

Full Length Research Paper

Noise exposure levels and health implications on daily road side petty traders at some major roundabouts in Ibadan, Nigeria

Ogunseye T. T.*, Jibiri N. N. and Akanni V. K.

Department of Physics, Faculty of Science, University of Ibadan, Ibadan, Nigeria.

Received 24 October, 2018; Accepted 04 December, 2018

The level of noise exposure to daily road side traders at five major roundabouts in Ibadan metropolis was assessed. Noise measurements were made using a precision multi-function sound level meter. Measurements were made at three different periods of the day; morning (7:30 to 11:30 a.m.), afternoon (12:00 to 3:00 p.m.) and evening (4:00 to 5.00 p.m.) for a consecutive period of ten days. The highest mean maximum noise levels of 87.19 dBA (evening), 87.14 dBA (morning) and 87.35 dBA (afternoon) were obtained at Ojo, Iwo road and Dugbe roundabouts respectively while all the lowest mean minimum noise level for the periods of measurements were obtained at Sango roundabout. The results obtained were within the safe recommended 90 dBA for an 8 h exposure noise level by Occupational Safety and Health Administration. However, longer periods beyond 8 h may portend deleterious acoustic effects to these traders given the peculiar nature of the daily road side business activities and also being close to sources of noise from vehicles at these roundabouts

Key words: Noise exposure level, roundabout, noise health effects, road side petty traders.

INTRODUCTION

Noise may be defined as an unwanted sound emitted from different sources which is unpleasant to human hearing. Noise is produced in almost human activities and can be classified as either occupational noise (noise at workplaces) or environmental noise (noise from vehicular traffic). In Ibadan metropolis, noise pollution is a common environmental problem (Maduemezia, 2002). Noise emanating from vehicle is the most common type of noise pollution (Debasish and Debasish, 2012). Vehicular noise from highways and other roads is associated with the volume of traffic, the speed of the

traffic and the number of trucks in traffic flow. The negative effects of noise pollution are multifarious to human health. These include annoyance, insomnia, low productivity at work, permanent ringing or buzzing in the ears (tinnitus), sleep disturbance and fatigue, psychological stress and stress related disease, psychological changes in heart beat and increased blood pressure (Dawal et al., 2007; Akinkuade and Fasae, 2015). The most conspicuous effect of noise pollution is damage to human hearing ability which may be temporary or permanent depending on the exposure time (Morillas

*Corresponding author. E-mail: tseyetaofik@gmail.com.

Table 1. Maximum and minimum sound levels (dBA) at Sango roundabout.

7:30 - 11:30 am		12:00 - 3:00 pm		4:00 - 5:00 pm	
Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
73.86	69.14	81.72	73.92	81.62	73.04
77.34	69.66	82.34	73.72	81.64	72.50
74.42	66.70	72.88	65.00	79.44	72.59
77.10	66.18	76.26	71.74	84.48	76.32
74.58	65.25	81.14	75.32	76.44	70.40
75.14	64.38	77.62	67.30	80.48	68.82
74.16	66.68	78.14	66.88	80.10	65.42
72.04	68.84	77.16	65.50	80.30	67.50
76.64	65.36	81.92	65.86	78.84	69.30
78.72	69.22	83.36	71.62	71.22	62.56

