Impact of air pollution in Mymensingh city of Bangladesh: focusing peoples' perception

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Abstract

The present study was conducted to investigate the impact of air pollution in some selected areas of Mymensingh city. The relationship between independent variables (age, educational qualification, family size and communication exposure) with the basic idea and impact of air pollution (dependent variable) was investigated in this study. To conduct the study, two hundred (200) respondents were selected randomly from four study sites under Mymensingh city. Pearson's product-moment correlation coefficients were analyzed to examine the relationship between the concerned variables. The findings revealed that 87.5% people have basic idea and 12.5% people have no idea about air pollution. About half (46%) of the peoples had high impact, 34% had medium and 20% had low impact because of air pollution. Out of four independent variables, three variables such as educational qualification and communication exposure had positive and significant relationship, age had negative but significant relationship and family size had non-significant relationship with their perception and awareness of air pollution. Further assessment on different air pollutants in the study area may explore the original status of air pollution and their impact on environment as well as on livelihood.

Key words: Air pollution, Mymensingh city, impact, awareness

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Introduction

Clean air is essential to maintain the gentle balance of life on this planet, not just for humans, but wildlife, vegetation, water and soil. But nowadays air pollution, especially in the large cities, is a major environmental hazard in Bangladesh. There are two major sources of air pollution in Bangladesh, vehicular emissions, and industrial emissions (Islam, 2014). Besides that, urbanization, industrialization and economic growth all resulted in a profound deterioration of air quality (Wahid, 2006) in Bangladesh.

Deteriorating air quality is a serious threat to human health. It also adversely affects the environment, destroys ecosystems, disrupts photosynthesis, causes climate change, and impoverishes biodiversity, and so on (Paoletti *et al*., 2010). The influence of poor ambient air quality on human health, agricultural production and damage to materials has been well documented in developing and developed countries. For years now, there have been evidence of growing numbers of cases of respiratory diseases (Svartengren *et al*., 2000; Afroz *et al*., 2003), various types of allergies, circulatory problems (Brunekreef and

Holgate, 2002), disturbances of the central nervous system (sleeplessness, headaches), and a greater incidence of cancer (Afroz *et al.*, 2003; Sokhi *et al.*, 2008; Lv *et al.*, 2011) and even higher mortality especially in the elderly and in children (Anderson, 2009). It was reported that the yearly economic loss associated with these health problems could range from a low estimate of $60 million to a high estimate of $270 million, equivalent to 1.7 to 7.5% of the city's gross product (Rahman, 2010). The World Health Organization (WHO) surveyed air quality in cities around the world. According to the study the highest levels of air pollution was found in mega cities of developing countries while air quality of developed countries like Japan and the United States was improving (WHO, 2006). Developing countries such as China and India which now suffer from serious air pollution, are beginning to build their environmental management systems (Kuklinska, 2015).

There are many researchers worked on Particulate Matters, indoor and outdoor air quality comparison, people perception on air pollution in rural and urban areas in Mymensingh region but limited reports found on the impact of air pollution based on respondent's perception (Sarker *et al.*, 2018; Islam *et al.*, 2018; Hasan *et al.*, 2020). Remembering these data the present study is conducted.

Mymensingh, a divisional city of Bangladesh is situated on the right bank of the river Brahmaputra. There are various sources of air pollution in Mymensingh city, among them unfit vehicles and industries are notable. Though green landscape around Mymensingh city and monsoon heavy rainfall helps to reduce the intensity of air pollution, a significant change in land uses and human intervention aggravate the degradation of air quality (Rouf *et al.*, 2012) which has become more acute in these recent days. This is mainly due to, in Bangladesh the level of understanding knowledge and awareness of the respondents in context of air pollution is comparatively low. Though air pollution has become a major concern

in Bangladesh, very few researches have been conducted to understand the impact of air pollution in Bangladesh. In view of the above considerations stated above the present study was undertaken to observe the peoples' knowledge about the impact of air pollution and to investigate the overall scenario of air pollution in Mymensing city.

