

NOISE LEVEL IMPACTS ON HUMAN HEALTH IN HEALTH CARE UNITS OF BOGRA TOWN, BANGLADESH

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ABSTRACT

The study was conducted at the ten govt. as well as private health care units (HCU) in Bogra town of Bangladesh to find out the impacts of noise levels associated with health effects during the period from October 2017 to March 2018. Multi-Function Environmental Meter was used for measuring noise levels in the selected health care units. From the study the highest and lowest noise level were found in 2017 at Shahid Ziaur Rahman Medical College Hospital (107.7 ± 4.37 dB) during the month of October and Annesha Clinic (60.3 ± 1.81 dB) during the month of October, respectively. On the contrary, the highest and lowest noise levels in 2018 were found at Shahid Ziaur Rahman Medical College Hospital (109.7 ± 4.7 dB) during the month of February and Modern Dental Care (59.5 ± 1.11 dB) during the month of March, respectively. However, all of the recorded noise levels were exceeded the acceptable limit of 45 dB set by the DoE for day time in case of silent area. Concurrently a survey study was conducted with doctors, students, nurse/staff and patients. Most of the common problems occurred from noise pollution were identified as conversation, headache and hearing problems. To resolve the problem maximum respondents emphasized on awareness of visitors, banning of hydraulic horn, making sound barriers, and controlling visitors. However, the role of NGOs, researchers and professionals, media and concerned individuals is significant in minimizing the environmental hazards of noise pollution.

Key words: Noise level, health care, human health, Bogra town.

Introduction

Noise pollution exists in hospitals all over the world, is a common stressor and is recognized as not just as a nuisance but a serious health hazard. Various studies have measured hospital noise and linked to negative patients' quality care (Juang *et al.*, 2010; Pope, 2010; Moshi *et al.*, 2011). Evidence has also been accumulated that noise is a risk factor in sleep disturbance (Gabor *et al.*, 2003; Xie *et al.*, 2009), cardiovascular dysfunction, speech interference and mental health distortion, including hearing impairment and balance disorder (Satterfield, 2001; Ising and Kruppa, 2004). The effect may not only affect the patient's wellbeing and comfort, but may also cause stress for the staff, decreasing work performance and increasing anxiety. The source of noise pollution include doors slamming, trolleys rolling in corridors, alarms and moving parts of medical equipment are all important as are the frequently loud conversations among, staff members or visitors in hospitals (Safarpour *et al.*, 2010). Evidence has also been showed that exposure of noise is increasing at an alarming rate at health care centers both Rajshahi city (Sultana, 2014) and Mymensingh city (Islam 2016). More importantly, general hospitals and clinics are located along the roadsides and around the busy places of the city and town. Beside the increasing degree of air and water pollution, noise pollution is also emerging as a new threat to the inhabitants of Bogra town. Due to rapid urbanization, the level of noise pollution is increasing at major health care units in Bogra town. Little studies were conducted with industrial activities, construction activities, highly traffic congestion, indiscriminate use of loud speakers, and mismanagement of the health staffs and their lack of awareness in Bogra town. At this point, in the existing study, noise levels at various places of indoor, outdoor and other important departments at the selected hospitals and clinics of Bogra town area were measured and compared with the DoE and WHO regulation to reach the following objectives: to investigate the level of noise pollution and to assess the health effects of noise pollution for ensuring sound and peaceful environment in health care units of Bogra town.

Materials and Methods

Study area: The study site was Bogra Municipal Area 10.72 sq km, located in between 24°41' and 24°59' north latitudes and in between 89°16' and 89°30' east longitudes. It is bounded by Shibganj (Bogra) upazila on the north, Shahjahanpur upazila on the south, Gabtali upazila on the east, Kahaloo upazila on the west. Total number of population are 154807 where the density of population per sq km 14441 (Banglapedia, 2004). There are ten health care units (HCU) located at Bogra Town area were selected according to the objectives of the study, which included: Shahid Ziaur Rahman Medical College Hospital, Modern Dental Care, Sutrapur; Samsunnahar Clinic, Thontonia; Popular Diagnostic Centre Ltd, Thontonia; Akota General Hospital, Sherpur Road; Doctors Clinic, Mofiz Paglar More; Independent General Hospital, Bogra Sadar; Ibn Sina Diagnostic & Consultation Center, Kanojgari; Maleka Nursing Home & Diagnostic Centre, Sutrapur and Annesha Clinic, Sherpur Road. All the health care units were situated besides the highway as well as zila roads. Selection process was based on ease of collection of required data and proximate information and noise polluting sources.

