

EVALUATION OF THE PEOPLE PERCEPTION ON MAJOR NOISE SOURCE AND ITS IMPACT ON HEALTH AT DIRE DAWA CITY, ETHIOPIA

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Abstract. Noise pollution consists of any unwanted sound from various sources with numerous effects. Urban noise pollution is one of the challenges of those people that live in the urban area and which causes health and social problems. The aim of this study was to evaluate the people perception on major noise source and its impact on health at Dire Dawa city, Ethiopia. Cross-sectional study method and purposive random sampling were applied as well as structured pre-tested questionnaire was developed. The result of this study revealed that the major sources of noise in the city were vehicles, such as three wheel vehicles, automobiles, and trucks. One of the major findings of this study was that people perceptions of noise pollution do not depend on the intensity level of sound, but merely on the people's interest for that sound. For instance, the noise source from the religious institute was not considered as a noise for the follower of that religion, but it was considered as a noise pollution for others. Moreover, the noise source from recreation centers was not considered as noise pollution for most respondents. Another important finding of this study was the sensory adaptation to the noise of the people. For the people who have lived for a long time around one type of noise source, that noise was not considered as noise pollution, but it was considered as noise pollution for the newcomers. These two important findings of this study disagree with the World Health Organization (WHO) Guidelines for Community Noise and health risks associated with noise pollution [26].

Key words: Noise pollution, noise sources, perceived effects.

INTRODUCTION

The word noise is derived from the Latin word, *nausea*, meaning seasickness. Noise has many definitions depending on where the sound exists and its effect on the recipient. Therefore, the definition of noise is stated in different ways by different authors as follows: the noise by [11] is “the sound which is undesired by the recipient”. A noise is an unwanted sound with random intensity of signals that bears no information (*Encyclopedia Americana*). Noise means wrong

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sound in the wrong place at the wrong time [20]. Noise pollution may be defined as unwanted sound which gets damped into the atmosphere without regarding the adverse effects it may have. Noise is an unwanted sound that creates annoyance and interferes in conversation, disturbs sleep and the teaching-learning process, reduces work efficiency, causing stress and challenges the public health. One could say that the noise is a silent killer growing day-by-day [27]. Noise is any sound independent of loudness that may produce undesired physiological or psychological effects on individuals and may interfere with the social ends of an individual or of a group. These ends include all human activities, communication, work, rest, recreation, and sleep [18]. Therefore, the noise is generally defined as an unwanted or harmful sound that causes general physical and psychological health problems. Sound becomes unwanted when it either interferes with normal activities such as sleeping, conversation, or disrupts or diminishes one's life quality.

In urban areas, the problem of noise pollution is ranked to be the third next to air and water pollution [15]. Urban noise pollution is one of the problems of the people who live in urban area and it is one of the causes of health and social problems. Urban noise levels are a complex mixture of noise from transportation, factories, commercial advertisement, machines, and people. There are many adverse effects of excessive noise or sudden exposure to noise, such as indiscriminate use of horn by the vehicles and widespread use of loud speakers in social and religious ceremonies. The excessive noise may cause deafness, nervous breakdown, mental disorder, high blood pressure, head-aches, dizziness, inefficiency and insomnia [5]. In addition, [15] reported that even a relatively low level of noise adversely affects human health. For example, it may cause hypertension, disrupt sleep and hinder cognitive development in children [12]. The effects of excessive noise could be also so severe that either a permanent loss of memory or a psychiatric disorder might occur [25].

Among the urban noise sources, the road traffic noise is the highest contributor to noise pollution. It is also the big challenge for urban planners and environmental engineers to overcome road traffic noise in cities [21]. A continuous high level of noise can cause serious stress on the auditory and non-auditory, and on the nervous system of the city dwellers [3, 22]. It is also a leading cause of great annoyance for exposed population due to the poor conditions of car engine exhaust [7]. In addition, there are various studies carried out on road traffic noise pollution, which causes severe physiological and psychological health problems such as, irritation, human performance and actions, hypertension, heart problems, tiredness, headache, and sore throat respectively [15]. Though, noise pollution is a slow and subtle killer, especially when it is accompanied by other types of pollution.