et al., 2002; Sheetal et al., 2006). A report by World Health Organization (WHO) revealed that 16% of the disabling hearing loss in adults is attributed to occupational noise (Alsheli and Mohammed, 2015). Exposure to noise pollution affects millions of people worldwide on a daily basis. Numerous studies had been conducted with respect to noise exposure and its associated impact on workers worldwide (Rabinowitz et al., 2010; Sirajus et al., 2014). In Nigeria, the problem of noise exposure is widespread and this has led to the introduction of safety measures against noise pollution. According to the International Labour Organization (ILO), 85 dBA is set as the warning limit, while 90 dBA and above is set as the hazard limit with material risk. The standard measurement of noise exposure in relation to health of an individual in an environment should be in the range of 80 to 90 dBA. In a recent study of effects of noise on Nigerian workers, it was reported that 100% of workers which include the petty traders exposed to noise for a period of 14 years, developed hearing impairments (Ighoroje et al., 2004; Bisong et al., 2004). A similar result from a study was reported by Yesufu et al. (2013). A study conducted at Agbor, a city in Nigeria, revealed that noise from most areas in the city was caused by big trucks, luxurious buses and also during commercial activities (Anomohanran and Osemeikhian, 2006). Environmental noise pollution has serious health implications on Nigerian workers and very few reports of noise pollution studies are available in Nigeria. The aim of this study is to assess and evaluate the noise exposure levels at some major roundabouts in Ibadan metropolis and its health implications to road side petty traders who transact their business daily and also close to vehicular noise. It is envisaged that this study will be useful to assess the degree of impact of noise pollution on these road petty traders.

MATERIALS AND METHODS

Ibadan metropolis is located between longitude 3° 56' East of Greenwich Meridian and latitude 7° 23' North of the Equator. It has

a population of 1,338,659 according to the provisional census figure released by the National Population Commission (2006) covering an area of 128 km². The study was conducted in September 2016 at five different roundabouts in Ibadan metropolis. The major roundabouts considered were Ojoo, Sango, Iwo road, Dugbe and Challenge roundabouts. Noise level measurements were carried out at three different periods of the day; morning (7:30 to 11:30 a.m.) afternoon (12:00 to 3:00 p.m.) and evening (4:00 to 5:00 p.m.) for a consecutive period of ten days. The noise level measurements were carried out using a Precision Multi-function Environmental Meter (CEM Sound Level Meter, model DDT- 8820 with a serial number 11017778) and factory calibrated with a resolution of 0.1 dBA. The CEM Sound Level Meter measures accurate sound in decibels and displays the readings on the LCD display for easier viewing. Measurements of noise level exposure were made at some distances from the source of the sound. A total of 150 measurements each for maximum sound level L_{max} and minimum sound level L_{min} were recorded and the average sound level L_{ave} was calculated for each roundabout. The measurements were recorded at intervals of 30 s for a period of 30 min. An oral interview eliciting information on age and years of transacting business was also conducted on the road side petty traders at the roundabouts to determine their feelings and implications of being exposed to vehicular noise experienced daily. The characteristic nature of this type of traders in Ibadan and in most cities in Nigeria is that they transact their businesses in an outside open spaces of not more than 5m from the road. This exposes them not only to noise but to other daily hazards such as dust and vehicular fume emission pollution.

RESULTS AND DISCUSSION

The measured noise level at the five roundabouts (Sango market, Ojoo market, Iwo road market, Dugbe market and Challenge market) during the morning hours (7:30 to 11:30 a.m.), afternoon (12:00 to 3:00 p.m.) and evening hours (4:00 to 5:00 p.m) for consecutive period of ten days are presented in Tables 1 -5. The mean maximum noise levels and mean minimum noise levels for each roundabout are presented in Figures 1- 5. From Figures 1 to 5, the mean maximum noise level at the roundabouts ranged from 75.40 to 84.57 dBA, 77.35 to 87.35 dBA and 79.45 to 87.19 dBA while the mean minimum noise levels ranged from 61.14 to 73.09 dBA, 69.69 to 75.12 dBA and 69.84 to 74.78 dBA during the

Table 2. Maximum and minimum sound levels (dBA) at Ojoo roundabout.

7:30 - 11:30 am		12:00 - 3:00 pm		4:00 - 5:00 pm	
Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
82.60	73.20	88.14	74.04	83.30	73.84
80.72	71.62	84.52	73.20	82.58	73.06
80.70	71.74	88.54	74.76	86.00	76.54
83.32	72.88	82.82	71.60	86.28	74.48
78.46	72.14	81.56	72.46	90.76	76.26
80.34	74.80	88.08	74.84	83.22	73.12
83.84	71.66	93.02	79.70	91.52	79.20
82.24	73.70	81.72	73.92	86.06	65.16
81.08	70.96	87.62	71.86	87.12	72.30
83.20	70.78	85.98	75.42	87.08	71.60

Table 3. Maximum and minimum sound levels (dBA) at Iwo road roundabout.

