Progressive Agriculture 29 (1): 22-32, 2018 **ISSN: 1017 - 8139**

Progressive Agriculture
Journal homepage:http://www.banglajol.info/index.php/PA

People's perception and awareness on air pollution in rural and urban areas of Mymensingh Sadar upazila

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Abstract

The present study was conducted to investigate peoples' perception level and awareness of air pollution in some selected areas of Mymensingh sadar upazila. The relationship of independent variables (age, educational qualification, family size, residence and communication exposure) with the peoples' perception level and awareness of air pollution (dependent variable) was done to understand the objectives of the study. Six Hundreds (600) respondents were selected randomly from six study sites under Mymensingh sadar upazila for collecting data during the period of Jan 2016-April, 2017. Pearson's product-moment correlation coefficients were computed to examine the relationship between the concerned variables. The findings revealed that about half (46.67 percent) of the peoples had medium perception and awareness, 31.67 percent had low and 21.67 percent had high perception and awareness about air pollution. In rural areas, 43.33 percent respondents had low, 50.00 percent had medium and only 6.67 percent had high perception and awareness of air pollution. In urban areas, 20.00 percent respondents had low, 43.33 percent had medium and 36.67 percent had high perception and awareness of air pollution. Majority of the respondents (93.33 percent) were lacking of proper awareness of air pollution in rural areas while 63.33 percent in urban areas. Out of five independent variables, three variables such as educational qualification, residence and communication exposure had positive and significant relationship, age had negative and significant relationship and family size had no relationship with their perception and awareness of air pollution.

Key words: Air pollution, rural and urban areas, Bangladesh, perception, awareness

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Introduction

The air is elastic, invisible and tasteless mixture of gases that surrounds the earth. Though air is an important element for all living organisms, it is polluted due to several natural process and human activities. The effects of air pollution are widespread and have no national boundaries (Rangwala *et al.*, 1990). Air pollution is the presence in ambient atmosphere of the substances, generally resulting from the activity of man, in sufficient concentration, present for a sufficient time and under circumstances which interfere significantly with the comfort, health or welfare of persons or with the full use or enjoyment of the property (Junker *et al.*, 2000). The air that we breathe can consist of many contaminants including ozone (O_3), sulfur dioxide (SO_2), the particulate matter, volatile organic compounds (VOCs) and nitrogen oxides (NO_x). Each of these contaminants has specific impacts on human health and the environment

(Synnefa *et al.*, 2003, Lee *et al.*, 1999). A scientific and technical review of the history of air pollution cannot commence much before the year 1850 (Halliday, 1961). The problems related to the air pollution have become an issue of concern for more than few decades. In 1968, experts from the World Meteorological Organization (WMO) drew up a program for monitoring the levels of certain air pollutants over time. This initiative formed the basis for the first global Background Air Pollution Monitoring Network, which supplied information on the influence of pollutants on the climate (Köhler, 1988). The World Health Organization (WHO) surveyed air quality in cities around the world. The study found the highest levels of air pollution in mega cities of developing countries while air quality of developed countries like Japan and the United States was improving (Organization and UNAIDS, 2006). Developing (like Bangladesh) or rapidly industrializing countries are most vulnerable to air pollution because a great amount of air pollutants from various sources mix continuously in the environment.

In developing countries like Bangladesh, population explosion along with widespread urbanization has resulted in dense urban centers with poor air quality. Urbanization, industrialization and economic growth resulted in a profound deterioration of air quality (Wahid, 2006). It has become increasingly evident in recent years that activities aimed at improving the living conditions of the ever growing population in developing countries cause air pollution intensively. Increasing air pollution adversely affects the environment, destroys ecosystems, disrupts photosynthesis, causes climate change, impoverishes biodiversity, and reduces crop harvests as a result of soil acidification (Paoletti *et al.*, 2010). Deteriorating air quality is a serious threat to human health. For years now, we have been observing growing numbers of cases of respiratory diseases (asthma, bronchitis, pneumonia) (Svartengren *et al.*, 2000, Sunyer *et al.*, 1993, 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).

In parallel with the advancement of technology, industrial revolution has imported new problems. Air pollution is one of such problems and has been severely affecting the urban as well as rural area environmental quality in the globe. Air pollution is a major concern in the large cities of Bangladesh. The main contributors of air pollution are motor vehicles, brick kilns, diesel generators and industries. In recent years much research interest has been shown on atmospheric particles as they influence on climate change and cause adverse health effects (Hasan *et al.*, 2010). Air quality monitoring data is limited in Bangladesh, however, periodic surveys by the Department of Environment (DOE), indicate that the ambient levels of SPM, SO_2 and airborne lead are higher than the Bangladesh air quality guidelines. The pollutants emitting from automobiles are obvious contributor to the pollution problem in Bangladesh; however, no emissions inventory detailing sources of pollution in national level is currently available. However, air quality policy is not the same in every country/region. Rich countries are introducing more stringent standards and advanced strategies to reduce air pollution (Kuklinska *et al.*, 2015). Although, a considerable amount of work has been done to measure the various characteristics of air pollutants both indoors and outdoors throughout the world, there is dearth of knowledge on indoor air quality in the developing world (Colbeck *et al.*, 2008). Mymensingh is a populated and rapidly developing cities in Bangladesh. The rapid growth of population along with unplanned land use development and inefficient traffic management system caused tremendous pressure on existing road network in Mymensingh. Air pollution caused by transportation is being growing a serious environmental problem in this district. It occurs due to the use of low lead gasoline without proper catalytic

converters, high sulfur in diesel, large number of high polluting vehicles, impure fuel, inefficient land use, and overall poor traffic management. The heterogeneous flows of traffic and having poor maintenance four stroke engine vehicles, which emit greater proportion of black smoke, are the major issues of concern. Bangladesh government, NGOs and civil society has taken some policies and programs to control the environmental problems but these efforts are not fruitful. In this context, as a developing country, Bangladesh need some initiate to reduce the level of air pollution. The initiates may be taking of proper environmental policy; increasing of literacy rate; changing of curriculum on environment in school, college and universities; implementation of environment friendly law; contribution of media can be contribute to increase perception and awareness about air pollution of the people in Bangladesh. To understand people perception and awareness about air pollution, very few researches have been conducted in Bangladesh. This study was conducted for observation the peoples' perception and awareness about air pollution as well as compare the level of peoples' perception and awareness of air pollution in rural and urban areas in selected part of Bangladesh.

