International Journal of Multidisciplinary Research and Publications
ISSN (Online): 2581-6187

Impact of Occupational Noise on Hearing Abilities of Cereal Millers in Katsina-Ala Metropolis, Benue State

Samuel Terhemba Kungur[1], Victor Akaazua Hanmaikyur[2]
[1]Department of Physics, College of Education, Katsina-Ala
[2]Department of Computer Science, College of Education, Katsina-Ala

***Abstract*—** *Noise is generally an unpleasant sound which disturbs the human being psychologically and physiologically. High levels of occupational noise remain a problem in all regions of the world and there's evidence of its increasing prevalence in the work place. This study examines the impact of occupational noise on hearing abilities of cereal millers in Katsina-ala metropolis with the purpose of assessing the extent of occupational noise pollution. Noise pollution levels within the work places and its perceived effects on the workers was monitored within the mill centers at the Katsina-Ala main market, three (3) rice mills and four (4) domestic mills in the town. Noise measurement was done according to ISO 1996-2002 using Digital Integrating Sound Level Meter, SLM (MS6702). Questionnaires were used to assess the perceived effects of the noise emanating from the mills on the workers. The mills at the market, all the domestic mills and a rice mill were found to emit hazardous noise levels LAeq, above 85dBA, while the remaining two rice mills released LAeq, 82.8 and 83.3 dBA, respectively, all exceeding WHO guidelines and local standards safe limits for noise levels within the work place, except the last two mills. Perceived effects of the noise on workers were significant. Some 28.9% complained of persistent headaches, 26.7% complained of ringing in the ears, 6.7% hearing loss and 8.9% of sleeplessness. The study found that 100% of the workers did not use any hearing protective devices against noise hazards, 31% claimed it was not available, 6.7% said it was expensive, 35.6% see no need of using any hearing protective device and 26.7% have no reason of not using the hearing protective device. It is recommended that Environmental monitoring agencies such as the National Environmental Standards and Regulation Enforcement Agency should make every effort to address the high noise level in the manufacturing sector by enforcing laws regarding high level of noise in manufacturing industry like the cereal mills. Environment management agencies should intensify inspection on the quality of ear protective devices in use in the manufacturing sector and create awareness of noise and its impacts on public health and welfare to help reduce irresponsible behaviors and exposure to dangerous noise levels*.

***Keywords*—** *Occupational noise, Hearing, Cereal millers, Disorder*.

I. INTRODUCTION

An important factor to the quality of life in the urban centers is related to the noise levels to which the population is exposed to. Several factors interfere with the amount of noise pollution throughout the environment (Adejobi, 2012). Evidence has accumulated that noise is a risk factor in sleep disorder, cardiovascular dysfunction, speech interference and mental health distortion, including hearing impairment and balance disorder (Mithanga, Gatebe and Gichuhi, 2013).

In some occupational groups, high noise levels can result in intolerable reactions and negatively impact on job satisfaction and performance (Ali, 2010). With repeated and prolonged exposure to noise levels in the order of greater than 80dB hearing impairment may occur (Atmaca, Peker and Altin, 2005). This process of hearing impairment may be gradual but it could eventually result in the destruction of the hair cells of the organ of Corti (Chisolm, Willott and Lister, 2003). Apart from high noise causing acoustic trauma, it can cause a temporary or permanent shift in the hearing threshold which may result in profound or total deafness.

Hearing impairment can be caused by one time exposure to noise as well as repeated exposure to noise at various levels of loudness over an extended period of time. The usual conversation tone is at or less than 60dB (Dettman, Pinder, Briggs, Dowell *et al*, 2007). Exposure to a daily average noise level that is above 85dB is dangerous because of damage to the hair cells (Dorman and Wilson, 2004). This is a matter of public health concern in many places including Benue state.

There are few or poorly enforced noise pollution control laws in many parts of the country. The occupational groups exposed to noise pollution are hardly aware of the health risks of the noise levels at their places of work (Alton and Ernest, 1990). There are also no protective measures in use among these workers to reduce the impact of noise on their health. There is a definite critical level of noise and duration of exposure which trigger the process of hearing impairment (Ighoroje, Marchie and Nwobodo, 2004). These critical levels vary with age, genetic make-up and previous exposure to loud noise.