Measurement of noise level: In this study, Multi-Function Environmental Meter was used for data collection. Measurement range is: 1) Lo = 35-100 dB; ii) Hi = 65-130 dB (Frequency Weighting: A, C). Sound level meters are usually equipped with weighting circuits which filter out selected frequencies. It has been found that the A-scale on a sound level meter best approximates the frequency response of the human ear. The most common measure of sound level is sound intensity and pressure. Sound intensity is the average rate of sound energy transmitted through a unit is perpendicular to the direction of the sound propagation, typically measure in Pico-watts per square meter. Sound pressure levels were measured on the scale of a sound meter are abbreviated dB.

Data collection: Noise levels at different hospitals and clinics of Bogra town area were conducted for a period of the year from October 2017 to March 2018. The measurement of noise levels were carried out between the periods of 10:00 AM to 2:00 PM and 5:00 to 7:00 PM with the help of a sound level meter both in the indoor and outdoor spaces of the selected ten health care units. Reading was taken in each hourly interval for a period of one minute both on working days and weekends. In order to assess health effects of noise pollution and identify sources of it, a questionnaire survey was conducted. Randomly selected samples were divided into four group's i.e. medical students, patients, doctors and nurse/staff. From each study location, ten doctors, twenty nurses/staffs, thirty patients and twenty students were interviewed face to face for accomplishing the survey. In this study, secondary data or relevant information were collected from various noise pollution related literature, books, journals and websites, etc.

Data processing and analysis: The collected data were analyzed with the help of Microsoft Excel and the results obtained were presented in the tables to explain the condition of noise level at hospitals and clinics of Bogra Town.

Results and Discussion

The monthly variation of noise levels in 2017 at the health care units (HCU) in Bogra town was shown in Table 1. The highest and lowest mean±SD noise levels were recorded from Shahid Ziaur Rahman Medical College Hospital as 107.7±4.37dB in October and 102.7±3.78 dB in December; while for Modern Dental as 74.5±1.52 dB in December and 63.7±1.21dB in October as well as for Samsunnahar Clinic as 101.3±3.67 dB in December and 99.9±3.20 dB in October; for Popular Diagnostic Centre Ltd. as 100.7±3.81 dB in October and 100.7±3.81 dB in December; for Akota General Hospital as 100.5±3.71 dB in October and 86.5±1.95 dB in December; for Doctors Clinic as 88.7± 1.98 dB in November and 72.3±1.81dB in December; for Independent General Hospital as 78.3± 1.91dB in November and 68.7± 1.81 dB in October; for Ibn Sina Diagnostic & Consultation Center as 96.3±2.69 dB in November and 87.2±1.99 dB in October; for Maleka Nursing Home & Diagnostic Centre as 94.5±2.32 dB in December and 73.7±1.87 dB in October and for Annesha Clinic as 86.5± 2.01dB in December and 60.3±1.81 dB in November, respectively. The values of noise levels were fluctuated with the measuring period, which concluded that it is a crucial hazard in the health care units (HCU) in Bogra town.

Table 1. Noise level in selected health care units (HCU) at Bogra Town in 2017 (Average monthly data only)

