based on perspective study among Palm Oil Mill workers.
- (iii) To identify the impact of occupational noise exposure on Palm Oil mill workers' health

1.5 Significance of the Study

Safety and Health at the workplace are important for the well-being of both employees and employers because a human loss is immeasurable and intolerable. As such loss or injuries can employ major loss to the families. It is the duty of both employers and employees to protect themselves from the dangers and threats that might arise in the workplace. This study could give information on the issue related to occupational noise exposure in scope in the palm oil mill. Further, this examination would likewise be advantageous to the palm oil industries as this investigation give helpful information on the word related noise hazard.

1.6 Scope of the Study

This research has been carried out at a Palm Oil Mill. The noise monitoring and examination in the mills were assessed by the questionnaires that had been validated and also by the researcher's observation and direct assessment by using a sound level meter. The data from the questionnaires will be analyzed using SPSS. Meanwhile, environmental noise exposure was analyzed by using the equipment's software.

2. Literature Review

Upgrading of living standards and economic development makes industrial activities, manufacturing, development, transportation, and others growing rapidly. However, this situation indirectly leads to some pollution problems especially noise pollution. The government and the directly involved parties are concerned with this problem. A lot of efforts have been taken to ensure the level of noise pollution in this country is at a satisfactory level. A glimpse of this research and will give a review of the issues that have been considered and shows an alternate point of view that attempts are featured in this research. Furthermore, a quick scan of the hypothesis and wording in the study of occupational noise were discussed in this research.

2.1 Occupational Noise

Occupational noise or unwanted sound is one of the most pervasive occupational health problems. It is a by-product of many industrial processes such as the palm oil industry. Sound consists of pressure changes in a medium (usually air), caused by vibration or turbulence. These pressure changes produce waves emanating away from the turbulent or vibrating source.

As indicated by Bridger (1995), characterized occupational noise as a sound or sounds at such adequacy as to cause irritation or to meddle with correspondence. Furthermore, in an observation-based study by Kiernan, (1997), the findings have shown that even relatively low levels of noise affect human health adversely. It may cause hypertension, disrupt sleep, or hinder cognitive development in children.

The effects of excessive noise could be severe that either there is a permanent loss of memory or a psychiatric disorder (Bond, 1996).

In placing more emphasis, Ying (2016) claimed that noise also has been recognized as an important area along with other forms of pollution. Through noise pollution is a slow and subtle killer, yet very little efforts have been made to ameliorate the same along with other types of pollution have become a hazard to the quality of life. According to The Canadian Hearing Society, sound can exist and come from certain sources in this complex urban environment. Table 1 shows the comparisons of the level of occupational noise in the workplaces including palm oil mills.

Table 1: Typical level of occupational noise (San Diego State University, Environmental Health & Safety)

Task	Avg. Noise Level (dB-A)
Operating forklift	87
Cutting Wood	93
Cutting lawn	94
Installing trench conduit	95.8
Welding	98.4
Grinding	99.7
Chipping Concrete	102.9
Working near Generator	116
Lathe	81
Welding Equipment	94.9
Hand Power Saw	97.2
Screw Gun, Drill	97.7
Rot hammer	97.8
Chop saw	98.4
Stationary Power tool	101.8
Chipping Gun	103.0

(a) Noise Transmission Path

Noise emitted from a source is transmitted through many complicated paths, sometimes through a conductor and sometimes as radiation. When it reaches a device or equipment, that equipment is exposed to noise. According to Lakai (1998), noise reaches a listener by several paths. It first must propagate or travel at some distance through the air, before it can reach the air. The receiver who is influenced by the noise or sound may refer to a single person, a group of people, a community, or equipment where the operation is affected by noise. These elements are not always constant but it depends on the path and the receiver.

(b) Noise Levels

Noise, or any type of sound, consists of fluctuations in pressure, p , measured in pascals (Pa), which is a force per unit area. Human hearing is extremely sensitive, and people hear very well over a wide range of pressures. Hence, to put this wide range into a more reasonable scale, logarithms are used. The SPL is defined as, $L_p = \text{SPL} = 20 \log_{10} (P/P_0)$ dB (A).