The basic aim of this study was to determine the impact of occupational noise on hearing abilities of cereal millers in Katina-Ala metropolis, Benue State. The other objective was to assess the impact of these noise levels on hearing among the cereal millers.

II. MATERIALS AND METHODS

A total of forty five (45) cereal millers were selected using the cluster sampling technique. Those selected had spent a minimum of one year on the job and were in no way provided with noise prevention aids. The millers carry out their business for a period of 10- 12 hours daily and 6- 7 days in a week.

A structural health and lifestyle questionnaire to elicit information from the workers was utilized in this study and

Samuel Terhemba Kungur and Victor Akaazua Hanmaikyur, "Impact of Occupational Noise on Hearing Abilities of Cereal Millers in Katsina-Ala Metropolis, Benue State," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 3, Issue 11, pp. 1-4, 2021.

the information elicited from the questionnaire formed the basis of selection of the 45 cereal millers. The results were analyzed using the Analysis of Variance (ANOVA) to check whether variations in noise levels from various sources within the group and at different times of the day were significant. Given the significance of noise to the public, the 5% level of significance was appropriate for the statistical test. The results of LAeq8-17obtained provided a representation of overall temporal and spatial distribution of noise levels at each mill sampled. By use of tables, the LAeq8-17 were compared to the national legislated standards OSHA and WHO guidelines and their extent were determined by the level of deviations from the standards. Table 1 shows the cereal mills sampled for the study.

Table 1: cereal mills sampled for the study

Category of Cereal mill	site selected
Mill center at the Market:	Site A
Rice mill:	Site D
	Site B
	Site C
Domestic mills:	
	Site E
	Site F
	Site H

Determination of Ambient Noise

The ambient noise levels of the seven (7) different cereal mills were determined using a digital integrating Sound Level Meter, (MS6702). This is a Type 2 SLM which measures sound levels in accordance with IEC 651 Standards. The ambient noise level was determined at three different times of the day between: 9-10am, 12-1pm and 3-4pm. The mean of these determinations was calculated. The aim of the time determination was to ascertain if there were peak periods for noise levels in these places.

III. RESULTS

Result of the level of noise pollution in site "A" are summarized in Table 2.

Table 2: Noise levels variation at site "A" during the day

Days	time of the day	L_{peak}	L_{max}	L_{eq}	$L_{Aeq9-17}$
	9am – 10am	101.8	99.5	100.3	97.6
Day 1	12pm - 1pm	98.0	94.8	93.0	
	3pm – 4pm	98.9	97.2	96.6	
	9am – 10am	91.6	90.3	90.7	93.1
Day 2	12pm – 1pm	96.7	94.5	94.4	
	3pm – 4pm	104.6	100.0	93.5	
	9am – 10am	95.8	93.5	95.0	93.5
Day 3	12pm – 1pm	93.5	91.5	93.3	
	3pm – 4pm	96.5	88.6	91.4	

The levels indicated in the table are in dBA.

The average continuous equivalent noise level (LAeq8-17) values were calculated to be 97.6, 93.1 and 93.5dBA, and these exceeded the maximum permissible level of 85dBA set by (WHO, 2001) by 14.8, 9.5 and 10% respectively. This implies that the noise level at the cereal meals may have negative effect on the hearing ability of the millers.

Results of the level of noise pollution in site "B" are summarized in Table 3.

Table 3: Noise levels variation at site "B" during the day

Days	Time of the day	L_{peak}	L_{max}	L_{eq}	$L_{Aeq9-17}$
	9am -10am	98.2	94.6	95.8	94.5
Day 1	12pm – 1pm	99.6	96.8	94.3	
	3pm – 4pm	98.9	94.2	92.8	
	9am – 10am	90.6	89.8	90.0	92.8
Day 2	12pm – 1pm	96.2	94.1	93.8	
	3pm – 4pm	100.4	99.8	93.7	
	9am – 10am	94.6	92.5	93.6	92.3
Day 3	12pm – 1pm	93.8	91.4	92.2	
	3pm – 4pm	96.5	88.9	90.7	

The levels indicated in the table are in dBA

For sound level measurements at site "B", the average continuous equivalent sound level (LAeq8-17) values were calculated to be 94.5, 92.8 and 92.3dBA. These exceeded the maximum permissible level (WHO, 2001) by 11.2, 9.2 and 8.6% respectively. This implies that the noise levels at the cereal mills are higher than the permissible level and may have negative effect on the hearing ability of the millers.

