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NOISE IMPACT TO STUDENTS OF ROADSIDE PRIMARY SCHOOLS AT RAJSHAHI CITY IN BANGLADESH

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ABSTRACT

A high level of noise in classroom impairs verbal communication of students, which have negative effects on the cognitive performance. The high noise can also limit episodic memory of students. In this context, this study was conducted to measure the noise levels and its impact to students in selected roadside government primary schools in Rajshahi City, Bangladesh during May to November, 2022. The noise level was measured with the help of a digital sound level meter and a questionnaire survey was conducted among the students to evaluate the perception of noise. The results show that the average noise levels (Leq) in the roadside primary schools varied between the 74.1 and 80.1 dBA, with maximum noise 108 dBA and minimum 57.2 dBA. These noise levels are higher than the permissible range of 35 dBA recommended by the World Health Organization (WHO). The high level of noise was found to school adjacent busy road. During noise impact study, the majority of students (70%) expressed that their school are noisy "very much". They indicated that outside factors are responsible for excess noise in school premises. About half (51.7%) of the students responded that noise distracted their attention from the lesson and only 1% of students suffered from moderate headaches due to noise pollution. In terms of immediate reaction to excess noise, the majority of students (62.5%) had to cover their ears with hands to prevent noise hearing.

Keywords: Noise level, dBA, primary school, noise impact

Introduction

Nowadays, noise pollution is one of the major problems facing urban people, which has many adverse effects on the urban environment and may cause a great deal of cost to society (Martin *et al.* 2006). Moreover, noise can cause physical and mental health problems as well as disturbance of everyday life activities (Picoolo *et al*. 2005). Exposure to noise has various acute and chronic effects (Koh *et al*. 1998), which may have negative physiological and psychological effects such as sleeplessness, irritation, hearing loss, and mental disorders (Ingle *et al.* 2005).

These days, a significant portion of a child's youth is spent at school, which also serves as one of their primary social settings and activities (Alsubaie 2014). Learning in the classroom is usually conducted through verbal and auditory communication between teachers and students (Flexer and Long 2003). A calm and quiet environment is necessary for achieving the learning outcomes of the pupils.

The high noise levels in the classroom impair verbal communication, causing students to get tired very often, and this premature fatigue might have a negative effect on their cognitive effectiveness (Hagen *et al*. 2002). Effects of noise can result in limiting the episodic memory of teachers (Enmarker 2004). Students might not be an exception either if they are regularly exposed to loudness. Therefore, there is no substitute for improved learning in a healthy school. A health-promoting school frequently enhances its capacity as a health setting for living, learning, and working (WHO 2014). This is something we must make sure of for our children; however, the noise level around schools has raised some issues. There is a need to control the noise exposure levels in sensitive areas like hospitals, schools, and kindergartens (Amin *et al*. 2014). Thus, it is necessary to ascertain the volume of noise and how it affects students in classrooms. Noise pollution may be considered a serious environmental issue due to the rapid growth of industrialization and urbanization.

Though many research works have been conducted on the same topic in different parts of the world, there has been

no work done on this topic in Rajshahi city. For this, this research was undertaken to fill up the gap to assess the noise pollution levels and its impacts to students in some roadside primary school in Rajshahi City.

Materials and Methods

Description of survey site: The study was carried out in Rajshahi City, which is a divisional headquarters and widely known as an educational city since the establishment of educational institutions like Rajshahi College, Rajshahi University, etc. Rajshahi City, located on the bank of the Padma River, is the fourth-largest city in Bangladesh. According to the Thana Education Office, there are 61 government primary schools and 80 non-government primary schools in the city, where 16,471 students are at primary education.

Noise level data measurement: Eight government primary schools with similar socioeconomic backgrounds were selected for this study. The sample schools were chosen from sites within 10 meters of major arterial roadways. The chosen schools may be referred to as "busy roadside schools" in this study, as the sites were located close to Rajshahi City's major arterial roads and are subject to numerous environmental noises. The list of schools is shown in Table 1.

The noise level was measured using with an IEC-compliant sound level meter (SL-4023SD) during May to November, 2022. The steps were taken to prevent sound reflection during noise measurement. An equivalent continuous noise (Leq) descriptor was used to determine the average noise level during a given period. The study also considered the maximum (Lmax) and lowest (Lmin) noise characteristics of time periods. Measurements of noise levels in the schoolyard, corridor, and classroom were done while classes were in session. The noise levels were recorded for two consecutive working days to calculate the average noise levels.

Noise impact survey: A questionnaire survey was conducted among the students to evaluate the views about noise pollution, sources of noise, effects on learning activities, and controlling measures. A five-point Likert scale and multiple-choice questions were used in the questionnaire. An observational check list was used to assess the factors responsible for noise pollution inside and outside the school premises, which include tree coverage, boundary walls, building type, doors and windows, and furniture arrangements. Due to time constraints, the survey was conducted during leisure period, therefore 15 students from third, fourth, and fifth grade students were interviewed from each school and the sample size was 120 students (male 61 and female 59) ages between 8 to 12 years. For data analysis, descriptive statistics were used to analyze questionnaire findings.

