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Research Paper

Sources, Level and Impact of Noise Pollution on Markets Women in Ibadan, Oyo State, Nigeria

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Abstract. This study examined the sources of environmental noise, the level of noise pollution and impact of noise on market women exposed to environmental noise in Ibadan metropolis. The study adopted a survey research design. Six markets (Bodija, Ogunpa, Sango, Dugbe, Mokola and Ojoo) were sampled within Ibadan metropolis, and two hundred and fifty (250) market women participated in the study. Three (3) research questions were raised and answered. Data were collected through a structured questionnaire tagged "Influence of environmental noise on the auditory performance and productivity of the market women research scale" with a reliability coefficient of 0.86. Data collected were analysed using frequency counts and percentages. The findings revealed the sources of noise in the markets within Ibadan metropolis to include noise from: vehicles, people, religious centres/activities, machines, generators, and the use of public address system for product advertisement; as well as incessant loud shouts/calls on intending buyers/customers towards calling for sales. It also revealed that there is high level of noise generally in the selected markets, as Bodija, Dugbe and Sango markets ranked the high category of markets with higher noise level, compared to the low noise making category of markets; which are Ogunpa, Ojoo and Mokola markets. Although, Bodija market has the highest noise level, while Mokola market has the lowest noise level. The study also showed that Exposure to noise in the markets sampled significantly affected the auditory performance of the market women, with 80.0% of the respondents having reduction in hearing perception and reduced productivity due to auditory fatigue and noise-related stress. Some of the recommendations are that the market women should endeavour to preserve their hearing through hearing conservative protocols, and that government should, as a matter of urgency ensure compliance with the activities to control noise in the markets.

Keywords: Auditory performance, environmental noise, job-related stress and productivity, hearing conservation, hearing loss and market women in Ibadan metropolis.

INTRODUCTION

Noise is one of the most pervasive occupational health problems and a by-product of many activities across the globe. Noise is very harmful and deleterious in nature to human hearing system and functions. Noise is a health-threatening phenomenon, which often affects the health, safety, productivity and leisure of human being. Thus, whenever any sound signal that is appreciably louder than conversational level is generated within an environment may result to temporary hearing loss or temporary threshold shift (TTS) on the part of listeners, because such sound possesses oto-destructive properties or characteristics which are harmful to the listener, and if it continues it can lead to permanent threshold shift (PTS) or permanent hearing loss is noise (Osisanya, and

Ojetoyinbo, 2014; Boateng and Amedofu, 2004; Oyedepo, 2012; Basorun and Olamiju, 2013). Evidently, in the human environment noise is audiologically regarded as unwanted sound as well as potential health hazard to both the health and communication status of those who are exposed to it. To this end, noise has been reported to be an environmental pollutant ravaging the human environment due to improved human environment and activities, as well as technological advancement (Osisanya, 1998; Osisanya *et al*., 2014; and Osisanya, 2017). Similarly, Basorun and Olamiju (2013) have reported that noise is increasingly being judged as an important environmental public health issue that has achieved a dangerously alarming proportion and proven hazardous in all spheres of life, and market places are not exceptions. Either noise is continuous or intermittent, high frequency or low frequency, it will still be unwarranted and undesirable for a normal hearing. Evidently, in the human environment noise is audiologically regarded as unwanted sound as well as potential health hazard to both the health and communication status of those who are exposed to it (Osisanya, 1998; Osisanya and Obalola, 2015). Noise is dumped into the environment without regards to the adverse effects it may cause to unwilling listeners. Oyedepo (2012) reported that noise pollution in Nigeria cities is relatively higher when compared with recommended levels by World Health Organization. In the same vein, exposure to noise may destroy the hair cells and reduce the nutrient and oxygen in the inner ear thereby placing a greet impingement on the occupational performance of the workers in such environment (Fada and Osisanya, 2017). Additionally exposure to noise has been observed to have some deleterious effect on the health, hearing mechanism and psycho-social well-being of people working within the noise ravaging environment (Adesokan and Osisanya, 2019). Clark and Stanfeld (2007) have also registered their concern over the intensity of noise in market places that has increasingly become an environmental public health concern. The produced sound may contain properties that are pleasant or harsh, orderly or discordant, palatable or discomforting depending on the psychology and configuration of the listener and the consistency and intensity of the sound produced or both.

