

THE EFFECT OF NOISE ON BLOOD PRESSURE AND ACADEMIC ACHIEVEMENT OF STUDENTS IN EDUCATIONAL INSTITUTIONS : A STUDY BASED ON URBAN AND RURAL AREA SCHOOL CHILDREN OF BALLY, HOWRAH

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Abstract

The term noise is commonly used to describe sounds that are disagreeable or unpleasant produced by acoustic waves of random intensities and frequencies. Educational institutes are located near the busy places such as bus-stand, market area, busy roads etc. suffer from noises and hence disturbing in school activities like teaching, learning and discussion session. Therefore, educational zone requires a serene atmosphere instead of any disturbances including from the traffic noise. Evidence shows that continuous exposure to noise can changes the blood pressure and heart rate in school children. Most of the studies have shown a rise in systolic and/or diastolic blood pressure with decreasing summative achievement. From the results of the study it is shown that significant changes are there in systolic blood pressure and diastolic blood pressure, from the students of urban noisy area and rural quite area .So this indicates that noise can be a contributing factor in the development of arterial hypertension and consequently their achievement can be effected.

Key words: Noise pollution, Blood pressure, academic achievement

Introduction.

Noise pollution, also known as pollution of sound or sound pollution, is the propagation of noise with harmful impact on the activity of human or animal life. Noise is defined as any unwanted or disagreeable sound and is often dismissed simply as a “nuisance.” However, noise can become harmful when it interferes with a child’s normal activities, such as sleeping or talking, or disrupts or diminishes a child’s health or quality of life. Environmental noise is a known stress, which induces alterations of various physiological responses in individuals exposed to it.

Noise pollution is unwanted sound, which needs to be controlled to make the workplace comfortable. Different people react differently to the same type of noise. A noise level up to 90 dB does not have any appreciable effect. Exposure in excess of 115 dB is not permitted with unprotected ears as it runs the risk of hearing impairment. The average noise level of roadside traffic generally ranges from 85 to 180 dB.

High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease. According to the World Health Organization, children are especially vulnerable to noise, and the effects that noise has on children may be permanent. Noise poses a serious threat to a child’s physical and psychological health, and may negatively interfere with a child's learning and behavior.

Emergence of the problem:

The purposes of this study were to investigate the noise level in the school environment and within the classrooms that could affect the learning performance of the students and to assess the potential of this disturbance on the students' academic achievement along with their blood pressure levels. The World Health Organization (WHO) recommends that the background noise level should not exceed 35dB during teaching sessions. The noise brought the physiological impact in the forms of dizziness and uncomfortable feeling. Thus the achievement motivation of the learners is affected and noise may be a factor in this area. So this part may be investigated and this is a leading topic now a days. Immediate and serious attention must be given to control this mushrooming problem, since the overall loudness of environmental noise is doubling every ten years. This has encouraged me to choose this topic and study the effects of noise pollution on human's health.

Review of related literature:

In view of the importance of the review of related research, an attempt is made to analyze the related works on effect of noise pollution on the health parameters, specially cardiovascular issues and achievement of the secondary school children of ages 12-15.

These studies have been systematically presented in the following section.

Slater, R.B. (1968) has tried to establish a strong positive correlation between the noise pollution level and systolic and diastolic blood pressure level. The review on the relation among noise pollution and blood pressure, the achievement motivation of the school children of selected area are shown in his paper.

Evans et al, (1993) define noise as any audible acoustic energy that adversely affects the physiological or psychological wellbeing of the people.

Regecova et al (1995) explains the term noise which is commonly used to describe sounds that are disagreeable or unpleasant produced by acoustic waves of random intensities and frequencies.

Airey, S. & Mackenzie (1999) show that noise pollution is becoming increasingly more severe in industrial countries and the cost of alleviating it in future years is expected to be insurmountable.

Evans, (2001) says prevalence of noise is implicated in various illness of human and it is responsible for increased morbidity associated with modern life style.