According to the Noise and Health Organization (2017), the logarithm to the base 10 is used, and the symbol utilized is L_p , indicating the level of the pressure. The reference pressure P_0 is a threshold of human hearing and equals 20mPa. A much larger pressure corresponding to a loud sound might correspond to 100 dB or higher. Very often to measure noise, an additional frequency weighting is used. Human hearing isn't similarly delicate over all frequencies, and the most well-known technique to at any rate somewhat making up for this is the A-weighting curve. A-weighting stresses the frequencies to which the human ear is generally delicate and constricts the low recurrence and high recurrence parts

of the sound. The A-weighted SPL has indicated LA. This measurement is utilized usually in surveying a wide assortment of noise types and is frequently portrayed with the unit dB(A) or dBA.

2.2 Regulation and Guidelines of Noise Exposure

According to Noise Exposure Regulation 1989 under Factories and Machinery Act (FMA) 1967, it stated that all employees should not be exposed to noise level exceed the equivalent continuous sound level of 90 dB or exceeding the limits specified in the First schedule or exceeding the daily noise dose of unity and it also stated that no employee shall be exposed to noise level exceeding 115 dB at any time.

The high noise pressure level is one of the characteristics of noise pollution in Palm Oil Mill. Based on previous research, Zhang and Yuan (2012) claimed that people working in noisy environments in the long run, will not be deaf as long as the noise level is below 80 dB (A). At the point when the noise level is up to 100 ~ 105dB, the detection rate of the deaf by occupational noise is up to 52%, and hearing harm detection pace of high-recurrence noise is about 60%.

Long-term working in high-noise environments of the cement plant, the impact of noise on neurasthenia syndrome is obvious, which causes the sleeping disorder, dizziness, headache, fatigue, memory loss, and high blood pressure. At present, numerous people believe that a high level of industrial noise and traffic noise is one of the major reasons for the high incidence of heart disease.

2.3 Occupational noise exposure in Palm Oil Mill

Occupational Safety and Health Act 1994 (Act 514) and Factories and Machinery Regulations 1989 are highly compliant in Palm Oil Mill. However, Ismail (2013) highlighted that the effectiveness of Malaysia's noise management still needs to put more efforts as the study found that the workers' and managers' attention on the importance of noise management is still lack of awareness. This finding was supported by Abdullah & Bakar (2014) and Alajlan (2013).

Hongwu (2003) reported that in noise production mechanisms, industrial noise is divided into gas-dynamic noise, mechanical noise, and electric magnetic noise. Exposure to high levels of noise causes hearing loss and may cause other harmful health effects as well. Noise impacts human activities in an extensive range, which damages human hearing, even causes diseases of the nervous system, digestive system, and cardiovascular system.

2.4 Safety and Health Management in Palm Oil Mill

The palm oil industry in Malaysia is a regulated industry. In palm oil mills, both the 1994 Occupational Safety and Health Act (Act 514) and the 1989 Noise Exposure Regulations are highly compliant.

2.5 Effects of Noise on workers' health based on previous studies

Most of the industries use big machines which are capable of producing a large amount of noise. Apart from that, various equipment like compressors, generators, exhaust fans, grinding mills also participates in producing big noise. Many studies have been studied about the negative effects of noise pollution. Ashrafi (2005) found that most workers' hearing ability is affected through the dangerous effect of the high noise levels. The physical burden of work in the industries has been decreased by placing modern automated machines in order to achieve higher productivity but in return, a lot of workers might diagnose the occupational health diseases as they often exposed to the machines' noise. Exposure to occupational noise can affect workers' health in the following circumstances such as hearing impairment, sleep disturbance, and impaired task performance.

2.6 Conceptual Framework

This study focus on the relationship between occupational noise exposure in the palm oil mill (independent variable) and its impact on the workers' health (dependent variable) following the hypothesis below:

H1: Occupational noise exposure has an influence on workers' health

3. Research Methodology

3.1 Research Design

The purpose of this study is to find out the awareness of the utilization of safety equipment among employees toward the noise exposure around them and to find out whether the palm oil mill has taken any action to reduce the impact of noise exposure on workers' health. The methodology is divided into three phases, which are:

- i) Phase 1: Consists of method development and scope of the study
- ii) Phase 2: Preparation of data collection and followed by data collection
- iii) Phase 3: Analyzed the data by using SPSS Version 21

After all these phases completed, the result will be discussed and the conclusion will be drawn from this research based on the analysis.