Markets in big cities, commonly open-air and rowdy, attract huge number of people and characterized by all kinds of activities that generate a lot of noise. The market environment is being overshadowed by an array of pollutants (Basorun and Olamiju, 2013) because they are characterized by different forms of activities that generate noise from the generators, loudspeakers, grinding machines, blade filing engines, vehicles, religious activities, buying and selling of foodstuffs and other items and so on, all polluting the environment and in turn affecting the auditory performance of market women, thereby leading to hearing impairment. In the view of Olokooba *et al.* (2010), the rowdy market scenes, the whining clatter of grinding machines, the second-hand cloth seller screams his genius, the sirens of important government functionaries, indiscriminate use of mobile phones are some of the sources of unwarranted noise around the market places. Oyedepo (2012) also reported that Nigerian cities, and by extension the markets therein, are environmentally noise polluted.

Noise intensity (loudness) is measured in decibels (dB). The decibel scale is an abstract unit, with decibel representing a logarithmic scale based on the intensity of the stimulus (using sound pressure measurement). Decibel is a standard measurement of sound as whisper measures 20dB while noise in quiet office measures 40dB, the normal conversation measures 60dB and a level of sound above 80dB is referred to as noise (Miglani, 2010). Abumere *et al.* (1999) submit that apparent subjective loudness of a stimulus is therefore a function not just of the intensity but also of the duration, variation of intensity, and frequency of the sound waves. Oyedepo (2012) ascertained that the normal hearing threshold is 20-25dB and that of a normal conversation is 60dB.

There are many types and varied sources of noise in the modern-day markets. Cognizance must be taken of the facts that the basic activities in the markets are buying and selling. In this case, buyers must do everything heavenly possible to attract buyers, by making a ‘shout out’ to the buyers. Excessive noise in market places is coming from those using music to promote sales of their wares (Anomohanran and Osemeikhian, 2005). One could simply imagine, or better still, experience the noise coming from thousands of sellers that are making a shout out at thousands f buyers as their customers

Religion-based noise is one of the major sources of noise in the markets. Congregational worship is another source of noise in the markets. Nigerian are so religious to the extent that markets have Mosques for Muslim prayers at the designated times. Christian preachers are also always available to win souls for the Lord. Singh and Davar (2004) identified the use of public address system used by Mosques as a major source of noise. Christians also use public address system (Loudspeakers) during preaching activities in the markets. Nigeria is a multi- religious society and is therefore prone to religious activities. Noise from the loudspeakers, automobiles and religious functions act as significant sources of noise pollution (Singh, 1984).

As the supply of electricity by Government Agencies is erratic, the need for electricity generating plants in the market places, especially for grinding machines and other equipment is inevitable by market women, to generate the needed electricity through generating plants without considering the attendants effects. Olokooba *et al*. (2010) observed that the noise from generators is equally hazardous. Also, noise coming from the use of electricity generators could be compounded by noise from those using music to promote sales of their wares (Anomohanran and Osemeikhian, 2005).

Noise from transport is another increasingly prominent feature of the urban environment (Clark and Stansfeld, 2007). Noise arising from road traffic can be attributed to the large number of automotive vehicles in comparison with other machines. Oyedepo (2012) has reported that Nigerian cities, and by extension the markets therein, are environmentally noise polluted and road traffic is a major noise source. Traffic noise has become a serious problem nowadays because of inadequate urban planning of the cities (Debasish and Debasish, 2012). The most rigorous and pervasive type of noise pollution that has been a predominant source of annoyance is traffic noise (Öhrström and Skånberg, 2004). Traffic noise is harmful to the health of almost one third population in the WHO European Region (WHO, 2012). Sources of traffic noise include sound from automobiles such as trucks, cars, motorcycles. Noise from road traffic can be augmented by the narrow streets and tall buildings which produce canyon in which traffic noise re-vibrates (Miglani, 2010). Urban markets are also exposed to noise from emergency vehicles like ambulance, fire fighters, sirens from security agents and top government officials' vehicles as well as blaring horns at gridlock. It is believed that sound at the level of 80db and above has become physically irritating, yet this sound is still considered not to be as loud as traffic noise on a busy street.