Shield and Dockrell, (2002) have studied that excessive noise pollution has been blamed not only for hearing damage and community annoyance but also for hypertension, fatigue, heart trouble, disturbed serum lipid, triglycerides, platelet count, plasma viscosity, glucose and reduced motor efficiency.

Shield and Dockrell, (2003) they even continued their work and shown that noise influences the cardiovascular, endocrine, metabolic, gastrointestinal and neurological systems. The cardiovascular system is considered to be the most involved and therefore has received the most attention. (Shield and Dockrell, 2004).

Van Kempen, (2006) has shown that there is evidence that noise presents a significant factor in the genesis of arterial hypertension and disorders of peripheral arterial circulation (Belojevic G et al, 2008).

Singh and Joshi,(2010) have studied several epidemiological studies which shown that road traffic noise might increase the risk of arterial hypertension (RR between 1.5 and 3.0) in adults who live in areas with daytime average sound pressure levels exceeding 65 dB.

Goswami et al,(2011) investigated the acute effects of short term loud noise on blood pressure and other cardiovascular parameters. Most of the studies have shown a rise in systolic and/or diastolic blood pressure.

Mangalekar et.al, (2012) says that the earlier studies were concerned mainly with external environmental noise exposure of schools, but more recently the effects of internal classroom noise have been investigated. It is generally accepted that noise has a detrimental effect upon the learning and attainments of primary school children .At the beginning of the 1990s there were two major reviews of previous work to date in this area, both of which concluded that chronic noise exposure of young children has a particularly detrimental effect upon their reading ability.

Methodology of the study:

A research method is a systematic plan for conducting research. Sociologists draw on a variety of both qualitative and quantitative research methods, including experiments, survey research, participant observation, and secondary data. Quantitative methods aim to classify features, count them, and create statistical models to test hypotheses and explain observations. Qualitative methods aim for a complete, detailed description of observations, including the context of events and circumstances.

The present study is of descriptive in nature .Considering the nature of the study,the reseracher has adopted sample survey method ,as it is mainly concerns with the present aim of this work.

A)Population:

The population of this study are the students of both sexes from Govt aided secondary and higher secondary schools who belongs to class VII-IX.(age ranges 12-15).

B)Sample:

160 students were considered based on exclusion criterion stratified randomly as the sample for the study.

The children will be divided into four groups according to noise exposure:

1. Quiet residence and quiet school;
2. Quiet residence and noisy school;
3. Noisy residence and quiet school,
4. Noisy residence and noisy school.

C)Study sample:

Children generally come to school at 8 a.m. and stayed there for 4-5 hours. Parents will be informed and a written consent obtained for the participation in the study.

The inclusion criteria for the study sample were: living on the present address for three or more years, and the orientation of child's room towards the streets.

The exclusion criterion was the presence of chronic diseases affecting arterial blood pressure (diabetes mellitus and/or renal diseases).

D)Tools:**a)Sound level meter:**

A sound level meter is used for acoustic (sound that travels through air) measurement of Noise Intensity. It is commonly a hand-held instrument with a microphone. The diaphragm of the microphone responds to changes in air pressure caused by sound waves. That is why the instrument is sometimes referred to as a Sound Pressure Level (SPL) Meter. This movement of the diaphragm, i.e. the sound pressure deviation (pascal Pa), is converted into an electrical signal (volts V).

In this study divinext Digital Noise Level Meter (Noise Monitor)Decibel Tester GM1351 is used to measure the intensity of noise in different area for the study. The sound level meter is a portable one which measured sound between 35-130dB, with resolution of 0.1dB.

b)Sphygmomanometer.

Is an instrument for measuring blood pressure, typically consisting of an inflatable rubber cuff which is applied to the arm and connected to a column of mercury next to a graduated scale, enabling the determination of systolic and diastolic blood pressure by increasing and gradually releasing the pressure in the cuff.

In this study Rossmax GB102 Aneroid Blood Pressure Monitor is used to check the blood pressure of the samples.

c)Mark sheets of final summative evaluation of 2018 academic year.