7:30 - 11:30 am		12:00 - 3:00 pm		4:00 - 5:00 pm	
Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
86.16	72.94	87.42	71.83	90.28	78.18
86.82	77.46	84.42	74.24	85.08	79.24
78.50	70.06	83.98	77.46	81.60	68.68
82.26	73.50	79.40	63.06	79.24	70.32
85.88	78.76	95.02	76.42	87.86	72.96
86.38	72.68	88.58	75.00	90.88	75.94
85.36	71.38	84.60	76.00	88.12	71.50
81.64	68.46	83.92	77.90	92.60	74.26
88.58	76.70	84.58	77.00	85.76	75.98
84.14	68.96	86.40	78.40	90.48	76.86

Table 4. Maximum and minimum sound levels (dBA) at Dugbe roundabout.

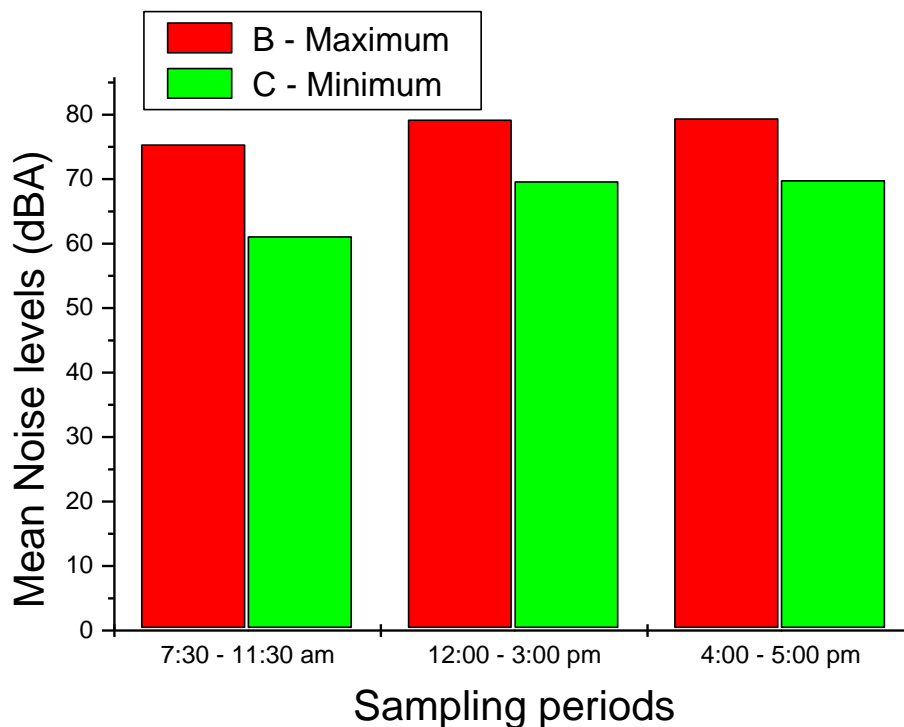
7:30 - 11:30 am		12:00 - 3:00 pm		4:00 - 5:00 pm	
Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
85.06	70.60	89.00	71.50	91.86	74.40
85.30	70.92	81.90	72.10	83.24	70.60
82.18	69.36	86.26	77.40	89.12	79.78
80.08	68.40	90.54	77.10	88.12	72.14
77.76	66.16	84.50	77.04	87.02	77.36
84.06	70.62	86.56	76.28	84.00	72.46
80.10	71.62	87.98	77.42	86.76	79.18
81.32	74.18	91.98	75.90	84.76	71.58
80.06	72.84	87.64	72.72	85.62	73.86
80.60	71.20	86.28	73.70	84.34	76.48

morning, afternoon and evening hours respectively. The highest mean maximum noise levels of 84.57 d BA, 87.35 d BA and 87.19 dBA were recorded at Ojoo, Dugbe and Iwo road roundabouts in the morning, afternoon and evening while the lowest mean minimum noise levels of

