



## Academic Stress Among Secondary School Students Living in Noise-Polluted Areas of Bihar

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### ABSTRACT :

Noise pollution is an often underestimated environmental problem, but has been a chief cause to various adverse effects on mental health and well-being. This research article investigates the adverse effects of noise pollution on the level of academic stress experienced by adolescents studying in secondary schools. For this study a sample of total 100 secondary school students studying in 9th and 10th standard residing in selected localities of Ara, Bhagalpur, Darbhanga, Muzaffarpur and Patna, the five noise polluted cities of Bihar, listed by the BSPCB were drawn through quota sampling technique, containing 20 samples each from these cities. The academic stress level was assessed through Scale for Assessing Academic Stress (SAAS-SUSVNM) was employed. The data was analysed through Pearson's product moment correlation. The result showed high academic stress levels among students from the selected localities. Strong correlation between noise pollution and academic stress levels was observed.

**Keywords :** Noise Pollution, Academic Stress, Adolescents, Secondary School Students.

### INTRODUCTION

Pollution is typically defined as introduction or excess of certain substances or agents that may cause adverse effects on living organisms and the ecosystem. These harmful substances or agents, also known as contaminants, can take the form of chemical substances or energy, such as heat, light or noise and can originate from various sources, including human activities like industrial processes, agricultural practices, and transportation. Noise, in the present era is becoming a major pollutant having large impacts on quality of life in urban areas. Noise can be defined as that unwanted sound, which produces undesirable physiological and psychological effects in an individual, by interfering with one's social activity, like work, rest, recreation and sleep. Noise pollution differs from other pollutants because it is temporary and does not persist once the noise stops, unlike gases and particulate matter, which linger in the atmosphere. The intensity of energy that these sound waves produce is measured in units called decibels (dB). The lowest hearing decibel level is 0 dB, which indicates nearly total silence and is the softest sound that the human ear can hear.

Over the past century, there has been a significant increase in noise from human activities. Despite its alarming increase, people tend to underestimate noise pollution as a health risk compared to other types of pollution. One of the major sources of noise pollution is transportation, including cars, aeroplanes, and trains. Urbanisation has also contributed significantly, with construction activities, industrial operations, and increased population density adding to the cacophony. Recreational activities, such as concerts and sports events, can also contribute to noise pollution.

Chronic exposure to high levels of noise has been associated with increased levels of stress hormones, such as cortisol, which can contribute to the development of anxiety and mood disorders (Hahad et al., 2019). Additionally, noise pollution has been linked to sleep disturbances, which can further exacerbate mental health problems (Halperin 2014). The impact of noise pollution on mental health is thought to occur through several mechanisms. Firstly, noise can disrupt the body's stress response system, leading to increased levels of stress hormones and physiological arousal. This can contribute to feelings of anxiety and tension (Hahad et al., 2019). Secondly, noise can interfere with sleep, which is essential for maintaining mental health (Halperin 2014). Sleep disturbances caused by noise pollution can lead to fatigue, irritability, and cognitive impairments, all of which can negatively impact mental well-being (Halperin 2014). Certain populations may be more susceptible to the effects of noise pollution on mental health. For example, children exposed to high levels of noise at an early age may be at an increased risk of developing behavioural problems and cognitive deficits (Halonen et al., 2021). Similarly, older adults may be more sensitive to noise due to age-related changes in hearing and increased vulnerability to stress (Wang et al., 2022).

Several studies have consistently highlighted the detrimental effects of noise on students' academic performance and well-being. Hygge et al. (2003) demonstrated that noise negatively affects attention and working memory performance. Supporting this, Shield and Dockrell (2008) found that noise exposure in classrooms impairs children's concentration and memory. Extending the focus to higher education environments, the research by Abulude et al. (2024) showed substantial evidence demonstrating the negative effects of noise pollution on individuals' cognitive function, psychological well-being, and physiological responses, ultimately impacting academic performance and user satisfaction. Similarly, Evans and Maxwell (1997) reported that elevated noise levels in schools were associated with lower reading scores in children. These findings align with a meta-analysis by Stansfeld and Matheson (2008), which confirmed a consistent link between environmental noise and poorer academic outcomes in children.

Further research has explored the psychological impact of noise exposure. Lercher et al. (2002) found that increased noise contributes to higher stress levels in students, which in turn can hinder academic performance. The effects of noise are not limited to daytime environments, as Hume et al. (2012) demonstrated that nighttime noise disrupts sleep patterns, leading to fatigue and impaired cognitive functioning during the day. The study by Muzet (2007) complements this finding by stating that even low-level noise during sleep can reduce sleep quality, resulting in daytime sleepiness that may further undermine academic performance.

Bihar State Pollution Control Board (BSPCB) identifies Ara, Bhagalpur, Darbhanga, Muzaffarpur and Patna as one of the most noise polluted cities in Bihar. The Bihar State Pollution Control Board (BSPCB) has conducted ambient noise level monitoring at various locations in Bihar, including Ara, to observe the environmental impact of noise pollution. The BSPCB has also implemented the Noise Pollution (Regulation and Control) Rules, 2000, which regulate the noise levels in different zones and prohibit the use of loudspeakers and public address systems without prior permission.