Results of the level of noise pollution in site "C" are summarized in Table 4.

Table 4: Noise levels variation at site "C" during the day

Days	Time of the day	L_{peak}	L_{max}	L_{eq}	$L_{Aeq8-17}$
	9am – 10am	84.9	82.1	83.4	84.0
Day 1	12pm – 1pm	86.5	84.2	84.3	
	3pm – 4pm	85.2	84.4	84.3	
	9am – 10am	85.7	84.3	84.0	83.0
Day 2	12pm – 1pm	83.8	82.9	82.1	
	3pm – 4pm	84.5	82.4	82.6	
	9am – 10am	84.8	83.3	83.2	83.1
Day 3	12pm – 1pm	85.1	83.3	83.1	
	3pm – 4pm	84.5	82.7	83.0	

The levels indicated in the table are in dBA

The LAeq8-17values were calculated to be 84.0, 83.0 and 83.1dBA. These are below the maximum permissible noise level of 85dBA set by (WHO, 2001) by 1.8, 2.4 and 2.2% respectively. This implies that the noise level at the cereal mills is below the standard set by WHO, 2001.

Results of the level of noise pollution in site "D" are summarized in Table 5.

Table 5: Noise levels variation at site "D" during the day

Days	Time of the day	L_{peak}	L_{max}	L_{eq}	$L_{Aeq8-17}$
	9am – 10am	85.2	82.9	83.0	83.9
Day 1	12pm – 1pm	86.2	85.1	84.8	
	3pm – 4pm	84.9	84.0	83.8	
	9am – 10am	85.8	84.2	83.9	83.0
Day 2	12pm – 1pm	84.0	82.8	82.6	
	3pm – 4pm	84.3	82.1	82.4	
	9am – 10am	84.6	82.8	82.4	82.8
Day 3	12pm – 1pm	85.6	83.1	83.0	
	3pm – 4pm	84.7	82.7	83.1	

The levels indicated in the table are in dBA

The average continuous equivalent sound levels ($L_{Aeq8-17}$) values were calculated to be 83.9, 83.0 and 82.8dBA.These are below the maximum permissible noise level set by (WHO,2001) by 1.3, 2.4 and 2.6% respectively. This implies

Samuel Terhemba Kungur and Victor Akaazua Hanmaikyur, "Impact of Occupational Noise on Hearing Abilities of Cereal Millers in Katsina-Ala Metropolis, Benue State," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 3, Issue 11, pp. 1-4, 2021.

that the extent of noise level at site "D" may have little or no effect on the cereal millers but may interfere with speech, annoyance, and sleep disturbance.

Results of the level of noise pollution in site "E" are summarized in Table 6.

Table 6: Noise levels variation in site "E" during the day

Days	Time of the day	L_{peak}	L_{max}	L_{eq}	$L_{Aeq8-17}$
Day 1	9am – 10am	95.9	93.8	94.5	95.2
	12pm – 1pm	99.9	94.7	97.0	
	3pm – 4pm	95.3	92.5	93.4	
Day 2	9am – 10am	94.1	91.3	93.4	92.5
	12pm – 1pm	95.6	91.8	91.3	
	3pm – 4pm	97.1	94.2	92.6	
Day 3	9am – 10am	94.7	90.8	91.6	91.5
	12pm – 1pm	94.9	91.8	91.9	
	3pm – 4pm	95.9	93.7	91.0	

The levels indicated in the table are in dBA

The noise level at site "E" is higher than that of site "D", the $L_{Aeq8-17}$ value were calculated to be 95.2, 92.5 and 91.5dBA. This is higher than the maximum permissible level set by (WHO,2001) at 85dBA by 12, 8.8 and 7.6% respectively. These data shows that the noise level at site "E" may have negative effect on the hearing ability of the millers.

Results of the level of noise pollution in site "F" are summarized in Table 7.