3.2 Data Collection

This study was conducted using both quantitative and qualitative approaches. Table 2 shows the details of data collection and data analysis.

Table 2: Details of data collection and analysis

Objective	To determine the occupational noise exposure level in the Palm Oil Mill	To determine the association between Mill Workers' General Awareness and Occupational noise exposure	To identify the Palm Oil Mill workers' awareness on occupational noise exposure
Instrument Activity	Sound Level Meter Workplace inspection, noise monitoring, noise report	Questionnaire Questionnaire distribution, observation	Questionnaire Questionnaire distribution, observation
Analysis Standard / Guidelines	Equipment's software Factories and Machinery (Noise Exposure) Regulations 1989	SPSS version 21 NIOSH, DOSH Occupational Safety and Health Act 1994, Guidelines on Occupational Safety and Health Management Systems	SPSS version 21 NIOSH, DOSH Occupational Safety and Health Act 1994, Guidelines on Occupational Safety and Health Management Systems

4. Data Analysis and Results

This study was conducted at a palm oil mill located in Johor, Malaysia. The sound level meter has been used in this research to achieve one of the objectives which are to determine the occupational noise

exposure level among workers while questionnaires were distributed among workers to identify the Palm Oil Mill workers' awareness and the impact of occupational noise exposure on their health. The related information was also collected to meet the objectives of this study.

4.1 Identification of workstation with high noise level

Many organizations have put into practice noise regulation to control and prevent their workers exposed to excessive noise. During the walk-through survey, the occupational level at each workstation had been measured and the result is shown in Table 3.

Table 3: Results of workstation noise exposure level survey

Station	Workstation	Noise Level (dBA)	Type of Noise
1	Ramp	80.1 – 97.2	Intermittent continuous
2	Kernel, Oil room, Press, Sterilizer	92.3 – 100.1	Continuous
3	Boiler, Engine	85.4 – 101.4	Continuous
4	Water treatment. Workshop	84.7 – 99.4	Continuous

Based on Table 3, the minimum noise level in most workstations or production areas were exceeded the Action Level (85 dBA) and Permissible Exposure Limit (PEL) of 90 dB(A). Station 2 (Kernel & Nut station, Oil room, Press station, Sterilizer station) shows the highest noise level as compared to other workstations, and those workstations are exposed to continuous noise. Maintenance was carried out twice per year for all those operating machines to keep them in good condition.

4.2 Occupational Noise Level at workstations

In this study, the noise survey was conducted in 4 workstations in accordance with the procedure standard manual for precise results. The noise survey was conducted in 3 hours which is from day time (11.00 am to 2.00 pm). Table 4 tabulates the occupational noise level in four workstations during the day and night time.

Table 4: Workstation noise level measurement

Station	Workstation	Noise Level (dBA)	Mean value (dBA)
1	Ramp	82.2 – 98.1	90.15
2	Kernel, Oil room, Press, Sterilizer	90.3 – 101.2	95.75
3	Boiler, Engine	86.4 – 103.4	94.90
4	Water treatment. Workshop	85.2 – 100.5	92.85

The table showed the different noise level dB(A) in selected workstations in Palm Oil Mill which lies between 90.15 dB(A) to 95.75 dB(A) with mean value 92.95 dB(A), which can be considered as a high value according to Malaysia standard 85 dB(A), and OSHA permissible limit 90 dB(A). Working hours are similar to each selected workstation which are 8 hours per day. According to (Jan 2014), 85dB(A) with the exposure is continuous for more than eight hours per day is the Standards in occupational health whereby those noise levels will affect physical harm to workers. Moreover, The Factories and Machinery (Noise Exposure) Regulations 1989 was set the permissible limit of exposure as no workers shall be exposed to a continuous noise level of 90 dB(A) and also no workers shall be exposed to noise level exceeding 115 dB(A) at any time.