Materials and Methods

Study Area: The study was conducted in Mymensingh city under Sadar Upazila of Mymensingh District. The Upazila was selected as study area due to the presence of different socio-economic classes of people. People with almost all types of occupational status (Teacher, Doctor, Farmer, Engineer, Businessman, Fisherman, Worker, Day laborer, Driver etc) lives here.

Preparation of questionnaire: Preparation of questionnaire is a must to conduct any survey and hence a questionnaire was prepared according to the objectives of the present study to record the information needed. Wording was done with concern to ensure that these are easily understood by the respondents as well as ensure their cooperation. The questions of the interview schedule were also arranged in such a way that the respondents could give an account of their opinion perception and awareness of air pollution.

Data collection: For primary data collection, four places of Mymensingh city Under Mymensingh Sadar Upazila was selected in this present study. A field survey was conducted during the period from July-December, 2018 to collect necessary data from the respondents by taking their personal interview. The study covered a number of total two hundred (200) respondents including fifty (50) respondents randomly chosen from each of four selected places. Six (6) variables were selected to conduct the study of which 4 variables (Age, Educational qualification, Family size and Communication exposure) were selected as independent variables and two others (Basic idea of air pollution and Impact of air pollution) were selected as

dependent variable. All possible efforts were made to explain the purpose of the study to the respondents in order to get actual overview. To overcome errors of the survey, all possible measures were also taken. After completion of each interview, each questionnaire was checked and verified with regard to ensure that the answer to each item had been properly recorded. Besides, supporting data and related materials were collected from different sources like internet, previous research and survey reports which were served as secondary data sources.

***Statistical analysis*:** In the present study, tabular analysis was done to classify the collected data and to derive the relevant findings. To confirm the variability of data obtained and validity of results, all the data were subjected for the statistical analyses using software SPSS (Statistical Package for Social Sciences). To find out the relationships between impact of air pollution and the selected characteristics of the respondents, The Pearson's product moment correlation co-efficient "r" was computed. Correlation matrix was also computed to determine the interrelationship among the variables and finally the analyzed data have been integrated and presented accordingly.

Results and Discussion

***Selected characteristics of the respondents*:** To understand the four selected characteristics of the respondents this part is decorated. The characteristics selected for this study are age, education, family size and communication exposure and those of the respondents are represented in (Table 1).

***Age*:** The age of the respondent ranged from 17 to 62 years whereas the average was 35.10. Based on their age, the respondent was classified into three categories, namely young (15 t0 30 years), adult (36 to 50 years) and old (above 50 years) as shown in (Table 1). In different study areas, the highest proportion (45%) of the respondent was adult, while 43% of them being young and only 12% were old. Thus, the findings

showed that majority of the people were young to middle aged group.

Table 1. Distribution of the respondents of different areas according to the selected characteristics (age, education, family size and communication exposure).

Characteristics	Categories (Range)	Total Respondents (200)		Mean
		No.	%	
Age	Young (15-30)	86	43.00	35.10
	Adult (31-50)	90	45.00	
	Old (Above 50)	24	12.00	
Educational Qualification	Illiterate	17	8.5	10.13
	Literate/ can sign only	9	4.5	
	Primary (1-5)	37	18.5	
	Secondary (6-10)	32	16.0	
	Higher secondary (11-12)	40	20.0	
	Graduate (13-17)	65	32.5	
Family size	Small family (2-4)	48	24	5.80
	Medium family (5-7)	119	59.5	
	Large family (8-11)	33	16.5	
Communication Exposure	Low (0-5)	61	30.5	7.66
	Medium (6-10)	108	54	
	High (11-15)	31	15.5	

***Educational qualification*:** The educational qualification scores of the respondents ranged from 0 to 17 and the average was 10.13. On the basis of their educational scores, the respondents were classified into six categories, namely illiterate (0), literate/can sign only (0-0.5), primary (1-5), secondary (6-10), higher secondary (11-12) and graduate (13-17). The

distribution of the respondents according to their educational qualification was represented in (Table 1). The result revealed that in different selected areas, the highest proportion (32.5%) of the respondents had graduate level education, while 20% had higher secondary level, 18.5% had primary level, 16% had secondary level, 8.5% could not read and write and only 4.5% of them was either literate or could sign their names only.