Different people are not equally affected by the same noise. There is a vast variation in the individual sensitivity to sound. Moreover, the people are affected differently when they are at home or at work. Most of the people inhabiting

metropolitan cities or big towns and those working in factories are susceptible to the adverse effects of noise. The problem of noise pollution is lesser in small towns and villages than in main towns across the country. But, those individuals residing in villages or towns situated along the national or state highways or close to railway tracks do bear the brunt of excessive noise.

The effects of noise have been studied on humans [8, 9], animals [2], and buildings [13]. Noise is also a major factor that should be considered in the design and construction of new transport systems, as well as when improvements are made to the already existing systems [6]. In addition, local authorities and environmentalists should recognize the importance of monitoring trends in noise pollution when developing mitigating plans. As such, there is an obvious need to measure and model noise pollution.

There are several ways that can be utilized for controlling the level of noise. The first way is that the design and technology of equipment could be altered resulting in low noise emission. The second way is that the noise barriers may help us control noise. The third way is to protect receptors of sound by shields. Similarly, body and window planes may be made sound proof. Apart from technology, we may undertake various steps to modify the behavior of users of machines and equipment. Though a legal framework could be enforced to regulate users of equipment, it requires huge resources and good governance. The public education appears to be a good option because the noise problem is a social one [10]. The social survey should be one way of finding out what type of sound mostly upsets people and appears, at present, to be the only method of determining the effects of noise pollution. Today's need is that the careful social surveys should be carried out as soon as possible.

In the developed countries, a lot of actions have been taken to minimize the problems provoked by noise pollution. These actions include noise pollution control legislation/act, regulations, and noise policies [19]. In the developing world, the problem is not equally recognized by all countries. Some countries, like Egypt, introduced restrictions to improve environmental conditions. This restriction includes (i) ban on horns, (ii) ban on horns and trucks, (iii) ban on horns, trucks and noisy buses [17].

The Government of Ethiopia has established a comprehensive environmental policy in 1997. The overall policy goal is aimed to improve and enhance the health and quality of life of all Ethiopians. Noise pollution is governed by the Environmental Pollution Control Proclamation 300/2002 [14] and other laws. Even though, there have been a policy and laws addressed to noise pollution which have never been implemented properly. Even more this country has not yet fully recognized noise pollution as human health risk factors [4]. This could be due to the lack of baseline information on the level of noise in industrial, commercial, and residential areas of the urban setting as well as its effect on human health.

However, noise pollution in Addis Ababa has shown a significant change from time to time as evidenced by the increasing number of complaints [1].

Moreover, the study conducted at Dire Dawa city by [23] shows that the magnitude of the noise level in the overall city was very high and above the permissible limits. For example, the result revealed that in the hospital's area, the noise pollution was 103.68 dB and 104.27 dB during the morning and in the afternoon, respectively, which is shown in Table 2. These are due to the change in industrialization, urbanization, population growth, expansion of road network, and an increase in the number of motor vehicles over the last 10 years. Hence, there should be a legal framework to manage noise pollution in hospitals, residential and school area, commercial and religious centers, and other urban areas as well as the development and implementation of legislative measures based on scientific information. Therefore, baseline information on the status of noise pollution level in Dire Dawa city should be generated to support control measures in this specific setting. Therefore, this research was aimed to evaluate and generate baseline information on the people perception on major noise source and its impact on health at Dire Dawa city.

MATERIALS AND METHODS

The measurement work was done using the sound level measurement in Dire Dawa administration for two consecutive months shown in [23].

STUDY AREA

The study was conducted at Dire Dawa city located between latitude $9^{\circ}27'$ and $9^{\circ}49'$ North and longitude $41^{\circ}38'$ and $42^{\circ}19'$ East, on an average altitude of 1,221 m. There are nine urban administrative units in the city in which the study addresses eight of them. There are about 6,000 three wheel vehicles, hundreds of automobiles and trucks within the city. The city is one of industry colliders selected by the government as it is nearer to port Djibouti and there is a railway which connects the two cities. There is also an international airport nearby. There are at least one mosque and a church in every village that generates announce and preaches religious discourses through loudspeakers and microphones over the head of these spiritual houses.