Table 7: Noise levels variation at site "F" during the day

Days	Time of the day	L_{peak}	L_{max}	L_{eq}	$L_{Aeq8-17}$
Day 1	9am – 10am	95.2	93.4	94.6	94.9
	12pm – 1pm	98.7	93.8	96.4	
	3pm – 4pm	95.1	94.3	92.8	
Day 2	9am – 10am	94.7	92.8	93.1	92.5
	12pm – 1pm	96.4	93.7	91.6	
	3pm – 4pm	98.8	93.7	92.6	
Day 3	9am – 10am	94.3	91.2	90.3	91.0
	12pm – 1pm	94.8	90.6	91.9	
	3pm – 4pm	95.4	92.8	90.7	

The levels indicated in the table are in dBA

The average continuous equivalent sound levels ($L_{Aeq8-17}$) values were calculated to be 94.9, 92.5 and 91.0dBA.These are above the 85dBA maximum permissible noise level set by (WHO,2001) by 11.6, 8.8 and 7.1% respectively. This implies that the extent of noise level at site "F" may have effect on the hearing abilities of cereal millers.

Results of the level of noise pollution in site "H" are summarized in Table 8.

Table 8: Noise levels variation at site "H" during the day

Days	Time of the day	L_{peak}	L_{max}	L_{eq}	$L_{Aeq8-17}$
Day 1	9am – 10am	96.1	93.2	95.0	95.2
	12pm – 1pm	98.9	94.8	96.7	
	3pm – 4pm	96.2	93.1	93.4	
Day 2	9am – 10am	94.6	91.5	93.2	92.6
	12pm – 1pm	95.7	91.4	91.7	
	3pm – 4pm	96.8	94.3	92.7	
Day 3	9am – 10am	95.1	90.3	91.2	90.9
	12pm – 1pm	93.9	90.2	90.3	
	3pm – 4pm	96.7	93.6	91.0	

The levels indicated in the table are in dBA

Site "H" is among the mills generating high noise contravening the guideline set by WHO, 2001. The $L_{Aeq8-17}$ values were found to be 95.2, 92.6 and 90.9dBA and were 12, 8.9 and 6.9% above the maximum permissible noise level of 85dBA set by WHO, 2001.

This implies that the noise level at site "H" may have negative effect on the hearing ability of the millers.

IV. Discussion

It is not important to note that the cereal millers do not use any protective gears nor are they well aware of the possible health risks of noise pollution. However, occupational noise poses important health risks, and form one of the biggest industrial diseases. The paucity of regulatory measures against emission of loud noise and lack of protective gears by the cereal millers increase the health risk posed by the loud noise in them. In this study, seven cereal mills were used; five of the mills (site A, B, E, F and H) used diesel based engines to carry out the milling activities while the remaining two site (site C and D) used electric based engines for their daily activities which generated little amount of noise below the permissible noise level of 85dBA as set by WHO, 2001. Nevertheless the noise levels generated at the other five sites is significantly greater than the permissible noise level of 85dBA.

The noise levels generated at the cereal mills has a great effect on the cereal millers. 71.1% of the millers complained of been affected by the noise at the cereal mills and 6.7% complained of hearing loss. Noise induced hearing loss starts to manifest after 10-15 years of exposure (Arcadio and Gregoria, 2002). The 6.7% manifestation of hearing loss in this study is a big percentage considering that only 35.6% of the respondents had worked for more than 10 years.

The measured data indicated that most of the cereal mills exceeded the maximum permissible occupational noise levels thus putting public health at risk. And these noises was tested statistical using a one way ANOVA to check on the variation of noise on daily basis and was significantly proven that the workers were subjected to a constant level of noise at the cereal mills except for site E, F and H where it was statistically proven that the noise at these mills varied. However, sites E, F and H are domestic mills where the turn up of customers are not always many as compared to site A, B, C and D where the cereal millers are always busy with customers.