Sl. No.	Locations	Mean Noise level (dB)			Standard Level
		Oct. 2017	Nov. 2017	Dec. 2017	
1	Shahid Ziaur Rahman Medical College Hospital	107.7±4.37	104.5±3.78	102.7±3.78	45 (ECR, 1997)
2	Modern Dental Care, Sutrapur	63.7±1.21	67.3± 1.37	74.5±1.52	
3	Samsunnahar Clinic, Thontonia	99.9±3.20	92.3±2.96	101.3±3.67	
4	Popular Diagnostic Centre Ltd, Thontonia	100.2±3.51	100.7±3.81	92.3±2.76	
5	Akota General Hospital, Sherpur Road	100.5±3.71	87.3±1.96	86.5±1.95	
6	Doctors Clinic, Mofiz Paglar More	88.3±1.95	88.7± 1.98	72.3±1.81	
7	Independent General Hospital, BograSadar	68.7±1.81	78.3± 1.91	76.5±1.83	
8	Ibn Sina Diagnostic & Consultation Center, Kanojgari	87.2±1.99	96.3±2.69	88.5±1.84	
9	Maleka Nursing Home & Diagnostic Centre, Sutrapur	73.7±1.87	87.3± 1.97	94.5±2.32	
10	Annesha Clinic, Sherpur Road	61.5±1.97	60.3±1.81	86.5± 2.01	

The monthly variation of noise levels in 2018 at the health care units (HCU) in Bogra town is shown in Table 2. The highest and lowest mean±SD noise levels in Shahid Ziaur Rahman Medical College Hospital were observed as 109.7±4.77 dB in February and 97.7±2.94dB in January, while 70.1±1.80 dB in February and 59.5±1.11 dB in March at Modern Dental Care; 99.4±3.00 dB in March and 81.7±1.33 dB in February at Samsunnahar Clinic, 107.9±3.96 dB in February and 99.6±3.12 dB in January at Popular Diagnostic Centre Ltd, 99.3±2.98 dB in March and 87.1±1.96 dB in January at Akota General Hospital; 93.1±2.07dB in January and 74.5±1.85 dB in March at Doctors Clinic; 78.3± 1.91 dB in February and 68.7±1.81dB in January at Independent General Hospital; 96.3±2.69 dB in February and 79.3±1.80 dB in March at Ibn Sina Diagnostic & Consultation Center; 80.1±1.80 dB in February and 69.5±1.81 dB in March at Maleka Nursing Home & Diagnostic Centre as well as 89.3±2.03 dB in March and 73.4±1.97 dB in February at Annesha Clinic, respectively.

From the two year study the highest and lowest noise level were found in 2017 at Shahid Ziaur Rahman Medical College Hospital (107.7±4.37 dB) during the month of October and Annesha Clinic (60.3±1.81 dB) during the month of October (Table 1). On the contrary, the highest and lowest noise levels were found in 2018 at Shahid Ziaur Rahman Medical College Hospital (109.7±4.7 dB) during the month of February and Modern Dental Care (59.5±1.11 dB) during the month of March (Table 2). The comparison between the year 2017 and 2018, the maximum highest noise level was found in 2018 at Shahid Ziaur Rahman Medical College Hospital (109.7±4.7 dB) that means noise level has increased than the year of 2017. All of these noise levels were exceeded the day time limit for silent area (45 dB) set by DoE (ECR, 1997) and (30 dB) set by WHO (Yildirim and Mayda, 2019). On the other hand, the major sources of noise pollution at the health care units are shown in Fig. 1. Most of the respondents directly suggested that the major cause of noise pollution is crowded by visitors.

Health effects of noise pollution: The respondents themselves personally suffered from six distinguish problems caused by noise pollution. The most common problems that they were suffering included headache, hearing problem, problem in conversation, absent-mind, palpitation and drowsiness (Fig. 2). A possible remedial measure for noise pollution is shown in Fig. 3. For reducing the noise pollution; all the respondents suggested for increased awareness of visitors, and banning of hydraulic horns (Fig. 3).

Table 2. Noise level in selected health care units (HCU) at Bogra Town in 2018 (Average monthly data only)