The intensity of the noise in market places has increasingly become an environmental public health issue (Clark and Stanfeld, 2007) because market noise is one of the major environmental pollutants that have direct effects on human performance (Debasish and Debasish, 2012) and a major burden on the quality that are exposed to it (Singh & Davar, 2004). Persistent exposure to high level of noise like what pervades market places is injurious to health (Boateng and Amedofu, 2004; Oyedepo, 2012; WHO, 2012) and may have serious detrimental effects on the market women. A substantial number of people have hearing loss as a complication of high levels of noise (Abumere *et al*., 1999). Hearing impairment may happen because of noise pollution whenever the sound level goes beyond tolerable level; when the human ear when exposed to a sound that goes over 100dB for certain period of time might be permanently damaged (Clark and Stansfeld, 2007).

To understand hearing process, it is imperative to analyze the function of sensory cells in the inner ear. Sound waves enter the outer ear and travel through the ear canal to the eardrum. The eardrum vibrates from the incoming sound waves, and vibrations are sent to the middle ear, where the ossicles in the middle ear (malleus, incus and stapes) amplify these sounds. These vibrations are then sent to the cochlea (inner ear). The cochlea is fluid-filled organ with an elastic membrane called the basilar membrane. Sensory cells (outer and middle hair cells) sit on top of the basilar membrane. The vibrations sent to the inner ear lead to a travelling wave along the basilar membrane, resulting from the electro motility of the outer hair cells. This motion causes bristly structures (stereocilia) on top of the inner hair cells to bump up against an overlying membrane (tectorial membrane) and deflect. This causes the inner hair cells to depolarize and release neurotransmitters across the synapse between the inner hair cells and the auditory nerve fiber. Here, the sound waves are changed into electrical signals. These signals are carried by the auditory nerve to the brain. In the brain, the signal is translated into sound perception, and if the received signal is excessively high, can damage the ear, leading to permanent hearing loss. In most cases, exposure to noise could lead to tinnitus; a continuous ringing in the ear or head without any external corresponding sound signal, and it may be in form of low pitched, mild or high pitched sound, which may begin suddenly or gradually in nature (Osisanya, 2019).

Evidences abound that constant exposure to noise can damage sensitive structures in the human ear resulting in hearing loss (Bugliarello *et al*., 1976; Miller, 2000; Donatelle, 2002). Noise-induced hearing loss results from damage of the cells of the cochlea in the inner ear arising from continuous exposure to occupational noise (Rabinowitz, 2000). The observed increase in noise level in metropolitan cities is responsible for rising incidence of deafness among the inhabitants (Bhargava, 2001), and this causes decrease in one's ability to hear, as the quality and clarity of auditory perception is affected. While these effects are often temporary, it is not uncommon for some residual permanent damage to persist for the remainder of the affected person's life. Hearing loss interferes with the ability to communicate. Beyond the obvious impact of hearing impairment on communication, potential consequences of unmanaged hearing loss include limitations of activities, interference with independent living and safety issues (Debasish and Debasish, 2012).

Nowadays, across the globe, noise has become a major environmental issue, particularly in urban areas, affecting a large number of people. It poses a serious threat to the auditory performance of market women that are usually exposed to it for more than eight hours each a day. Noise as an environmental pollution has many sources and levels of intensity in our market places confronting the large population of the market women engaging in outdoor trading activities has no form of environmental noise control. There are various effects and consequences of long exposure to noise, among which are communication distortions, poor job performance, ill-health status, inter-personal relationships among the traders, hearing impairment and subsequently, hearing loss. It is against this that the study seeks to examine the sources of environmental noise within the markets, its perceived level or intensity, and hearing loss among the market women in Ibadan metropolis as a major effect.