61.14 d BA, 69.69 d BA and 69.84 d BA were recorded at Sango roundabouts in the morning, afternoon and evening respectively. These low values of mean minimum noise levels recorded at Sango roundabout may be as a result of the peculiar nature of the roundabout. The

Table 5. Maximum and minimum sound levels (dBA) at Challenge roundabout.

7:30 - 11:30 am		12:00 - 3:00 pm		4:00 - 5:00 pm	
Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
82.82	70.02	86.28	71.52	86.30	73.90
81.64	66.14	83.20	72.86	77.30	66.76
79.46	69.76	83.48	71.56	81.86	71.20
77.22	69.08	90.20	72.78	86.34	71.26
83.70	69.66	88.10	74.48	88.40	75.74
77.72	66.36	84.26	71.42	82.32	72.64
82.00	66.02	90.00	78.18	85.04	72.00
80.02	70.52	87.52	71.90	84.92	72.00
79.02	68.90	91.60	79.34	84.76	73.00
77.68	64.92	85.58	72.94	82.04	69.28

**Figure 1.** Mean maximum and minimum noise levels at Sango roundabout.

roundabout is not located at the commercial area of the town and also only light vehicles not trucks pass through it unlike Iwo, Ojoo and Dugbe roundabouts. The high values of mean maximum noise levels recorded at Ojoo, Dugbe and Iwo road roundabouts may be attributed to the fact that the volume of vehicles plying the network of roads was very high and that the traders have the highest patronage around the time frame. Although these values fall within the recommended noise level of 90 dBA by Occupation Safety and Health Administration (OSHA) and Federal Environmental Protection Agency (FEPA) (FEPA, 1991) which is presented in Table 8, the petty

traders may be prone to Noise Induced Hearing Loss (NIHL) and other associated ailment due to excessive exposure to noise. A number of studies observed a strong positive correlation between high noise exposure and the NIHL (Ahmed et al., 2001; Sulkowski and Kowalska, 1986; Ashraf et al., 2009; Belachew and Berhani, 1999; Osibogun et al., 2000; Yildirim et al., 2007). Table 6 shows the age distribution of the interviewed petty traders. The distribution of the petty traders according to their ages was: 20% were 30 to 35 years, 36% were 36 to 40 years and 41 to 60 years were 44%. This shows that majority of the petty traders are

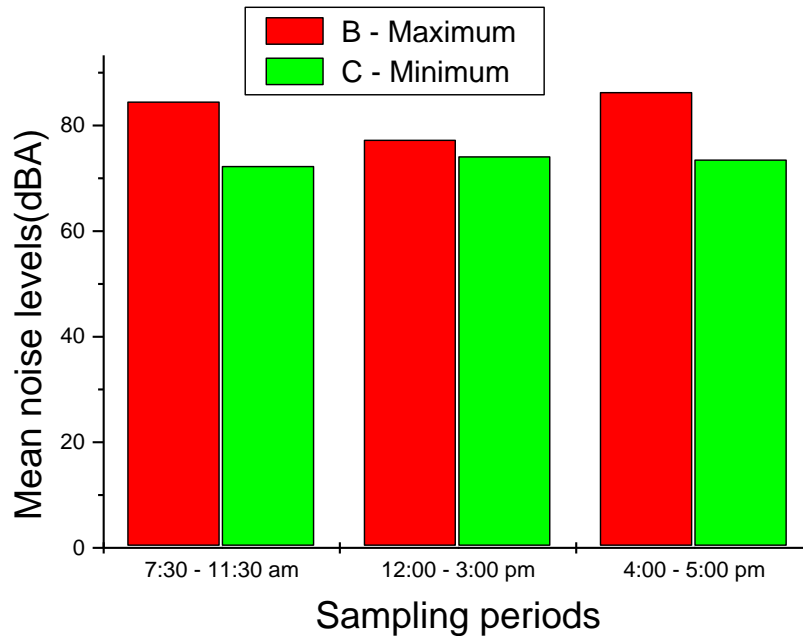


Figure 2. Mean maximum and minimum noise levels at Ojoo roundabout.