V. Conclusion

In conclusion, loud noise certainly endangers the health of cereal millers; the findings here provide further evidence which is consistent with similar work done by Sataloff , Sataloff and Yerg, 1983. Beyond impairment of hearing, loud noise affects several other physiological processes of the body as well as mental well-being. Hearing impairment similarly has its many psycho-physiological consequences. The concerned levels of Government will need to put policies in place and ensure strict compliance to protect different occupational groups, including the cereal millers whose business is becoming one of the fastest growing means of sustenance in the study area. Hopefully the findings will serve to inform the policy makers in government and the industry to institute control and safety measures to protect their workers

Samuel Terhemba Kungur and Victor Akaazua Hanmaikyur, "Impact of Occupational Noise on Hearing Abilities of Cereal Millers in Katsina-Ala Metropolis, Benue State," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 3, Issue 11, pp. 1-4, 2021.

and to raise the level of awareness of these workers on the health risks of their work environment and thus stimulate them to use protective gears. This will go a long way to help secure the growing population of the millers.

VI. RECOMMENDATIONS

In the light of the above analysis and findings, the study hereby advances the following recommendations that:

1. Workers should be subjected to hearing tests periodically.
2. Noise reduction protectors should be worn by workers to prevent direct exposure of the ears to noise at the work place.
3. Environmental monitoring agencies such as the National Environmental Standards and Regulation Enforcement Agency should make every effort to address the high noise level in the manufacturing sector by enforcing laws regarding high level of noise in manufacturing industry like the cereal mills.
4. Environmental Management Agencies should intensify inspection on the quality of ear protective devices in use in the manufacturing sector and create awareness of noise and its impacts on public health and welfare to help reduce irresponsible behaviors and exposure to dangerous noise levels.
5. National Environment and Management Agency should strictly ensure that noise control measures are included in the factory design, location of industries and selection of production processes.

ACKNOWLEDGEMENT

We sincerely express our appreciation to TETFUND for providing the funds and the College of Education, Katsina-Ala Management for providing an enabling environment for us to successfully carryout this research.

REFERENCES

[1] Adejobi, O.S (2012). Spatio-Temporal Analysis of Noise Pollution Levels in Lagos State: Oshodi- Agege Route Experience. *European Journal of Globalization and Development Research*, 5(1): 266-286.
[2] Acardio, P.S. & Gregoria, A.S. (2002). *A Design Approach*. London: Routledge.
[3] Ali, S.A. (2010). Industrial Noise Levels and Annoyance in Egypt. *Applied Acoustics.* doi:10.1016/j.apacoust.2010.11.001
[4] Alton, B. & Ernest, J. (1990). Relationship between loss and noise exposure levels in a large Industrial population: A review of an over looked study. *JAcousticSoc.Am,88.*
[5] Atmaca, E., Peker, I. & Altin, A. (2005). Industrial noise and its effects on humans. *Polish Journal of Environmental Studies,* 14(6), 721-726.
[6] Chisolm, T. H., Willott, J. F. & Lister, J. J. (2003). The aging auditory system: Anatomic and physiologic changes and implications for rehabilitation. *International Journal of Audiology*, 42(Suppl. 2), 23–25.
[7] Dettman, S. J., Pinder, D., Briggs, R. J. S., Dowell, R. C. & Leigh, J. R. (2007). Communication development in children who receive the cochlear implant younger than 12 months: Risk versus benefits. *Ear and Hearing,* 28(2, Suppl.), 11-18.
[8] Dorman, M. F. & Wilson, B. S. (2004). The design and function of cochlear implants. *American Scientist*, 92, 436-445.
[9] Ighoroje, A.D.A, Marchie. C. & Nwobodo, E.D. (2004). Noise Induced Hearing Impairment as an Occupational Risk Factor among Nigerian Traders. *Nigeria J. of Physiological Sciences* 9(1-2), 14-19.
[10] Mithanga, J., Gatebe, E. & Gichuhi, M. (2013). *Evaluation of Noise Levels in Manufacturing Sectors in Thika District, Kenya.* Unpublished MSc thesis, Juja: Jomo Kenyatta University of Agriculture and Technology.
[11] Sataloff , J., Sataloff, R.T. & Yerg, R.A. (1983). Intermittent exposure to noise; effects on hearing. *Annals of Otology, Rhinology and laryngology*, 92: 623 - 628.
[12] WHO. (2001). *Occupational and community noise, (Fact Sheet No. 258),* Geneva: World Health Organization.

Samuel Terhemba Kungur and Victor Akaazua Hanmaikyur, "Impact of Occupational Noise on Hearing Abilities of Cereal Millers in Katsina-Ala Metropolis, Benue State," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 3, Issue 11, pp. 1-4, 2021.