Thus, this study determined the consequences of environmental noise pollution on the auditory performance

of the market women in Ibadan. The specific purpose of this study includes to:

1. determine the sources of noise pollution in the markets sampled
2. assess the level of environmental noise generated within the sampled markets.
3. investigate the influence of environmental noise on the auditory performance of the market women.

This study will help market women in awakening their consciousness of the impact of environmental noise which they have taken with levity. It will serve as enlightenment and encouragement for market women market to embark on the need for regular audio logical screening so as to evaluate their auditory performance from time to time and for medical corrections if the need arises, for proper care and support. It will also be useful to the general public who patronize the markets regularly on the damage that exposure to excessive noise could do to their hearing capacity and also ginger them to plan on how to avoid the dangers. The study will also serve as repertoire of information to policy makers in the Ministries of Environment to either consolidate or re-think ways of hearing conservation; serving as a catalyst to ensure that necessary control measures are instituted to prevent hearing in the markets. The results of the study will also add to the existing body of knowledge on the issue and dangers of unwarranted noise in the markets.

RESEARCH QUESTION

1. What are the sources of noise pollution in the markets sampled?
2. What is the level of noise generated in the sampled markets?
3. What are the impacts of noise on the auditory performance of market women exposed to environmental noise?

METHODOLOGY

Descriptive survey research design was adopted for the study. A total of 250 market women from six different market locations within Ibadan; Bodija, Ogunpa, Sango, Dugbe, Mokola and Ojoo, were the sample, using Purposive sampling techniques. Influence of environmental noise on the auditory performance and productivity Research Scale (IENAPPRS) - a 30-item questionnaire with reliability co-efficient of 0.86, and a Sound Level Metre were the two instruments used to collect data in the study. The questionnaire was administered on the market women, as the illiterate ones were assisted towards attending to the items in the questionnaire.
Frequency counts and percentage were used in analyzing the data generated.

RESULTS

Answering the Research questions

Research question 1: What are the sources of noise pollution in the sampled markets?
Table 1 revealed that 233 respondents indicated that vehicles are sources of noise pollution as against 16 respondents who indicated that vehicles are not sources of noise pollution while 1 respondent is indifferent to the construct, 210 respondents indicated people as the source of noise pollution as against 34 respondents who did not indicate people as the source of noise pollution, while 6 respondents are indifferent to the construct, 152 respondents indicated animals as the sources of noise pollution as against 84 who indicated that animals are not sources of noise pollution while 14 respondents are indifferent to the construct, 156 respondents revealed that religious places are sources of noise pollution as against 81 respondents who revealed that religious places are not sources of noise pollution while 13 respondents are indifferent to the construct, 208 respondents revealed machines as sources of noise pollution in the market as against 40 respondents who revealed that machines are not major sources of noise pollution while 2 respondents are indifferent to the construct, 209 respondents indicated that product advertisement is a source of noise pollution as against 35 respondents who indicated that product advertisement is not a source of noise pollution while 6 respondents are indifferent to the construct and 221 respondents revealed that others such as loud music are sources of noise pollution as against 24 respondents who revealed that others are not sources of noise pollution while 5 respondents are indifferent to the construct.

Research question 2: What is the level of noise generated in the sampled markets?
The level of noise generated in the sampled markets as indicated in Table 2 shows that Bodija market had 105.5dBA as the level of noise generated, Dugbe market had 100.5dBA as the level of noise generated, Sango market had 99.3dBA as the level of noise generated, Ogunpa market had 95.1dBA as the level of noise generated, Ojoo market had 90.1dBA as the level of noise generated, while Mokola market had 89.5dBA as the level of noise generated. Based on the measure of sound level meter employed to survey the noise level, it is concluded that Bodija market had the highest noise level in all the six markets sampled, while Mokola market had the lowest level of noise generated.