Results and Discussions

The noise data shows that the noise levels (Leq) in the roadside primary schools fall between the 80.1 and 74.1 dBA range (Table 2). The S-1 school was observed to have the highest Lmax of 108 dBA as it located adjacent to the inter-district national highway (Natore Road), where the flow of heavy vehicles such as buses and trucks occurred. On the other hand, the lowest Lmax of 93.4 dBA was recorded at S-3. The S-4 had the highest Leq of 80.1 dBA, while S-5 recorded 79 dBA. S-6 was close to

Table 1. General information of primary schools

SL	Name of school	Symbol used	Students Number	Teaching staff	Non-teaching staff
1	Mirjapur Government Primary	S-1	193	7	0
2	Khademul Government Primary	S-2	123	6	1
3	Krishokanto Government Primary	S-3	118	7	1
4	Kadirgonj Government Primary	S-4	180	9	1
5	Gourhanga Government Primary	S-5	129	6	1
6	Railway Government Primary	S-6	109	7	1
7	Helenabad1 Government Primary	S-7	298	8	1
8	Raninogor Government Primary	S-8	309	10	1

Table 2. Noise level in roadside primary schools

SL	School	Noise level in dBA								
		School yard			Corridor			Classroom		
		Leq	Lmax	Lmin	Leq	Lmax	Lmin	Leq	Lmax	Lmin
1	S-1	76.3	108.0	63.1	78.2	105.2	64.1	80.1	107.2	64.0
2	S-2	77.2	102.5	65.1	75.0	98.0	63.0	76.1	95.3	63.2
3	S-3	75.4	98.5	63.0	75.1	93.8	63.0	76.0	93.4	63.1
4	S-4	77.3	104.2	62.2	78.1	98.4	62.2	80.0	97.2	62.2
5	S-5	76.5	105.3	63.4	78.0	98.2	65.3	79.0	98.3	64.1
6	S-6	77.1	106.0	65.5	78.0	102.3	65.3	78.5	102.0	65.1
7	S-7	74.4	103.4	57.4	74.1	97.6	57.1	74.2	97.3	57.2
8	S-8	75.2	102.6	59.2	75.5	104.3	60.2	78.2	104.2	60.0
	Average	76.1	103.8	62.3	76.5	99.7	62.5	77.7	99.3	62.3

Dhaka bus stand and Rajshahi railway station, but it did not have the most noise because it was encircled by some bushy trees. The lowest equivalent noise level (Leq) of 74.1 dBA was measured at S-7, where vehicle movements were comparatively low. The range of minimum noise level (Lmin) was 57–65 dBA. The average noise of the schools at the schoolyard was 76.1 dBA, the corridor was 76.5 dBA, and the classroom was 77.7 dBA.

The noise level in the highway region school of Kargil, India, was around 57.4 dBA indoors and 63.0 dBA outdoors (Fatima *et al*. 2023), which were lower than the current findings, but the noise levels of classrooms (78–92 dBA) and playgrounds (61–97 dBA) in the schools in Anambra State, Nigeria, seemed to be similar (Ochiabuto *et al*. 2020). On the other hand, noise levels (75.7-98.5 dBA) in schools in Zaria, Nigeria, were a bit higher (Owojori *et al*., 2017). In Turkey, the noise level was found to be 82.18 dBA in public schools during break time (Bulunuz *et al*. 2017).

However, the World Health Organization (WHO) standard background noise level for classrooms of 35 dBA was exceeded at least by 39.4 dBA in each of the 8 surveyed roadside schools (WHO 1999). This might be due to how close they are to the road and how many residential buildings, stores, and other workshops surround them. In addition to this, two schools (S-5 and S-6) were located near the railway. Most of the schools were found to have little or no trees around them, and no school had suspended ceilings, which could have acted as a soundproofing measure.

So, it was evident that average classroom noise in the surveyed schools remained higher than that in the corridor and schoolyard. It was due to the students' usual chanting and physical movements. Additionally, the noise level went up during loud reading. Sometimes dragging the steel-frame benches created extra noise along with the vibrating sound of the students jumping. The corridor was noisy during the intermission period, and the schoolyard was noisy during assembly and closing. Concrete buildings with two doors and four windows, with an average rectangular classroom size of 35 square meters, are used for classes. These buildings had limited sound absorption capabilities. In most cases, roadside windows remained close to prevent outside noise. There was no false ceiling in any of the schools.

From noise survey it was found that 70% of students expressed that their school premises was "very much" noisy, 19.20% said it was "moderately," 6.7% said "slightly," and 4.2% said "extremely" noisy (Table 3). A half of students (50%, mean 2.28) expressed that an inside element was "slightly" responsible for the noise, while 41.7% (mean 4.18) opined that an external factor was to blame for the increased noise volume at their schools. It is clear from this that outside factors (mean 4.18 > 2.8) contributed to school noise more than inside factors.