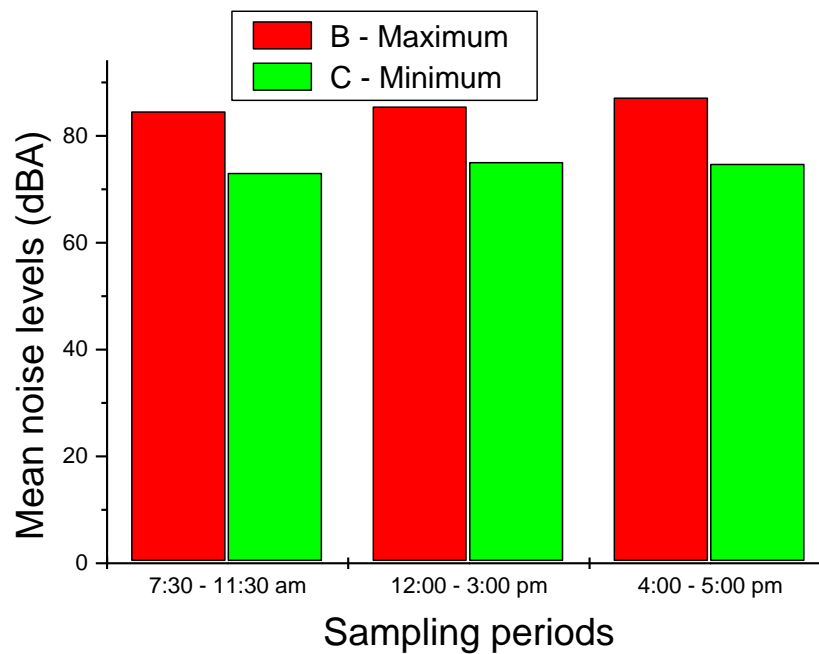


Figure 3. Mean maximum and minimum noise levels at Iwo road roundabout.

within the age bracket of 41 to 60 years. Table 7 presents the responses of the respondents to ascertain the number of years of exposure to noise pollution at the roundabout. The results show that a significant percentage (40%) of the petty traders had spent between 5-10 years doing business at the roundabout and may be therefore prone to NIHL. The interaction with the roadside

petty traders also revealed that they felt discomfort due to noise produced by vehicles around the roundabouts. The roadside petty traders and people living around were exposed to excessive noise and may be prone to noise associated health effects such as hypertension, strokes, heart attacks, gastric ulcer and increase in blood pressure.

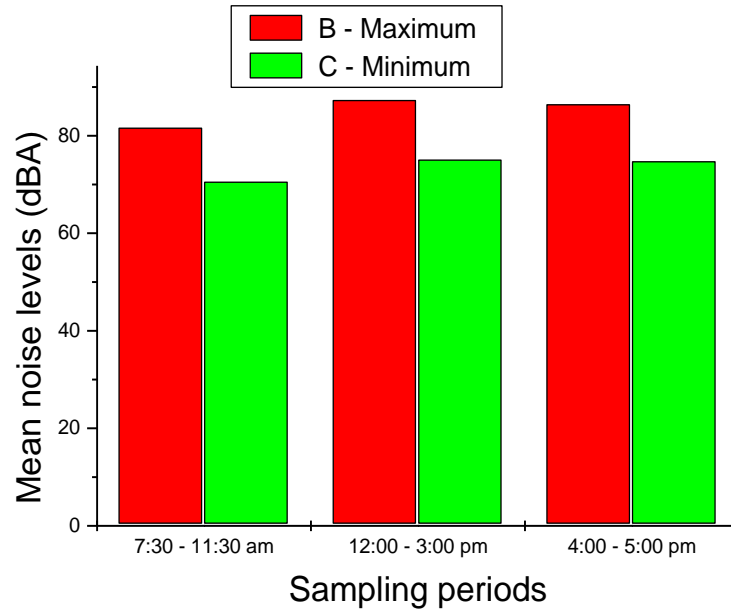


Figure 4. Mean maximum and minimum noise levels at Dugbe roundabout.