SAMPLE SIZE

The required sample size of the study was determined as described by [24] with a 95% confidence interval and 5% desired precision, this corresponding to a

required minimum sample size of 288. In this study, 298 people (211 males and 87 females) were involved, with intention of maximizing the accuracy.

STUDY DESIGN

Cross-sectional study method and purposive random sampling were applied. A standardized questionnaire was prepared and provided for respondents randomly in a purpose they respond in concern with a guided approach for clarification as some respondents were illiterate.

DATA COLLECTION TECHNIQUES AND PROCEDURES

A qualitative and quantitative approach was used to evaluate the people perception on major noise source and its impact on health at Dire Dawa city. Consequently, a pilot study was done previously to the structured pre-tested questionnaire was developed and interviews were conducted based on the objectives of the study. The questionnaire was translated to Amharic, the local language.

RESULTS AND DISCUSSION

AWARENESS OF RESPONDENTS ON NOISE POLLUTION

From 298 respondents who participated in this study, the majority of them are illiterate. The majority of the respondents, 83.2%, are living on the exposed area of the city as it is shown in Table 1. In addition, most of the respondents 73.5% agreed that they are working on the exposed area of noise pollution and 77.5% of them also know that noise pollution is illegal in the city, which means they know the regulations set by the environmental agency. However, the government has not regulated effectively the control of the noise problem.

Table 1

Awareness of respondents on noise pollution

Item	Yes (%)	No (%)
Is your working area exposed to noise pollution?	73.5	26.5
Do you know noise pollution is punishable by the government?	77.5	22.5
Is your residence area exposed to noise pollution?	83.2	16.8

MAJOR SOURCE OF NOISE POLLUTION IN DIRE DAWA CITY

The result of this study revealed that the major sources of noise in the city were vehicles, such as three wheel vehicles, automobiles, and trucks; as well as individual conversation as shown in Table 2. According to respondents' level of agreement, other sources of noises were not considered as a noise pollution to them, this being in contradiction to the report conducted in Addis Ababa [1]. His results showed that the religious institutions, commercial advertisements, music-video shops, night clubs, and workshops are among the top sources of noise which are completely different from the result of our study. Therefore, one of the major findings of our study was the people perception of noise pollution does not depend on only the intensity level of sound, but it mainly depends on the people interest for that sound. For example, the noise sources from the religion institutes (mosque, orthodox church, and protestant church) were not considered as a noise for the follower of that religion, but it was considered as noise pollution for others. Moreover, the noise source from recreation centers (night clubs and music shops) was not considered as noise pollution for most respondents as it was shown in [23]. This was in agreement with the report of [28] on the evaluation of noise pollution in educational institutes of Addis Ababa.

Table 2

Major sources of noise pollution in Dire Dawa city [9]

Source	Always true	Percent %	Never true	Percent %	Neutral %	Percent %
Three wheel vehicles	263	88.3	33	11.0	2	0.67
Welding and garage works	96	32.2	196	65.8	6	2.0
Mosque	120	40.3	171	57.4	7	2.3
Orthodox church	71	23.8	219	73.5	8	2.7
Night club	121	40.6	158	53.0	19	6.4
Protestant church	100	33.6	178	59.7	20	6.7
Bar grocery and hotel	153	51.3	134	45.0	11	3.7
Dogs barking	128	43.0	159	53.4	11	3.6
Music shop	68	22.8	210	70.5	20	6.7
Automobile and truck	224	75.2	67	22.5	7	2.3
Construction and working place	67	22.5	215	72.1	16	5.4
Market place	77	25.8	210	70.5	11	3.7
Industries	23	7.7	259	86.9	16	5.4
Schools	58	19.5	225	75.5	15	5.0
Individual conversation	192	64.4	94	31.5	12	4.1

Note: The shaded cells indicate the top high noise sources.