There are different types of noise at school that could annoy, bother, or disturb. Here, the sources were divided into two sections: inside factors and outside factors. The inside factors include noise derived from students'

Table 3. Noisiness in the school premises

Variables		Not at all	Slightly	Moderately	Very much	Extremely	Mean
How noisy is your school? (Noisiness)	N	0	8	23	84	5	3.72
	%	0	6.7	19.2	70.0	4.2	
Which factor is responsible for noisy? Inside factor	N	14	60	36	10	0	2.28
	%	12	50.0	30.0	8.0	0	
Which factor is responsible for noisy? Outside factor	N	00	4	20	46	50	4.18
	%	0.0	3.3	16.7	38.3	41.7	

voices, like hue and cry, screaming, and shouting; noise derived from the physical movements of students, like running, jumping, and pulling the benches; noise derived from devices like ringing; and announcements from school authorities through amplified sound. The outside factors include road traffic noise, noise from construction sites, workshops, and industries, and noise derived from communities like public meetings, miking, religious activities, and entertainment. The students traced the outside factor as the culprit for the noise in the schools. Similarly, in Surat, India, there was comparatively more noise outside the campus than inside the schoolyard when it came to areas with urban traffic streams (Ranpise and Tandel 2021).

Different types of disturbance, attentiveness, warning by teacher, hearing impact and headache are shown in Table 4. A half (51.7%) of students stated that noise during the lecture "very much" distracted them from paying attention. Interestingly, about 48.3% had been warned "sometimes", and 41.7% "fairly often" by the teacher for making noise in the school. So, it meant (mean 3.59) that they fairly often made noise and got warning. In terms of

Table 4. Effects of noise at schools

Items	Response type	Respondents	%	Mean (SD)
Does noise affect attentiveness during lessons? (Distract attentiveness)	Not at all	1	0.8%	3.58 (.806)
	Slightly	11	9.2%	
	Moderately	36	30%	
	Very much	62	51.7%	
	Extremely	10	8.3%	
Do you get warning from teacher for making noise in the school? (Warned by teacher)	Never	00	00%	3.59 (0.667)
	Almost never	01	0.8%	
	Sometimes	58	48.3%	
	Fairly often	50	41.7%	
	Very often	11	9.2%	
How well you can hear your teacher during lessons in general? (Affect hearing)	Not at all	0	0%	3.25 (0.538)
	With difficulty	6	5.0%	
	Normally	78	65.0%	
	Well	36	30.0%	
	Very well	00	00%	
Does noise in the school causes headache? (Cause headache)	Not at all	72	60.0%	1.41 (0.51)
	Slightly	47	39.0%	
	Moderately	01	0.8%	
	Very much	00	00%	
	Extremely	00	00%	

Table 5. Immediate reaction of the students

Variables / In response to excess noise what you do?	Respondent	Never	Almost never	Sometimes	Fairly often	Very often	Mean
1. Wait for it to go away	N	00	00	38	82	10	3.68
	%	0.0	0.0	31.7	68.3	8.3	
2. Cover ears with hands	N	00	31	75	14	00	3.20
	%	0.0	25.8	62.5	11.7	0.0	
3. Request noise doers	N	114	5	1	00	00	1.06
	%	95.0	4.2	0.8	0.0	0.0	

hearing from the teacher during class, most of the students (65%, mean 3.25) heard "normally" and no one used to hear "very well". But alarmingly, 5% heard their teacher with difficulty.

Due to their proximity to roads and busy places, students faced that kind of difficulty during the lesson. The horns of the vehicles on the nearby roads and other sources made it difficult for the students to hear from the teacher. Noise worked as a barrier to their academic achievement, particularly in subjects like mathematics and foreign languages like English. Because learning outcomes depend on the smooth flow of classroom activities, noise interrupted the process. The students who heard their teacher with difficulty were usually the back benchers.

In Taranto and Naples, Italy, the mean noise annoyance was considerably higher in industrialized areas (Minichilli *et al.* 2018). Another study in India revealed that for every ten-percentage point increase in Noisy Days% (in the Jan-Mar Quarter of Calendar Year), there was a 6.1 percent rise in Class 12 Boys Fail% for every ten-percentage point increase in Noisy Days% (during the Jan-Mar Quarter of Calendar Year) (Sumit *et al*. 2023).

In response to unusual excess noise in the school, the immediate reaction of the students was evaluated (Table 5). Most of the students (68.3%) "fairly often" waited for the noise to go away; 31.7% did it "sometimes" and 8% waited "fairly often". This meant that students generally" fairly often" (mean 3.68) waited for the noise to go away, which indicated their endeavour to adapt to the noise. Sometimes (62.5%) they covered ears with hands, but generally they did not request the noise makers to turn off or reduce the sound. This is because they are too little to do so, and in most cases, the noise sources are automobiles.

Conclusion

This study found that noise levels (Leq) in the roadside primary schools varied between the 80.1 and 74.1 dBA ranges, higher than the permissible level of WHO. About 70% of students expressed that noise pollution was "high" in their school. Most of the students indicated that outside factors like traffic movement, construction works, amplified sound are responsible for excess noise in the school premises. A half (51.7%) of the students replied that noise distracted their attention from lesson, however less than 1% students suffered from moderate headache due to noise pollution in roadside primary school of Rajshahi City.

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