Table 1: Different sources of noise pollution in the sampled markets

Sources of Noise pollution	Yes	No	I do not know
Vehicles	233 (93.2%)	16 (6.4%)	1 (0.4%)
People	210 (84%)	34 (13.6%)	6 (2.4%)
Animals	152 (60.8%)	84 (33.6%)	14 (5.6%)
Religious place	156 (62.4%)	81 (32.4%)	13 (5.2%)
Machines	208 (83.2%)	40 (16%)	2 (0.8%)
Product advertisement	209 (83.6%)	35 (14%)	6 (2.4%)
Others (vehicles, public address system)	221 (88.4%)	24 (9.6%)	5 (2%)

Table 2. Level of noise generated in the sampled markets

MARKET	dBA
Bodija market	105.5dBA
Dugbe market	100.5dBA
Sango market	99.3dBA
Ogunpa market	95.1dBA
Ojoo market	90.1dBA
Mokola market	89.5dBA

Table 3: Impacts of Noise on the market women sampled

Impact of Noise	Yes	No
Reduction in hearing perception	200 (80%)	50 (20%)
Difficulty in understanding what is being said	167 (66.8%)	83 (33.2%)
Annoyed when felt that people do not speak loud enough	167 (66.8%)	83 (33.2%)
Watch facial expression when someone is talking to you	75 (30%)	175 (70%)
Regular complaint about your hearing ability	183 (73.2%)	67 (26.8%)

Research question 3: What are the impacts of noise on the auditory performance of market women exposed to environmental noise?

Table 3 revealed that 200 respondents had reduction in hearing perception as against 50 respondents who had a perfect hearing ability, 167 respondents had difficulty in understanding what is being said as against 83 respondents who had no difficulty in understanding what is being said, 167 respondents got annoyed when felt that

people do not speak loud enough as against 83 respondents who do not get annoyed, 75 respondents watch facial expression when someone is talking to them as against 175 respondents who do not watch facial expression when someone is talking to them while 183 respondents had regular complaint about their hearing ability as against 67 respondents that had no complaint about their hearing ability.

DISCUSSIONS

Findings have revealed the various sources of noise in the selected markets within Ibadan metropolis. It has shown that vehicles are sources of noise pollution in the various markets. Clark and Stansfeld (2007) have earlier identified noise from transport as another increasingly prominent feature of the urban environment. Oyedepo (2012) has also claimed that noise arising from road traffic can be attributed to the large number of automotive vehicles. Traffic noise has become a serious problem nowadays because of inadequate urban planning of the cities (Debasish and Debasish, 2012). The most rigorous and pervasive type of noise pollution is traffic noise, in the opinion of Öhrström and Skånberg (2004). Sources of traffic noise include sound from automobiles such as trucks, cars, motorcycles. Miglani (2010) had reported noise from road traffic vibrating. Urban markets are also exposed to noise from emergency vehicles like ambulance, fire fighters, sirens from security agents and top government officials' vehicles as well as blaring horns at gridlock. People have also been identified as a major source of noise pollution in the markets. This is because thousands of sellers must make shouts out to thousands of potential buyers; as buyers must do everything possible to attract buyers. Religious activities were also named as culprits in the noise pollution saga. The views of Singh and Davar (2004) that the use of public address system used by Mosques and Christian preachers is in support of this finding. In fact, Singh (1984) had earlier aired his finding that noise from the loudspeakers during religious functions act as significant sources of noise pollution.

Machines were also identified as sources of noise pollution in the market. Prominent among such machines in the markets are grinding machines. This finding is in the same line with that of Olokooba *et al*. (2010), when they have earlier observed that the noise from machines and generators is intense and hazardous. It was also found that product advertisement is a major source of noise pollution. Market women have been found to use loud music in shouting out to their customers. Anomohanran and Osemeikhian's (2005) submission that excessive noise in market places is coming from those using music to promote sales of their wares, supports this finding.

Findings have also identified the level of noise generated in the sampled markets, showing that there is high intensity of noise in the selected markets. Bodija, Dugbe and Sango markets have the highest noise level compared with Ogunpa, Ojoo and Mokola markets. The baseline is that all the sampled markets within Ibadan metropolis are noisily polluted. Clark and Stanfeld (2007) have supported this finding with their submission that the intensity of the noise in market places has increasingly become an environmental public health issue. Debasish and Debasish (2012) also added to this that market noise is one of the major environmental pollutants.