E)Techniques:

The study was conducted to determine the level and impact of noise on pupils' learning performance. Which was observed through a survey at about 10 schools at Bally and Belur area. Some are located in nearby G T Road and some are interior. The study was done by measuring the noise level using the Threshold Limit Value (TLV) by taking approx 20 locations as the measurement points. The expected results will indicate the noise levels exceeded the standard TLV >55 dB.

The noise level at school classrooms will be measured. The classrooms will be classified into noisy zones based on the Noise Mapping.

a)Recording of systemic arterial blood pressure:

Blood pressure will be measured in supine position by using mercury sphygmomanometer. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) of all the subjects will be recorded. The measurements were performed after a 15 minute rest, in a sitting position, with a child's right arm at heart level. Two measurements were performed on the right arm with five-minute interval.

b)Measurement of heart rate:

The forearm of the subject was slightly pronated and the wrist slightly flexed. The radial pulse was felt with the tips of the fingers compressing the vessel against the head of the radius. The rate of the pulse was noted in beats per minute. The beats were counted for full one minute.

F)Method of data Analysis

The questionnaires were filled up by the sample and the results of the questionnaire were turned into percentages. Diagrams such as bar diagram, pie chart etc. are used.

G)Delimitation of the study:

- The study was delimited only to samples of 10 Govt. aided secondary and higher secondary schools of class VII-IX.
- Samples were segregated in four areas.
- Only 160 samples were collected for this survey.
- Time was not enough for the proposed study.

Table 1: Measurement of Noise Level from study area:

Day	Study area	Time				Remarks
		Noise level				
		10.30 am	12.00 noon	2.00 pm	Average	
06.06.19	Bally SantiramVidyalaya	90 dB(A)	90 dB(A)	90 dB(A)	90 dB(A)	Too High
13.06.19	Belur Girls High School	80 dB(A)	80 dB(A)	70 dB(A)	77 dB(A)	High
20.02619	Belur high School(Boys)	85 dB(A)	90 dB(A)	75 dB(A)	83 dB(A)	Too High
06.07.19	Bally Barrackpore School	90 dB(A)	90 dB(A)	80 dB(A)	87 dB(A)	Too High
13.07.19	Bally Jora-AswatthatalaVidyalaya	75 dB(A)	70 dB(A)	68 dB(A)	71 dB(A)	High
20.07.19	Bally Bangasishu (Balika) Vidyalaya	85 dB(A)	70 dB(A)	65 dB(A)	73 dB(A)	High
06.08.19	Bally Girls High School	55 dB(A)	50 dB(A)	50 dB(A)	52 dB(A)	Acceptable
13.08.19	Bally NischindaChittaranjanVidyalaya	55 dB(A)	50 dB(A)	55 dB(A)	53.3 dB(A)	Acceptable
20.08.19	Bally Sikshaniketan For Boys	60 dB(A)	55 dB(A)	60 dB(A)	58.3 dB(A)	Acceptable
27.08.19	Anandanagar High School (H.S.)	55 dB(A)	55 dB(A)	55 dB(A)	55 dB(A)	Acceptable

From Table 1,it is seen that average noise level from noisy area schools are 80.16 dB (A).Similarly average noise level from quite area schools are 54.65 dB(A).The noisy area sounds are too high to accept by the children.Obviously it will impact on their achievement motivation and health.