In addition, all the stations can be considered as highly exposed to the noise because each one of the stations has a noise level of more than 90 dB(A) which is over the permissible limit required by OSHA. Therefore, appropriate controls are needed to be taken regarding these situations.

4.3 Result and Analysis Based on Questionnaire

Throughout the pilot study, it is being verify that the method used in this study is suitable for the questionnaire to be answered by the palm oil mill workers. A comprehensive questionnaire was prepared in Malay and English language. A total of 80 questionnaires were collected from the participated palm oil mill. Table 5 shows the demographic summary of the respondents.

Table 5: Demographic summary of the respondents

Demographic characteristics		Frequency	Percentage (%)
Gender	Female	14	17.5
	Male	66	82.5
Age	< 18 years old	0	0
	20 – 29 years old	36	45.0
	30 – 39 years old	29	36.3
	40 – 49 years old	11	13.8
	> 50 years old	4	5.0
Education level	UPSR	1	1.3
	PMR/PT3	12	15.0
	SPM	25	31.3
	Diploma/Certificate	16	20.0
Occupational area	Bachelor Degree	26	32.5
	Ramp	15	18.8
	Sterilization	6	7.5
	Press	12	15.0
	Oil	10	12.5
	Kernel & Nut	16	20.0
	Boiler	6	7.5

In this study, the normality test has been conducted on the questionnaire results and has found that the data is not normal. Kolmogorov-Smirnov test has been used since the sample size for this study is larger than 50 (80 samples). Table 6 shows the normality test data. The normality test has been conducted to the mean of working position, use of PPE, and workers' health awareness. The results show the significant level for all those variables were not normal ($P < 0.05$). Therefore, Chi-Square and Kruskal-Wallis test has been used to show the association of not normal data.

Table 6: Normality test

	Kolmogorov-Smirnov		
	Statistic	df	Sig.
General awareness	0.174	80	0
PPE usage	0.166	80	0
Worker's health	0.190	80	0

Based on Table 7 (summary of association between workstations and general awareness of palm oil mill workers), it can be concluded that only the general awareness about operating machine and information about noise exposure awareness are significant to the noise exposure while the other general awareness is not significant. This might due to the noisy workstation always happened because of the operating machine sound. The operating machine in the workstation usually might reach over 90 dB(A) which is it can give bad impacts on worker's health. Moreover, if they did not have the general knowledge about it, they could not prevent themselves from getting into occupational noise hazards.

The other statement shows no significant between worker's general awareness and occupational noise exposure.

Table 7: Summary of association between workstations and general awareness of palm oil mill workers

Variable	Value	P	Significance
Working in standing position	6.202	0.625	No
Working with operating machine	12.077	0.036	Yes
Speech interference	10.532	0.230	No
Focus interference	6.603	0.580	No
Info about noise exposure awareness	13.328	0.054	Yes

The usage of PPE at work is one of the major components in evaluating the effectiveness of risk management and contributes significant consequences in the reduction of effects from occupational noise hazard. Table 8 shows the results of workers' understanding of the knowledge for using PPE and their feelings about using these safety devices during working hours.

Table 8: Summary of association between workstations and the mill workers' PPE knowledge

Variable	Value	P	Significance
Knowledge on ear protective device	7.861	0.447	No
PPE training	6.999	0.537	No
Use PPE due to awareness of hazard risk	21.500	0.006	Yes
Know machines produce high noise	10.161	0.254	No
OSH training	5.495	0.704	No

Table 9 shows a summary of the Kruskal-Wallis test between occupational noise area and workers' health. This part comprises five questions. These questions are to understand and analyze the worker's health and study the injuries level due to occupational noise exposure.

Table 9: Rank of worker's health

Workers' health	N	Rank mean	Rank
Tinnitus	1	39.19	2
Headache	7	38.79	3
Fatigues	50	45.82	1
Ear allergies	19	27.50	5
High blood pressure	3	37.00	4

Based on the chi-square results (Table 10), it shows that there was a significant difference in workers' health ($\chi^2(8, N = 80) = 10.055, p < 0.05$). Fatigues are the most common health problem in Palm oil mill workstation. This might due to frequent overtime and exposure to noise hazards. Studies show that high exposure level of noise has a contribution that causing Fatigues. Buksh *et al.* (2018) found that there is a significant relationship between noise exposure and the body's exhaustion. The second most common health problem is Tinnitus whereby the cause of this problem might because the noise exposure at the workstation was more than the permissible limit, 90 dB(A). While there is no significance between Occupational Noise Exposure and High Blood pressure ($P > 0.072$).