Family size: The family size of the respondents ranged from 3 to 11 members and the average was 5.80. On the basis of their family size, the respondents were classified into the following three categories as small family (2-4), medium family (5-7) and large family (8-11). (Table 1) represents the distribution of the respondents according to their family size. The study revealed that, highest proportion (59.5%) of respondent belonged to medium family followed by small 24% and large family 16.5%. Reduction in larger family in the study areas may due to increase of economic solvency, communication, consciousness about adoption of family planning measures and people's behavior.

Communication exposure: The level of communication exposure of the respondents in the study area indicated that the respondents are able to get information from various places about environmental awareness. Communication exposure scores of the respondents ranged from 1 to 15 and the average was 7.66. Based on the observed communication exposure scores, the respondents were classified into the following three categories namely low communication exposure (1-5), medium communication exposure (6-10) and high communication exposure (11-15). (Table 1) also represents the distribution of the respondents according to their communication exposure. The study revealed that in different study areas, about 54% of the respondents had medium communication exposure compared to 30.5% with low communication exposure and 15.5% with high communication exposure.

Basic idea on air pollution: Basic idea on air pollution of the respondents were divided in two categories, these were 'Yes' and 'No' (Figure 1). The study revealed that, 87.5% of the respondents had basic idea on air pollution whereas 12.5% had no idea on air pollution. Degroot *et al.*, (1966) reported the public perception about problems caused by air pollution in their own community and found that 43.6% of the respondents in 1959 thought so, and that percentage was increased up to 45.5% in a repeat study in 1962 which is lower than the present findings. Bickerstaff and Walker (2001) studied the people's perceptions of air pollution in Birmingham, UK and it was revealed that the basic idea of air pollution of respondents is 56% whereas the present findings is 1.6 times higher than the previous study which indicates that now a day's basic idea of air pollution is increased rapidly.
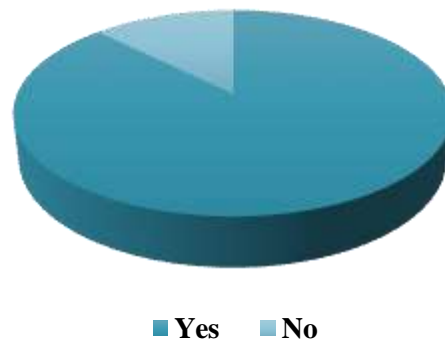

Figure 1. Basic idea on air pollution of the respondents.

Impact on air pollution: Air pollution impact scores of the respondents ranged from 6 to 125 and the average was 83.28. Based on the observed scores about impact on air pollution, the respondents were classified into the following three categories namely 'low' (1 to 50) and 'medium' (51 to 100) and 'high' (above 100). The distribution of the respondents according to their impact on air pollution is represented in (Figure 2). The study revealed that about 46% of the respondents had high whereas 34% had medium and the remaining 20% had low impact on air pollution. Bladen and Karan (1976) studied people's perception of air pollution in Chotanagpur, India where they found people have very

low impact on air pollution. The result of the present study is much better than the previous findings which indicates that now a day's people have become more concern about air pollution and the impact associated with this problem.
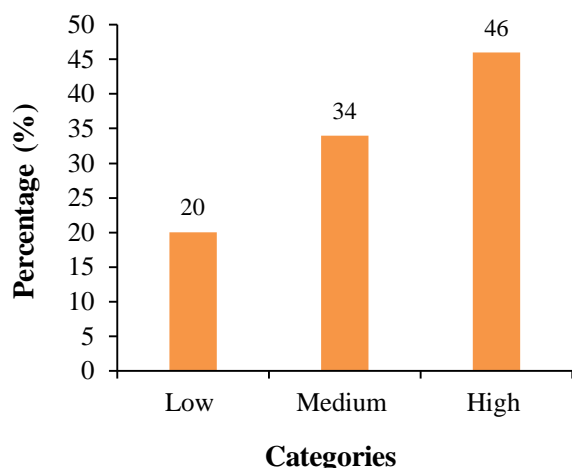

Figure 2. Distribution of the respondents based on impact of air pollution.