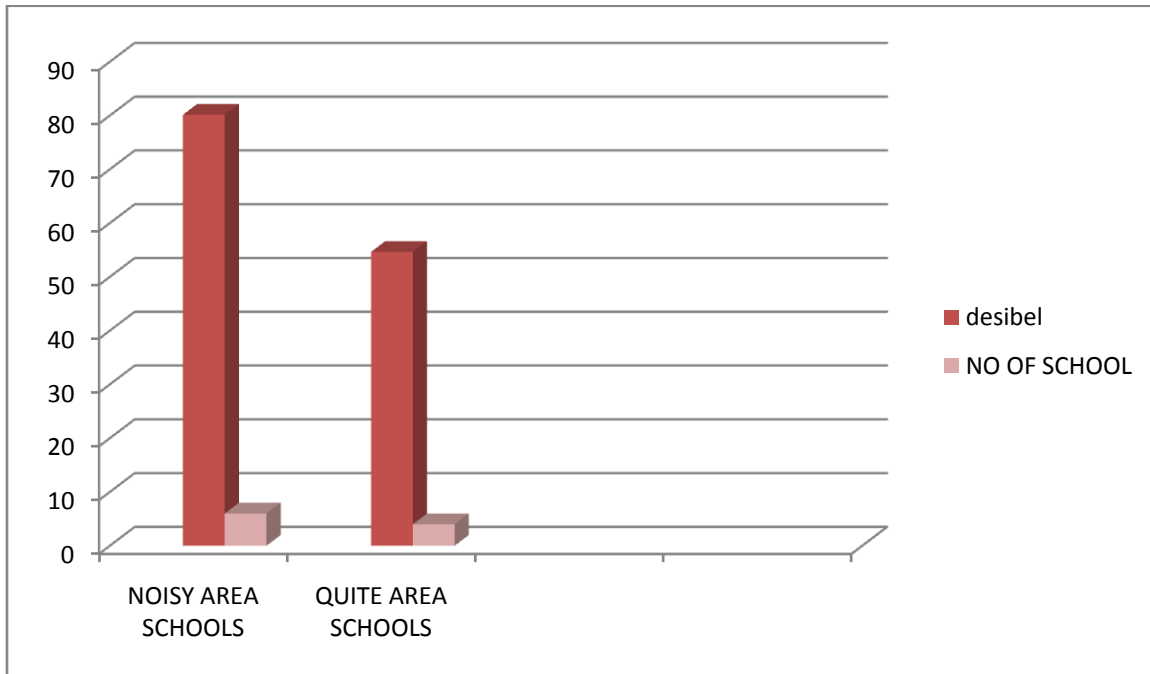


Fig 1(a):Average noise level from both area schools

Average noise level from both area schools

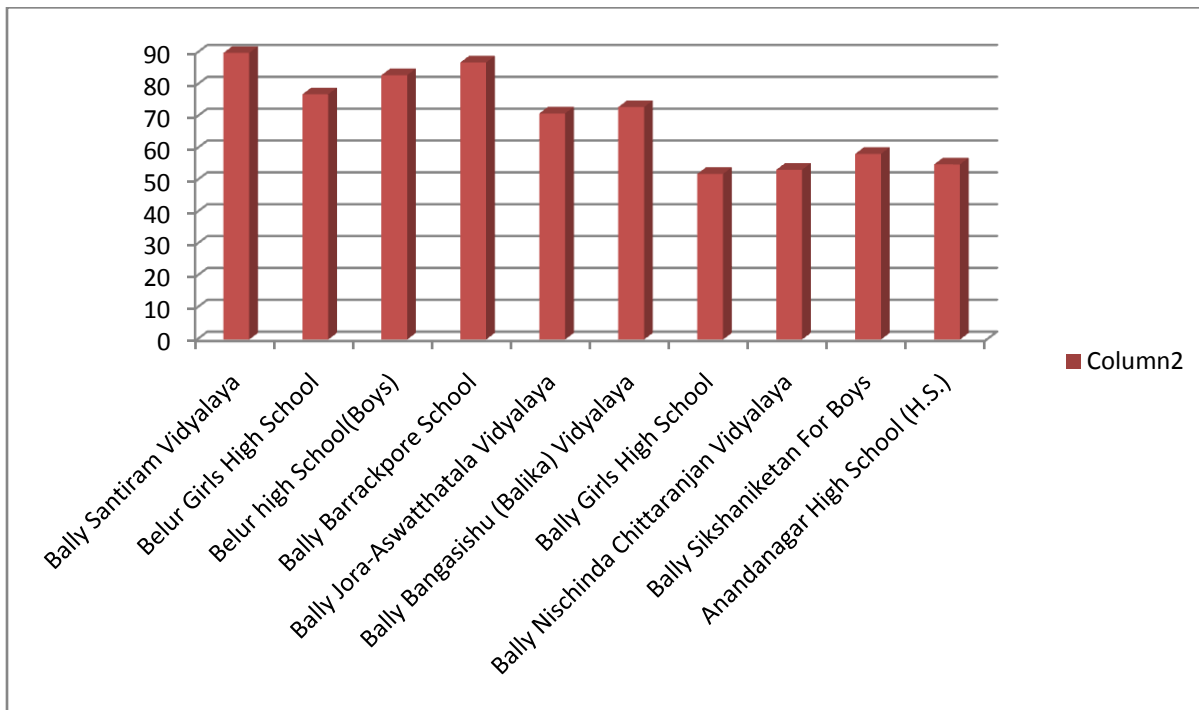


Fig 1(b):Average noise level of schools

Fig:1 Graphical representation of Table 1

Table 2: School wise information of type, locality environment and sample :

Sl.No	School	Address	Type	Locality	Environment	Sample collected
I.	Bally SantiramVidyalaya	382, Grand Trunk Rd, Bally, Howrah, West Bengal 711201	Boys	Beside G.T.Road	Noisy	16
II.	Belur Girls High School	Grand Trunk Rd, Belur, Liluah, Howrah, West Bengal 711202	Girls	Beside G.T.Road	Noisy	16
III.	Belur high School(Boys)	P 311, Grand Trunk Rd, Belur Math, Howrah, West Bengal 711202	Boys	Beside G.T.Road	Noisy	16
IV.	Bally Barrackpore School	Grand Trunk Rd, Belur, Bally, Howrah, West Bengal 711205	Boys	Beside G.T.Road	Noisy	16
V.	Bally Jora-AswatthatalaVidyalaya	Goswami Para, Dist. Howrah, Bally, West Bengal 711201	Boys	Beside Train route	Noisy	16
VI.	Bally Bangasishu(Balika) Vidyalaya	96, Goswami Para Road, Bally, Howrah, West Bengal 711201	Girls	Beside Train route	Noisy	16
VII.	Bally Girls High School	Bally, Howrah, West Bengal 711201	Girls	Interior	Quite	16
VIII.	Bally NischindaChittaranjanVidyalaya	Nischinda, Ghoshpara, Bally, Howrah, West Bengal, Ghosh Para, Howrah, West Bengal 711227	Boys	Interior	Quite	16
IX.	Bally Sikshaniketan For Boys	7, Sarkhel Para Ln, Bally, Howrah, West Bengal 711201	Boys	Interior	Quite	16
X.	Anandanagar High School	Sapuipara,	Boys	Interior	Quite	16