As we know, the market places around every corner of the country are an open market. They are full of noise and communication is not easy as such, since

everybody is shouting here and there. Peoples cannot understand what the other says. But the result shown in Table 2 is one of the least places where noise is produced relative to other. It was contrary to the result obtained by [4] around Addis Ababa and was higher than the permissible limit set for the commercial area. The other area which has a low level of noise was observed around the industrial area as it is shown in Table 2. This could be due to the fact that the development of industry across the city is at infant stages here.

Another important finding of this study was the people psychological adaptation to noise. That means, for the people who have lived for a long time around one type of noise source, that noise was not considered as noise pollution, but it was considered as noise pollution for newcomers. These two important findings of the study are disagreeing with WHO regarding the noise exposure recommendations. Therefore, the sound is considered as a noise when it is at wrong time and at wrong places, which is relative from person perceptions.

Moreover, Table 2 shows that a small number of respondents are neutral for mentioning source of noise as night clubs, churches, and music shops because they do not want to confront with these organizations.

The effects of noise pollution are fullness or stuffiness in the ear, pain and hearing fatigue, stress, distortion of sound and interference with speech, sensitivity, dizziness, cardiovascular and physiological effect and hearing impairment. Majority of respondents (55.37%) believe that there is a positive perception effect of fullness or stuffiness in their ear, which is shown in Table 3. 61.74% of respondents do not believe that they experience pain and hearing fatigue in the ears. But 51.4% of respondents believe that there is a perception of stress. On the contrary, 61.41% respondents believe that there is no dizziness perception. The results revealed that most of respondents do not believe perceptions on cardiovascular (70.81%) and physical effect, and hearing impairment (71.48%), which are contrary to WHO Guidelines for Community Noise [26] and health risks associated with noise pollution [27]

Table 3

Perceived effects of noise pollution by study participants

Perceived effects of noise	Participants perception of noise effects			
	Yes (n)	(%)	No (n)	(%)
Fullness or stuffiness in your ear	165	55.37	133	44.63
Pain and hearing fatigue	114	38.26	184	61.74
Stress	153	51.34	145	48.66
Distortion of sound and interference with speech	143	47.09	155	52.01
Sensitivity	141	47.32	157	52.68
Dizziness	115	38.59	183	61.41
Cardiovascular and physiological effect	87	29.19	211	70.81
Hearing impairment	85	28.52	213	71.48

CONCLUSION

The result of this study revealed that the major sources of noise in the city were vehicles, such as three wheels vehicles, automobiles, and trucks as it was shown [23]. The other sources of noise were not considered as noise pollutant.

One of the major findings of this study was that the people perception on noise pollution does not depend only on the intensity level of sound, but mainly on their interest for a peculiar sound. For example, the noise source from the religion institute was not considered as a noise for the follower of that religion, but it was considered as noise pollution for others. Moreover, the noise source from recreation centers was not considered as noise pollution for most respondents.

Another important finding of this study was the sensory adaptation to noise of the people. This means that the people who have lived for a long time around one type of noise source do not perceive it as a noise pollution while it was considered for the newcomers. These two important findings disagree with WHO guidelines for community noise and health risks associated with noise pollution [26].

Noise cannot be diluted, cleansed, collected or reused, but a precautionary principle can be applied, so that no human being should involuntarily be exposed to noise that could be harmful to their hearing, health, and wellbeing.

RECOMMENDATION

The city administration should design strategy and implement it to reduce noise pollution from schools, hospitals, offices, churches, mosques, and residential places. Public discussions on noise sources and adverse effects should be done in a regular manner to create and increase awareness of the people. Noise protection programs and legal frames should be designed by the city administration. The light and heavy industry sites and highways airports should be located far away from the residential areas. Concerned bodies should have clear noise pollution compliance handling and management system. Effective mitigation and control strategies of the noise emissions should be introduced. Sensitive environments such as schools, residence, hospitals, and public areas should have minimal threshold noise levels. The below recommendations are to be followed:

- Create public forums on noise sources and adverse effects.
- Create, collect, and distribute scientific research works about noise mitigation.
- Strengthen laws and administrative roles to control noise mitigation.
- Establish networks among environmental, higher institution in the city working on noise mitigation issues.

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