Relationship between the selected characteristics of the respondents and their basic idea on air pollution: Pearson's product Moment Correlation Co-efficient 'r' was used to test the null hypotheses concerning relationship between any two variables. A null hypothesis was rejected when the observed 'r' value was greater than the Table value of 'r' at 0.05 level of probability. Out of 4 variables, the relationships of 3 variables with respondent's basic idea of air pollution were significant, 1 was negative and non-significant, 1 was negative and significant and 2 was positive and significant. A summary of 4 correlations have been presented in Table 2.

Relationship between age of the respondents and their basic idea on air pollution: The relationship between age of the respondents and their basic idea of air pollution was measured by testing the null hypothesis: "there is no relationship between age of the basic idea and awareness of air pollution". The value obtained for the co-efficient of correlation between age of the respondents and their basic idea was -0.142 (Table 2). The relationships between these two variables, based on the co-efficient values indicated that: (a) The relationship showed a tendency in the negative direction between the concerned variables; (b) A significant relationship was found between the two variables and (c) The computed value of r (-0.142) was found to be negative and the value is higher than the table value (r=0.072) with 198 degrees of freedom at 0.05 level of probability.

Table 2. Correlation between selected characteristics and their basic idea on air pollution of the respondents.

Dependent variable	Independent variable	Computed value of 'r' N=200	Table value of 'r' at 198 degrees of freedom	
			0.05 level	0.01 level
Basic idea on air pollution	Age	-0.142*	0.072	0.312
	Educational qualification	0.506**		
	Family size	-0.018[NS]		
	Communication exposure	0.532**		

*Correlation is significant at the 0.05 level of probability (2 tailed), **Correlation is significant at the 0.01 level of probability (2 tailed), NS = Non significant.

Based on the above findings, the null hypothesis was rejected. It may be concluded that age of the respondents had negative and significant relationship with their basic idea of air pollution. Sarker (2005) and Roy (2007) revealed that the age of respondents had positive and significant relationship with their environmental awareness.

Relationship between educational qualification of the respondents and basic idea on air pollution: The relationship between educational qualification of the respondents and their basic idea of air pollution was measured by testing the null hypothesis. The observed value of the co-efficient of correlation between educational qualification of the respondents and their

basic idea of air pollution was 0.506 (Table 2). The relationships between these two variables, based on the co-efficient values indicated that: (a) The relationship showed a tendency in the positive direction between the concerned variables; (b) A significant relationship was found between the two variables and (c) The computed value of 'r' (0.506) was found to be higher than the table value ('r'=0.312) with 198 degrees of freedom at 0.01 level of probability.

Based on the above findings, the null hypothesis was rejected. Thus it can be concluded that educational qualification of the respondents had a positive significant relationship with their basic idea of air pollution. Educational qualification helps individuals to become rational, conscious and to become familiar with useful information about environmental awareness. A truly educated person is more conscious about every aspect of environmental issues and does not take part any destructive activities against country. Shalehin (2010), Aziz (2010) and Roy (2007) found in their study that, there was a positive significant relationship between education level of the respondents and their awareness of environmental issues which is similar to the present study.

***Relationship between family size of the respondents and their basic idea on air pollution*:** The relationship between family size of the respondents and their basic idea of air pollution was also measured by testing the null hypothesis. The value obtained for the co-efficient of correlation between family size of the respondents and their basic idea of air pollution was -0.018 (Table 2). The relationships between these two variables, based on the co-efficient values indicated that: (a) The relationship showed a tendency in the negative direction between the concerned variables; (b) A negatively non-significant relationship was found between the two variables and (c) The computed value of 'r' (-0.018) was found to be less than the table value ('r'=0.072) with 198 degrees of freedom at 0.05 level of probability.