(H.S.)	Ghosh Para, Howrah, West Bengal 711227				
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Table 3 :Area wise comparison among different aspects viz. noise level from both school and residence, samples collected from both environment and the selection criteria of the sample:

School	Area	dB from school area	dB from their residence area	Sample from noisy area	Sample from quite area	Sample collection area	Selection criteria of the sample
Bally Santiram Vidyalaya	Beside G.T.Road	90 dB(A)	70 dB(A)	16	0	Slum area	Noisy residence and noisy school
Belur Girls High School	Beside G.T.Road	80 dB(A)	50 dB(A)	2	14	Interior city	Quiet residence and noisy school;
Belur high School(Boys)	Beside G.T.Road	85 dB(A)	52 dB(A)	2	14	Interior city	Quiet residence and noisy school;
Bally Barrackpore School	Beside G.T.Road	90 dB(A)	75 dB(A)	16	0	Slum area	Noisy residence and noisy school
Bally Jora-Aswatthatala Vidyalaya	Beside Train route	75 dB(A)	45 dB(A)	2	14	Interior city	Quiet residence and noisy school;
Bally Bangasishu (Balika) Vidyalaya	Beside Train route	85 dB(A)	47 dB(A)	1	15	Interior city	Quiet residence and noisy school;
Bally Girls High School	Interior	55 dB(A)	45 dB(A)	0	16	Interior city	Quiet residence and quiet school;
Bally Nischinda Chittaranjan Vidyalaya	Interior	55 dB(A)	47 dB(A)	0	16	Interior city	Quiet residence and quiet school;
Bally Sikshaniketan For Boys	Interior	60 dB(A)	65 dB(A)	12	4	Slum area	Noisy residence and quiet school,
Anandanagar High School (H.S.)	Interior	55 dB(A)	56 dB(A)	13	3	Slum area.	Noisy residence and quiet school,