The noise level standards for different zones have been given in the table below :

**Table 1 :**

**Noise Level Standard for Various Locations**

Noise Level Standards		
	Day Time	Night Time
Residential	55	45
Commercial	65	55
Industrial	75	70
Silence Zones	50	40

Values are in dB

As the table indicates, the noise level standards for residential, commercial, industrial, and silence zones are 55, 65, 75, and 50 dB respectively, during the day time, and 45, 55, 70, and 40 dB respectively, during the night time. The mean ambient noise level at different locations and zones of Ara, throughout the year is given in Table 2 below :

**Table 2 :**

**Noise level at various cities of Bihar focused on the study**

Locality	Noise Level
Ara	72.30
Bhagalpur	74.20
Darbhanga	75.20
Muzaffarpur	76.40
Patna	78.80

Values are mean noise level of day and night in dB throughout the year

As can be seen from Table 2, the noise level at all the cities exceeded the prescribed standards. The noise level in Patna was the highest, followed by Muzaffarpur and Darbhanga. Traffic is the leading sources of noise pollution in these cities alongwith loudspeaker noise, and construction activities. The BSPCB has been taking various measures to control the noise pollution, such as creating awareness among the public, enforcing the noise rules, imposing fines on the violators, and conducting regular monitoring and inspection. However, the noise pollution in these cities of Bihar is still a serious issue that needs more attention and action from the authorities and the citizens.

### **AIM OF THE STUDY**

This study is aimed to investigate the level of academic stress among students residing in noise-polluted areas of these five cities of Bihar.

### **HYPOTHESES**

In light of various related literature, following null hypotheses were framed :

- Secondary school students living in the noise polluted localities will exhibit no academic stress on SAAS.
- There will be no relation between level of academic stress and noise pollution among secondary school students

## METHODOLOGY

### Sample

100 adolescents studying in secondary schools, i.e., standard 9th and 10th, were taken, comprising 20 students each from the most noise-polluted areas of these five cities of Bihar, mentioned above. The sample was derived from Makhania Kuan area of Patna, Tower Chowk area of Darbhanga, Bela area of Muzaffarpur, Town Hall area of Ara and Ghantaghar area of Bhagalpur, within a radius of one km. The sample was obtained through quota sampling technique.

### Tools

Scale for Assessing Academic Stress (SAAS) developed by Sinha et al. (2001) was used to assess the level of academic stress among these students. This scale consists of 30-items where respondents are expected to answer with “yes” or “no” response where each “yes” response carries 1 point. Higher score indicates greater academic stress level.

### Procedure

For the present study, the researcher personally approached the residents of the noise polluted localities and asked if they had any 9th or 10th standard students in their homes. Those homes who had students of these academic level, were explained the purpose of the research and permission was requested from the head of the families to allow their ward to participate in the study. Those who granted permission were asked to let the researcher meet their ward. A formal rapport was established with the participants prior to conducting the research. The participants were then told about the aim of the research and we're handed over a copy of SAAS. Clear instructions were given to the participants regarding SAAS, the items and the options. They were told that the scale consists of 30 items holding a yes or no option against each item to which the participant had to opt the most appropriate option closely resembling their situation. Participants were also told that there was no time limit however it would take hardly ten minutes to complete the survey. After they completed filling the form, the participants were warmly thanked and response sheets were taken back. The score was computed and correlation was calculated.

## RESULT AND DISCUSSION

The values of data retrieved from the students are given in Table 3 below :

**Table 3 :**

*Academic Stress Score of School Students in Various Localities of Ara (Bihar)*

Cities	Annual mean noise pollution level (in dB)	Mean score of Academic Stress on SAAS
Ara	72.30	20.25
Bhagalpur	74.20	21.55
Darbhangha	75.20	21.75
Muzaffarpur	76.40	22.50
Patna	78.80	24.20

From the above table, it is evident that the stress level of students residing in the selected areas of these areas were remarkably high. This enables us to reject the null hypothesis mentioned earlier, “Secondary school students living in the given noise polluted localities will exhibit no academic stress on SAAS.”

The result for correlation analysis is given in Table 5 below :

**Table-5 : Pearson's Correlation Coefficient**

r		Noise Pollution	Academic Stress
	Noise Pollution	1	0.7866**
	Academic Stress	0.7866**	1

\*\* Significant at 0.01 level

The calculated correlation coefficient,  $r(100) = 0.7866$ ,  $p < 0.01$ , indicating very strong positive correlation. Hence, we have substantial statistical evidence to reject the null hypothesis stating, “There will be no relation between level of academic stress and noise pollution among secondary school students.”

## CONCLUSION

From the research it can be concluded that exposure to noise-pollution can have a severe impact on academic stress of school students. Addressing noise pollution requires multilevel approach including regulatory measures, urban planning strategies, and individual behaviour change. Regulatory measures, such as noise ordinances and building codes, can help limit exposure to excessive noise. Ultimately, tackling noise pollution requires a collective effort. Governments, businesses, communities, and individuals all have a part to play in creating a quieter, healthier world. By raising awareness, implementing effective policies, and embracing innovation, we can reduce noise pollution and create a more peaceful environment for all.

This study was conducted on a very small sample size consisting of only 100 students from selected localities of Ara, Bhagalpur, Darbhanga, Muzaffarpur and Patna and therefore has a limited generalizability to a wider population. Future studies should be conducted on a larger sample of students from more diverse urban, semi-urban and rural localities of more cities of Bihar as well as from various socio-economics backgrounds, education level, age groups. Future studies should moreover, look at different kinds of noise, like traffic, construction, and concerts, as well as when noise is loudest during the day, and how these things affect stress levels. By studying the long-term effects of noise pollution on how well children do in school and how stressed they feel, we can learn a lot about how serious the problem is. It's also important for future studies to see how noise pollution affects children's daily lives and their school experiences.

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