Based on the above findings, the null hypothesis was accepted. It may be concluded that family size the respondents had negative and non-significant relationship with their perception and awareness of air pollution. Roy (2007) studied the relationship between the family size and environmental awareness of the respondents in his study and found negative relationship which supports the present findings.

***Relationship between communication exposure of the respondents and their basic idea on air pollution*:** In the same way the relationship between communication exposure of the respondents and their basic idea of air pollution was measured and the value obtained for the co-efficient of correlation between communication exposure of the respondents and their basic idea of air pollution was 0.532 (Table 2). The relationships between these two variables, based on the co-efficient values indicated that: (a) The relationship showed a positive trend; (b) A significant relationship was found between the two variables and (c) The computed value of 'r' (0.532) was found to be higher than the table value ('r'=0.312) with 198 degrees of freedom at 0.01 level of probability.

Based on the above findings, the null hypothesis was rejected. Thus it can be concluded that communication exposure of the respondents had a positive significant relationship with their basic idea of air pollution. This means that communication exposure of the respondents exerted influence for increasing their basic idea of air pollution. Therefore, it may be concluded that the respondents need to facilitate their educational opportunities as well as modern facilities for enrichment of their knowledge of air pollution. Aziz (2010), Shalehin (2010) also observed a positive significant relationship between communication exposure of the respondents and their awareness on environmental pollution which is similar to the present findings.

***Relationship between the selected characteristics of the respondents and their impact on air pollution*:** Pearson's product Moment Correlation Co-efficient 'r'

was used to test the null hypotheses concerning relationship between any two variables. A null hypothesis was rejected when the observed 'r' value was greater than the Table value of 'r' at 0.05 level of probability. Out of 4 variables, the relationships of 3 variables with respondent's impact on air pollution were significant, 1 was negative and significant and 1 was positive but non-significant. A summary of 4 correlations have been presented in (Table 3).

Table 3. Correlation between selected characteristics and their impact on air pollution.

Dependent variable	Independent variable	Computed value of 'r' N=200	Table value of 'r' at 198 degrees of freedom	
			0.05 level	0.01 level
Impact on air pollution	Age	-0.093*	0.072	0.312
	Educational qualification	0.803**		
	Family size	0.066^NS		
	Communication exposure	0.682**		

*Correlation is significant at the 0.05 level of probability (2 tailed), **Correlation is significant at the 0.01 level of probability (2 tailed), NS = Non significant.

Relationship between age of the respondents and their impact on air pollution: The relationship between age of the respondents and their impact on air pollution was measured by testing the null hypothesis: "there is no relationship between age of the respondents and their impact on air pollution". The value obtained for the co-efficient of correlation between age of the respondents and their impact was -0.093 (Table 3). The relationships between these two variables, based on the co-efficient values can be described as: (a) The relationship showed a tendency in the negative direction between the concerned variables; (b) A significant relationship was found between the two variables and (c) The computed value of r (-0.093) was found to be negative but value is higher than the table value (r=0.072) with 198 degrees of freedom at 0.05 level of probability.

According to the above findings, the null hypothesis was rejected. It may be concluded that age of the respondents had negative and significant relationship with their impact on air pollution. Sarker (2005) and Roy (2007) revealed that the age of respondents had negative and significant relationship with their environmental impact which is similar to the present findings.

Relationship between educational qualification of the respondents and their impact on air pollution: The relationship between educational qualification of the respondents and their impact on air pollution was measured by testing the null hypothesis. The value obtained for the co-efficient of correlation between educational qualification of the respondents and their impact on air pollution was found 0.803 (Table 3). The relationships between these two variables, based on the co-efficient values can be described as: (a) The relationship showed a tendency in the positive direction between the concerned variables; (b) A significant relationship was found between the two variables and (c) The computed value of 'r' (0.803) was found to be higher than the table value ('r'=0.312) with 198 degrees of freedom at 0.01 level of probability.