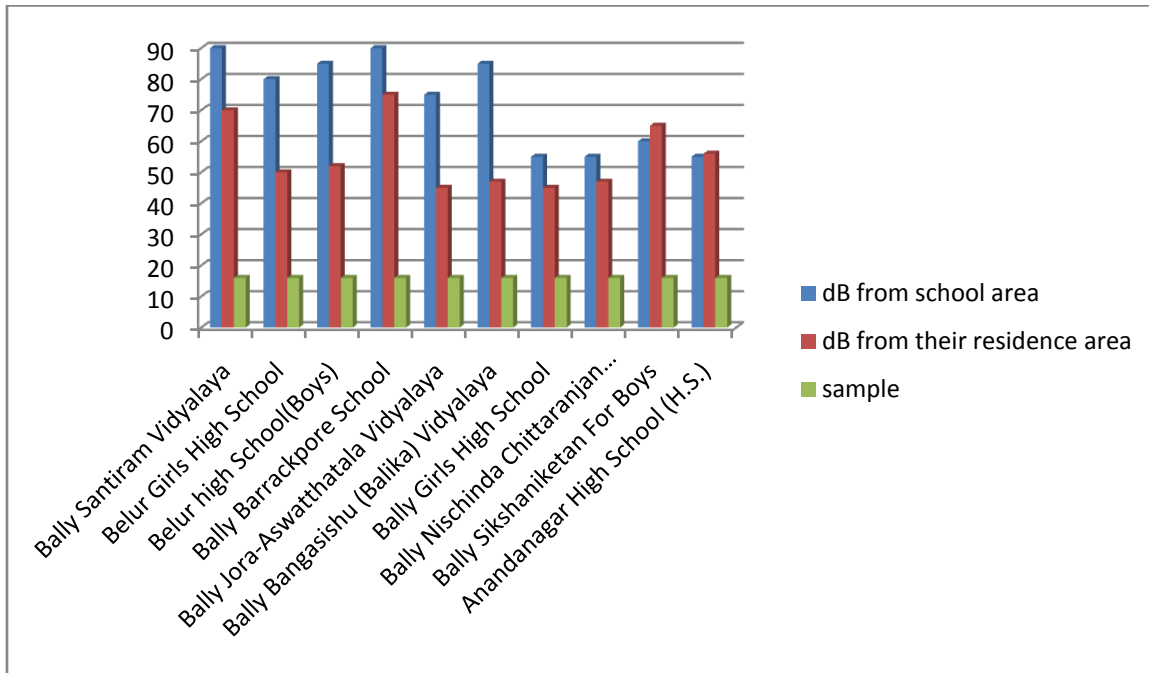


Fig 2: Graphical representation of Area wise co relation among different aspects viz. noise level from both school and residence, samples collected from both environment and the selection criteria of the sample.

Table 4: Comparison chart of environment type with their % of summative evaluation with grade average.