Markets environment are unnecessarily made to be noisy without regards to the adverse effects it may cause to unwilling listeners. The submission of Oyedepo (2012) that noise pollution in Nigeria cities is relatively higher when compared with recommended levels by World Health Organization supports this finding. Clark and Stanfeld (2007) have also identified the intensity of noise in market places that has increasingly become an environmental public health concern.

Findings have revealed the imparts of noise on the market women, that majority of the market women had reduction in hearing perception and complaint about their hearing ability as against fewer number who had a perfect hearing ability. With the intensity of noise found in the selected markets, that majority of the women are suffering from partial hearing loss is not shocking as evidences abound (Bugliarello *et al.*, 1976; Rabinowitz, 2000; Miller, 2000; Donatelle, 2002) that constant exposure to noise can damage sensitive structures in the human ear resulting in hearing loss. The observed increase in noise level in metropolitan cities is responsible for rising incidence of deafness among the inhabitants (Bhargava, 2001). Hearing loss interferes with the ability to communicate; trying to explain a compound task to a person who has deficiency in hearing could be very difficult. This is usually the case buyers face when trying to communicate with sellers who has deficiency in hearing. A substantial number of people have hearing loss as a complication of high levels of noise (Mathias *et al*., 2013). Olaosun *et al.* (2009) supported this position by submitting that hearing loss due to prolonged noise exposure is generally associated with destruction of the hair cells of the inner ear. Similarly, the study corroborates Boateng and Amedofu, (2004) who reported that increase in noise level in metropolitan cities above specified standard limits was identified to be responsible for rising incidence of deafness among the inhabitants.

Summary of findings

This study has shown that:

1. Findings have identified the various sources of noise in the selected markets within Ibadan metropolis to include; vehicles, people, religious activities, machines, generators, and the use of

2. loud music for product advertisement shouting out to their customers to promote sales of their wares.
3. There is high level of noise generally in the selected markets, with Bodija, Dugbe and Sango markets having the highest noise level compared with the Ogunpa, Ojoo and Mokola markets. Bodija has the highest noise level while Mokola has the lowest.
4. Exposure to noise in the markets sampled significantly affects the auditory performance of the market women, with 80.0% of the respondents having reduction in hearing perception.

CONCLUSION

Noise around the market place has been found to come from various sources including vehicles, people, religious activities, machines, generators, and the use of loud music for product advertisement shouting out to their customers to promote sales of their wares. The levels of noise in the selected markets are of high intensity with degree of consequences and effects on the market women. Effects of noise on the women included damage to the auditory performance of market women, headache, hypertension, inability to sleep at night, hearing impairment and consequently, hearing loss. There are control measures instituted by market association towards hearing conservation in the market, but many of the market women took such measures with levity.

RECOMMENDATIONS

It is recommended in this study that health educators should organize sensitization programs to educate the populace on the health effects of noise pollution; there should be seminars to include education on the risk of noise to the ears and the enforcement of wearing ear protection devices to avoid damage to the auditory system. It is also recommended that market women should endeavor to preserve their hearing through hearing conservative protocols; adding noise barriers, noise enclosures, vibration isolation mountings, laggings, silencers where appropriate to reduce noise at source. Avoiding metal to metal contact by using plastic bumpers, using a sound-reducing enclosure that fully encloses the machine(s), using sound-absorbing baffles between workers and the noise source, notifying people in advance when noisy work is to be carried out so they can limit their exposure to it, maintaining machines and equipment's in good condition to reduce noise, including the addition of noise mufflers, vibration isolators or duct silencers. Marketers should be provided with personal hearing protectors of correct rating and suitable for the work condition and should be instructed on how to make use of the hearing protectors correctly. Noisy machines should be installed in sound proof rooms or buildings. The purchasers should also make use of hearing protectors when going to the markets.

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