Sl. No.	Locations	Mean Noise level (dB)			Standard Level
		Jan. 2018	Feb. 2018	Mar. 2018	
1	Shahid Ziaur Rahman Medical College Hospital	97.7±2.94	109.7±4.77	103.6±3.51	45 (ECR, 1997)
2	Modern Dental Care, Sutrapur	69.1±1.78	70.1±1.80	59.5±1.11	
3	Samsunnahar Clinic, Thontonia	90.7±2.78	81.7±1.33	99.4±3.00	
4	Popular Diagnostic Centre Ltd, Thontonia	99.6±3.12	107.9±3.96	100±3.21	
5	Akota General Hospital, Sherpur Road	87.1±1.96	95.4±2.52	99.3±2.98	
6	Doctors Clinic, MofizPaglar More	93.1±2.07	90.1±1.99	74.5±1.85	
7	Independent General Hospital, BograSadar	78.1±1.92	84.1±1.93	72.5±1.83	
8	Ibn Sina Diagnostic & Consultation Center, Kanojgari	87.1±1.83	92.4±2.01	79.3±1.80	
9	Maleka Nursing Home & Diagnostic Centre, Sutrapur	78.1±2.03	80.1±1.80	69.5±1.81	
10	Annesha Clinic, Sherpur Road	87.1±2.01	73.4±1.97	89.3±2.03	

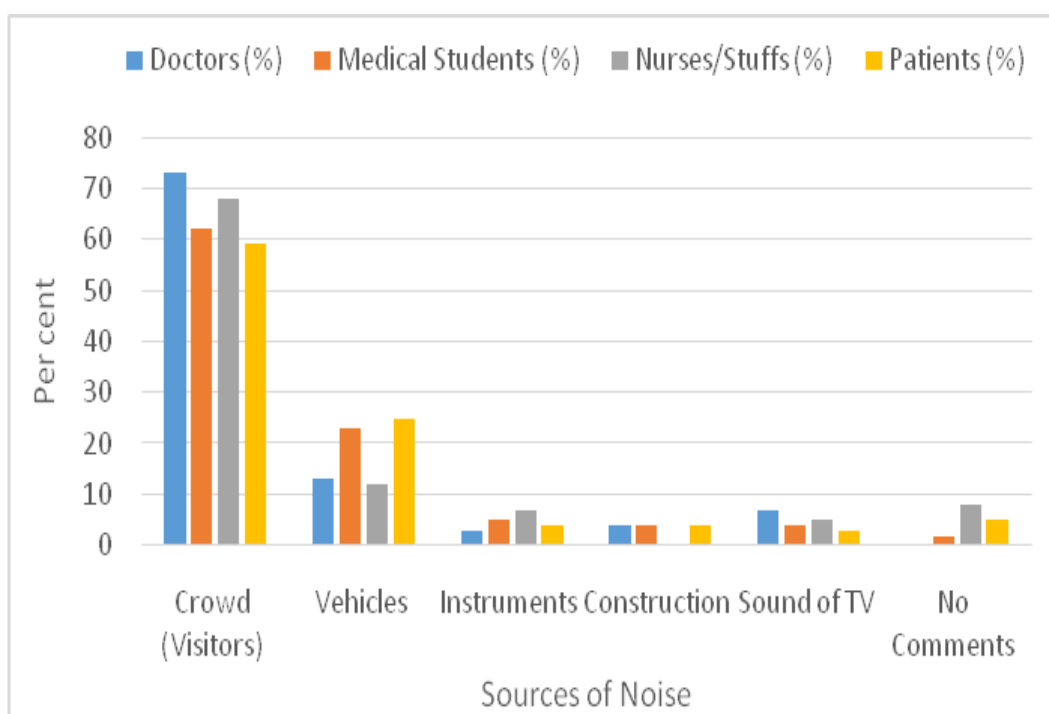


Fig. 1. Sources of noise at hospital and clinics at Bogra town according to the respondents