Environ ment type.	School	Type	Resi dence	C L A S S	No of sample		T O T a l	Average BP		%of summative evaluation	Grade average.
					N	Q					
Noisy residence and noisy school	Bally SantiramV idyalaya	BOY S	Slum area	VII	3	0	3	140/95	145/95	24%	D
				VIII	6	0	6	140/90		29%	C
				IX	7	0	7	150/100		25%	D
	Bally Barrack pore School	BOY S	Slum area	VII	8	0	8	130/95	23%	D	
				VIII	2	0	2	140/95	27%	C	
				IX	6	0	6	145/9	24%	D	

							16	0			
Noisy residence and quiet school,	Bally Siksha niktetan For Boys	BOY S	Slum area	VII	8	2	10	135/95	140/93	34%	C
				VIII	2	1	3	140/90		65%	B
				IX	2	1	3	135/95		74%	B+
	Ananda nagar High School (H.S.)	BOY S	Slum area	VII	7	1	8	130/90	140/93	36%	C
				VIII	5	0	5	140/95		66%	B
				IX	1	2	3	140/95		42%	C
Quiet residence and noisy school;	Belur Girls High School	GIRL S	Interi or city	VII	2	6	8	135/90	135/90	78%	B+
				VIII	0	4	4	135/95		44%	C
				IX	0	4	4	130/95		62%	B
	Belur high School (Boys)	Boys	Interi or city	VII	1	7	8	135/95	135/90	72%	B+
				VIII	0	4	4	135/90		77%	B+
				IX	1	3	4	135/95		76%	B+
	Bally Jora-Aswattha tala Vidyalaya	Boys	Interi or city	VII	0	4	4	135/90	135/90	41%	C
				VIII	1	5	6	135/95		73%	B+
				IX	1	5	6	135/90		95%	A
	Bally Banga sishu (Balika) Vidyalaya	Girls	Interi or city	VII	0	7	7	135/95	135/90	76%	B+
				VIII	0	3	3	135/95		61%	B
				IX	1	5	6	135/90		43%	C
Quiet residence and quiet school;	Bally Girls High School	GIRL S	Interi or city	VII	0	6	6	120/85	120/80	73%	B+
				VIII	0	6	6	120/80		64%	B
				IX	0	4	4	120/80		88%	A
	Bally Nischinda	BOY S	Interi or city	VII	0	8	8	120/80	85%	A	

Chittaranjan Vidyalaya	VIII	0	5	5	120/80	76%	B+
	IX	0	3	3	120/80	95%	A++
16							

Findings:

- Average noise level experienced by the students residing of noisy area lies between 70-75 dB.
- Average noise level experienced by the students residing of quite area lies between 45-60 dB.
- Total no of samples both gender from noisy area are 64.
- Boys from noisy area are 61, where as girls are 3.
- Among 64 students of both gender ,29 are from class VII,16 are from class VIII, and 19 are from class IX.
- Average systolic blood pressure of the noisy area samples are always high and it is 144
- Average diastolic blood pressure of the noisy area samples are always high and it is 95.
- Average pulse pressure of the noisy area samples are always high and it is 50
- Average pulse pressure of the quite area samples are always low and it is 40.
- Grade average % of summative evaluation for the noisy area is D
- Grade average % of summative evaluation for the quite area is A.

Conclusions:

Presently noise is a major risk factor for all of us. It is also a risk factor for school children. There is a strong correlation observed between huge noisy area and high blood pressure. Their annual summative report card was also studied. There is a strong relation between the achievement of the students those are in continuous exposure to noise and students from quite area. Noise is one of the major factor of their emotional disturbance and high blood pressure. The effect of noise in the classroom can make several disorders in students hearing, communication and intelligence.

The impact of noise generated by distributing questionnaires resulted the noise may bring physiological impact, which is often experienced by students in the form of dizziness. While the psychological impact include emotional and uncomfortable feelings. It also affects the communication process since the teacher's voice becomes unclear.

The actual mechanism for increase in blood pressure is not yet completely understood but it may be due to the following mechanism: The catecholamine released from adrenal medulla as a result of activation of adrenergic system, the effect of suprarenal glands steroids, angiotensin and also the direct effect of noise on arterial wall tension influences the blood pressure and heart rate.

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