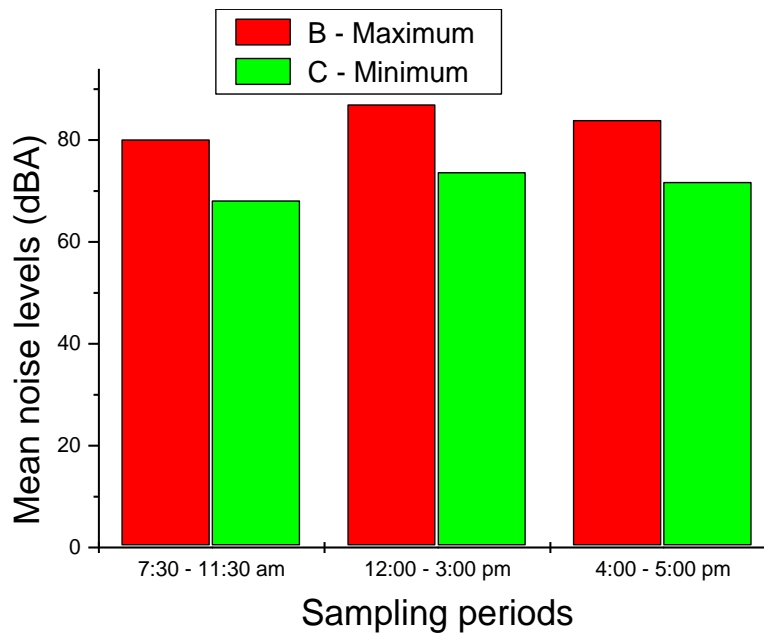


Figure 5. Mean maximum and minimum noise levels at challenge roundabout.

Conclusion

The level of noise exposure to road side petty traders being exposed to noise at five selected roundabouts in Ibadan metropolis has been carried out. This study shows that the level of daily noise exposure was within the recommended limit of 90 dBA. However, by

continuous exposure to excessive noise emitted by moving vehicles, these road side petty traders may in future experience hearing loss. It is therefore suggested that road side traders should be encouraged to use personal protective equipment such as ear plugs to minimize noise and be educated on noise induced hearing loss and other non-auditory effects of noise

Table 6. Age distribution of the interviewed petty traders.

Age-group	Frequency	Percentage
30-35 years	5	20
36-40 years	9	36
41-60 years	11	44
Total	25	100

Table 7. Number of years spent at the roundabout by the interviewed petty traders.

Years of exposure	Frequency	Percentage
1-4 years	7	28
5-10 years	10	40
11-20 years	6	24
21-25 years	2	8
Total	25	100

Table 8. Nigerians standard noise levels.

Hours per day	Permissible Exposure Limit (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

exposure; regular inspection and noise level tests on vehicles should be carried the relevant regulatory government agencies at both the State and Federal levels in Nigeria.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