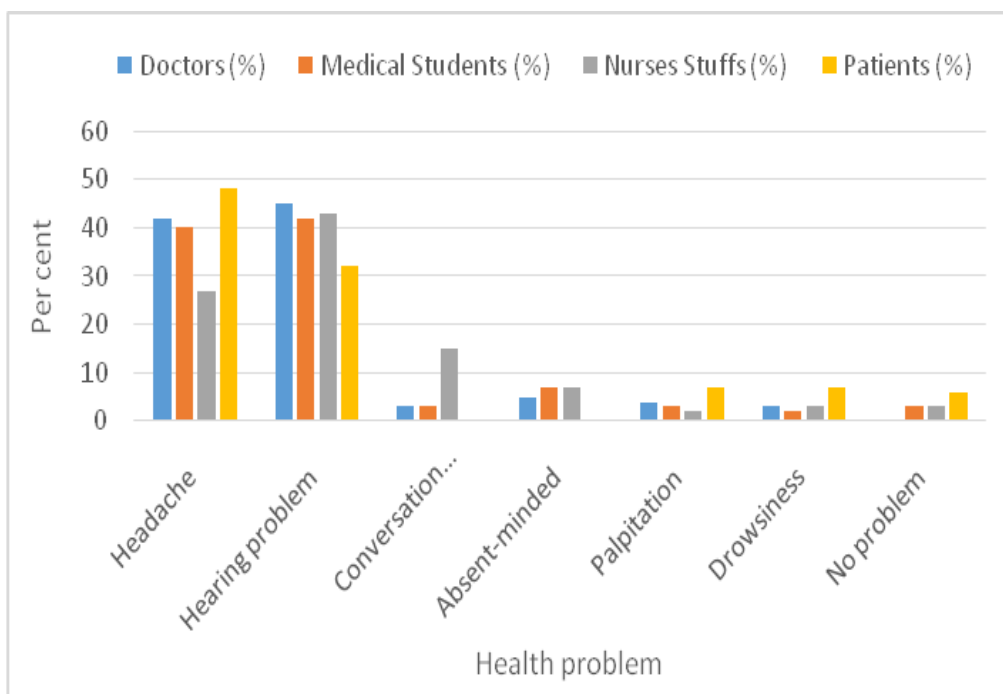


Fig. 2. Comments of respondents in case of health effects of noise pollution

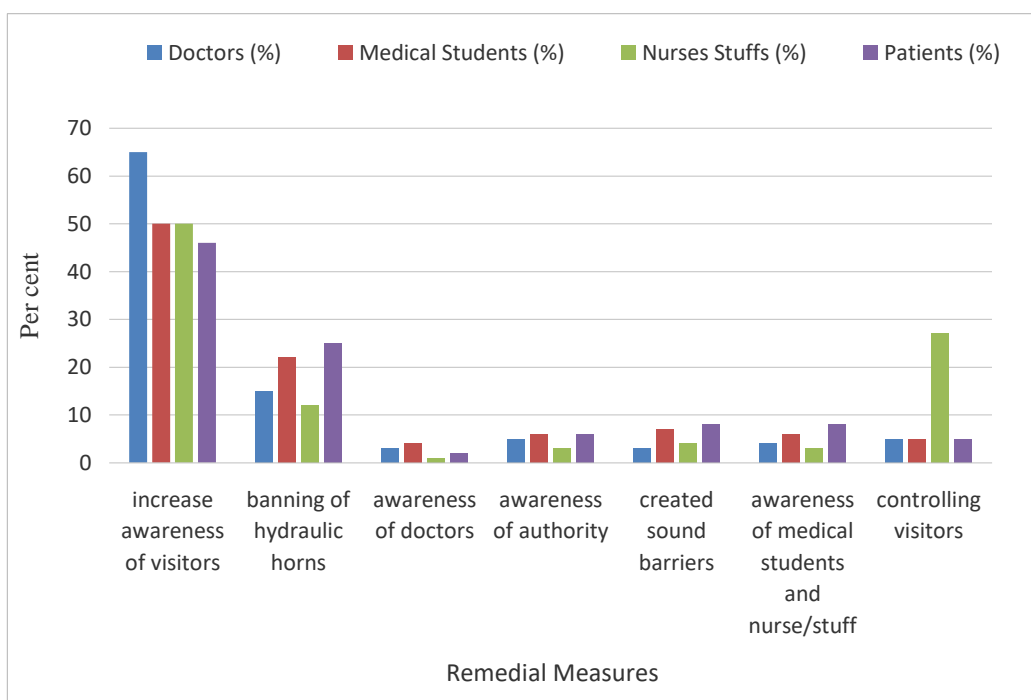


Fig. 3. Possible remedial measures for noise pollution

Conclusion

Noise pollution is becoming a major public health concern with all of its potential biological and social effects. Here the study recorded noise levels exceeded the DoE standard of 45 dB in all health care units. So, the authority must be conscious for managing the noise level for avoiding noise hazards on human health.

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