Table 10: Kruskal-Wallis test occupational noise area

	Worker's health
Chi-square	10.055

Df	8
Asymp. Sig. Result	0.022 Significance

5. Discussion and Conclusion

5.1 Discussion

One of the objectives of this study was to determine the noise occupational level among palm oil mill workers. In general, the noise level in most of the stations is more than 85 dBA which indicates further action of control. This finding is agreed upon by the result from the study of Ying (2016) who concludes that workers in oil mills were exposed to high noise.

The other objective of this study was to evaluate the occupational noise exposure levels based on a prospective study among palm oil mill workers. The obtained data have been analyzed and the results showed that there was no significant relationship between worker's general awareness and occupational noise exposure. The result showed only 2 of the variables were significant while the majority were not. These results could be the evidence that shows worker's general awareness and their knowledge about noise exposure has no relationship between the impacts of occupational exposure towards themselves. Mill's workers could have such knowledge and awareness but still, they need to work with the noisy machines and high noise level of the work environment.

The findings of this study do not support the previous study conducted by Buksh, *et al.* (2018). In his study, it has been proved that most of the variables for worker's general awareness and knowledge have a significant association with occupational noise exposure. The difference in both studies probably is due to different study designs and samples.

The other main objective of this study was to identify the impact of occupational noise exposure on Palm oil mill workers' health.

H1: Occupational exposure has a positive influence on workers' health

Based on the result, it shows that the mean for p-value does not exceed 0.05. Hence, this research accepts the H1 hypothesis and reject the null hypothesis. The outcome shows that occupational noise exposure has a significant association with palm oil mill workers' health. Out of 5 variables about workers' health, only one of them has no significance which is ear allergies while the others show a positive sign.

This study shows that fatigues and tinnitus are the most common worker's health affected by their occupational noise exposure. This fatigues problem probably might due to frequent overtime and continue to expose to a high noise level work environment. This result reflects a similar finding found by Williamson *et al.* (2011) in the study of the link between fatigue with several variables and disclosed that fatigue is affected by the nature of task effects.

Feder *et al.* (2017) found that among workers who had ever or currently worked in a noise environment (defined as needing to speak in a raised voice to be heard) reported tinnitus within the past 12 months. Furthermore, this finding agrees with the result from the study of Shargorodsky *et al.* (2010) who concludes that occupational noise exposure has implications for workers' health and safety as they are often associated with a higher risk of accidents in the workplace.

5.2 Conclusion

The palm oil mill in Johor, Malaysia has participated in this study. Both qualitative and quantitative methods had been used to fulfill the objectives of this study. The objectives of this study are to determine

the occupational noise exposure level among the Palm Oil Mill workers; to determine the association between Mill Workers' General Awareness and Occupational noise exposure, and to identify the impact of occupational noise exposure on Palm Oil Mill worker's health. These objectives have been met.

The results tabulated from the questionnaire show that there is no significant relationship between a worker's general awareness and occupational noise exposure level. It is found that only working with operating machines and information about noise exposure are significant while the other item did not significant with occupational noise exposure level. In addition, the obtained data have been analyzed and the results showed that there is a significant relationship between occupational noise exposure level and palm oil mill worker's health. The results show only Ear allergies have no significance while the others are significant. Hence, this result can prove that the occupational noise exposure level has a high impact on Palm Oil Mill worker's health.

On the other hand, noise monitoring results indicated that the noisiest station of the palm oil mill is Station 2 (Kernel & Nut, Sterilizer, Press station, Oil room) while the least noisy workstation is Station 4 (Water treatment, workshop). Overall, the occupational noise exposure in the Palm Oil Mill is more than 90 dB(A) which is over the Permissible Exposure Limit (PEL) required by OSHA.

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