Based on the above findings, the null hypothesis was rejected. Thus it was concluded that educational qualification of the respondents had a significant positive relationship with their impact on air pollution. This may due to educational qualification helps individuals to become rational, conscious and to become familiar with useful information about environmental awareness. A positive significant relationship between education level of the respondents and their impact of environmental issues was reported in several studies (Shalehin, 2010; Aziz, 2010; Roy, 2007) which supports the present findings.

Relationship between family size of the respondents and their impact on air pollution: The relationship between family size of the respondents and their impact of air pollution was also measured by testing the null hypothesis and the value obtained for the co-

efficient of correlation between family size of the respondents and their impact of air pollution was 0.066 (Table 3). The relationships between these two variables, based on the co-efficient values indicated that: (a) The relationship showed a positive trend; (b) A positively non-significant relationship was found between the two variables and (c) The computed value of 'r' (0.066) was found to be less than the table value ('r'=0.072) with 198 degrees of freedom at 0.05 level of probability.

According to the above findings, the null hypothesis was accepted. It may be concluded that family size the respondents had a positively non-significant relationship with their impact on air pollution. Roy (2007) studied the relationship between family size and environmental awareness of the respondents and found a positive relationship existed between the two variables which is similar to the present study.

Relationship between communication exposure of the respondents and their impact on air pollution: In the same way the relationship between communication exposure of the respondents and their impact on air pollution was measured and the value obtained for the co-efficient of correlation between communication exposure of the respondents and their impact on air pollution was 0.682 (Table 3). The observations those were made regarding the relationships between these two variables, based on the co-efficient values as: (a) The relationship showed a positive trend; (b) A significant relationship was found between the two variables and (c) The computed value of 'r' (0.682) was found to be higher than the table value ('r'=0.312) with 198 degrees of freedom at 0.01 level of probability.

According to the above findings, the null hypothesis was rejected. Thus it was concluded that communication exposure of the respondents had a significant positive relationship with their impact on air pollution. Aziz (2010), Shalehin (2010) also observed a positive significant relationship between communication exposure of the respondents and their

awareness on environmental pollution which is similar to the present findings.

Conclusion

The study was undertaken to investigate the impact of air pollution in Mymensingh city. The results of this study provide an overview about air pollution. The results of this study revealed that, among the respondents of the study sites, in case of age, the highest proportion (45%) was adult, compared to 43% of them was young and only 12% was old whereas in case of educational qualification, about 32.5% had graduation level education compared to 20% of them had higher secondary level, 18.5% had primary education level, 16% had secondary education level, 8.5% was illiterate and only 4.5%was literate/can sign only. On the other hand, in case of family size, the highest proportion (59.5%) of the respondents were belonged to medium size family category followed by small 24% and large size family 16.5%, majority (83.5%) of them were belonged to small to medium size families whereas for communication exposure, about 54% had medium communication exposure compared to 30.5% had low communication exposure and 15.5% had high communication exposure. In case of basic idea of air pollution, 87.5% of the respondents had basic idea about air pollution compared to 12.5% of the respondents had no idea about air pollution. In case of impact of air pollution, about 46% of the respondents had high compared to 34% had medium and 20%had low impact on air pollution. Majority of the respondents (80%) had medium to high impact on air pollution. However, the results obtained for null hypothesis testing revealed that educational

qualification and communication exposure had positive and significant and age had negative but significant relationship whereas family size had non-significant relationship with their basic idea and impact on air pollution of the respondents. Hence, the null hypotheses were rejected in terms of these characteristics (age, educational qualification and communication exposure) and was accepted in terms of family size. Based on the findings it can be concluded that majority of the respondents have basic knowledge about air pollution but most of are still in darkness about impact (cause, effect, management) of air pollution. Therefore, it requires proper attempt to raise literacy level and communication exposure to increase the awareness about air pollution among people. It is further suggested that Extra care with above concerned fields should be taken to increase awareness about air pollution among people lives in city area.

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