- Ahmed HO, Dennis JH, Badran O, Ismail M, Ballad SG, Ashoor A, Jerwood D (2001). Occupational noise exposure and hearing loss of workers in two plants in eastern Saudi-Arabia. *Annals of Occupational Hygiene* 45(5):371-380.
- Ahmed AA, Awadalkarim MA (2015). Noise exposure in two textile plants in Sudan. *European Scientific Journal* 11(5).
- Akinkuade ST, Fasae KP (2015). A Survey of Noise Pollution in Ado-Ekiti Metropolis Using Mobile Phone. *Natural Science* 7:475-482.
- Alshebli AA, Mohammed AA (2015). Noise Induced Hearing Loss at Two Textile Plants in Sudan. *European Academic Research* 2(11):13995-14006
- Anomohanran O, Osemeikhian EA (2006). Day and Night Pollution Study in Some Major Towns in Delta State, Nigeria. *Ghana Journal of Science* 46:47-54.
- Ashraf HD, Younus MA, Kumar P, Siddiqui MT, Ali SS, Siddiqui MI (2009). Frequency of hearing loss among textile industry workers of weaving unit in Karachi, Pakistan. *Journal Pakistan Medical Association* 59:575-579
- Belachew A, Berhane Y (1999). Noise-induced hearing loss among textile workers. *The Ethiopian Journal of Health Development* 13:69-75.
- Bisong AS, Umana NA, Onoyom-Ita V, Osim EE (2004). Hearing Acuity Loss of Operators of Food Grinding Machines in Calabar, Nigeria. *Nigerian Journal of Physiological Sciences* 19(1-2):20-27.
- Dawal SZ, Taha Z, Ismail Z (2007). Influence of Environmental Factors on Job Satisfaction in Malaysian Automotive Industries. *Journal- The Institute of Engineers, Malaysia* 69:3.
- Debasish P, Debasish B (2012). Effect of road traffic noise pollution on human work efficiency in Government Offices, Private Organizations, and Commercial Business Centres in agartala city using fuzzy expert system: a case study. *Advances in Fuzzy Systems* 2012:8. doi: 10.1155 / 2012 / 828593.
- Federal Environmental Protection Agency (FEPA) (1991). National guidelines and standard for industrial effluents, Gaseous emission and hazardous waste in Nigeria. Federal Environmental Protection Agency (FEPA) 52 p.

- Ighoroje AD, Marchie C, Nwobodo ED (2004). Noise-Induced as an Occupational Risk Factor among Nigerian Traders. *Nigerian Journal of Physiology Science* 19(2):14-19.
- Maduemezia A (2002). Physics, Health and the Environment. Invited paper presented at the 25th annual conference of the Nigerian Institute of Physics held at the Physics Advanced Laboratory, Sheda Science and Technology Complex, Abuja.
- Morillas BJM, Escobar GV, Sierra MJA, Gomaz VR, Carmona TJ (2002). An environmental noise study in the City of Caceres, Spain. *Applied Acoustics* 63:1061-1070.
- Osibogun A, Igweze IA, Adeniran LO (2000). Noise-induced hearing loss among textile workers in Lagos Metropolis. *The Nigerian Postgraduate Medical Journal* 7(3):104-111.
- Rabinowitz PM, Galusha D, Kirschie SR, Cullen MR, Slade MD, Dixon-Ernst C (2010). Effect of Daily Noise Exposure Monitoring on Annual Rates of Hearing Loss in Industrial Workers. *Occupation Environment Medical* 68:414.
- Sheetal A, Swami BL, Deepak M (2006). Analysis of traffic noise spectra for urban roads- a case study. *International Journal of Civil Engineering* 3(5):76-79.
- Sirajus S, Nazmul- Islam KM, Alam MS, Hossain MM (2014). Industrial Noise Level in Bangladesh; Is Worker Health at Risk? *Polish Journal Environment Studies* 23(5):1719-1726.
- Sulkowski W, Kowalska SL (1986). A permanent noise-induced shift in the auditory threshold in textile industry workers. *Medycyna pracy* 7:175-186
- Yesufu AL, Aina GR, Yawei Z, Umar OZ (2013). Work Environment Noise Levels and Risk Locations in Two Selected Commercial Areas in Ibadan, Nigeria. *Global Journal of Medical Research* 8(6):25-34.
- Yildirim I, Kilinc M, Okur E, Tolun FI, Kilic MA, Kurutas EB, Ekerbicer HC (2007). The effects of noise on hearing and oxidative stress in textile workers. *Industrial health* 45(6):743-9.