Materials and Methods

Study Area: The study was conducted in Mymensingh Sadar Upazila under Mymensingh District (Figure 1). This area is situated north of the equator between 24°38' and 24°54' north latitude and 90°11' and 90°31' east longitude (BBS, 2011). Mymensingh Sadar Upazila has a total area of 281 square kilometers (175 sq. miles). The Upazila is divided into 13 Unions and 245 villages. Total population of Mymensingh Sadar Upazila is 674452 (BBS, 2011).

Socioeconomic Characters: The study was based in villages and municipality under Mymensingh Sadar. There are mixes of lower, lower-middle and middle socio-economic class families living within the community. Almost all types of occupational status (Teacher, Doctor, Farmer, Engineer, Businessman, Fisherman, Worker, Day labor, Driver etc.) live here. The literacy rate of Mymensingh Sadar Upazila is 49.9%.

Sampling and Analyses: A field survey was conducted during the period from Jan 2016- April, 2017 in the study area which covered six hundreds (600) respondents taking equally from six places of villages and municipality area. From these six places, three villages were selected primarily from Baera, Bhabkhali and Ghagra Union and three places from Mymensingh municipality area. The target population/ respondents encompassed people with different backgrounds including age, educational qualification, family size, residence, communication exposure. The hypotheses of present research constituted 6 variables were selected of which 5 were selected as independent variables (Age, Educational Qualification, Family Size, Residence and Communication Exposure) and one was selected as dependent variable (Perception and Awareness of Air Pollution). After completion of data collection, the analysis was performed by using statistical treatment with SPSS (Statistical Package for Social Sciences) computer package.

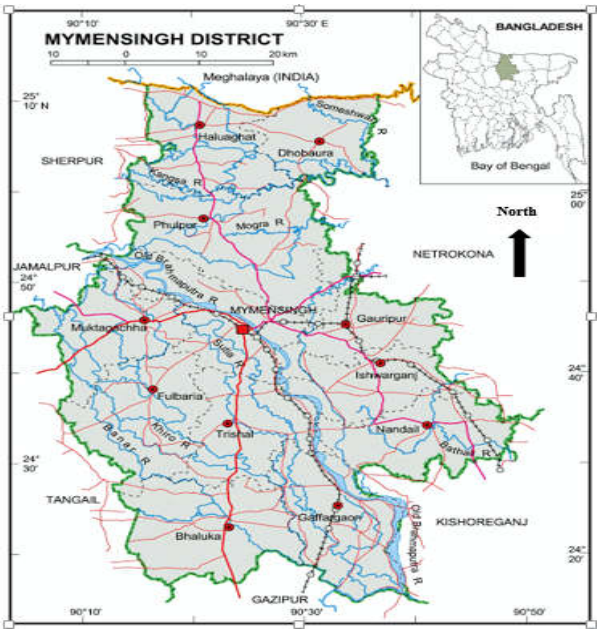

Figure 1. Map of the study area (Mymensing district and Sadar upazilla).

Results and Discussion

Selected characteristics of the respondents

Age, educational qualification and family size

The age of the respondents ranged from 23 to 61 years, the average being 390. The highest proportion (70% and 56.67%) of the respondents were middle aged for rural and urban areas respectively (Table 1a). Actually, the findings showed that majority of the people were young to middle aged group (Table 1b).

In both rural and urban areas primary education level accepted the respondents as the highest proportion (50% and 63.34% respectively) (Table 2a). Considering the both study areas, 43.33% of the respondents had primary level education, 31.67% had secondary level and 16.67% had higher secondary level education. About 8.33% of the respondents was either illiterate or could sign their names only (Table 2b).

Table 1a. Distribution of the respondents of different areas according to their ages.

Study Area	Categories	Total Respondents (N = 600)	
		Number	%
Village (300)	Young (up to 35)	60	20.00
	Middle aged (36-50)	210	70.00
	Old (Above 50)	30	10.00
Urban (300)	Young (up to 35)	120	40.00
	Middle aged (36-50)	170	56.67
	Old (Above 50)	10	3.33

Table 1b. Distribution of the respondents of both study areas according to their ages.

Categories	Total Respondents (N = 600)	
	Number	%
Young (up to 35)	180	30.00
Middle aged (36-50)	380	63.33
Old (Above 50)	40	6.67

Table 2a. Distribution of the respondents of different areas according to their educational qualification.

Study Area	Categories (Range)	Total Respondents (N = 600)	
		Number	%
Village (300)	Illiterate/can sign only (0-0.5)	10	3.33
	Primary (1-5)	150	50.00
	Secondary (6-10)	110	36.67
	Upper Secondary (11-17)	30	10.00
Town (300)	Illiterate/can sign only (0-0.5)	40	13.33
	Primary (1-5)	110	36.67
	Secondary (6-10)	80	26.67
	Upper Secondary (11-17)	70	23.33

Table 2b. Distribution of the respondents of both study areas according to their educational qualification.

Categories (Range)	Total Respondents (N = 600)	
	Number	%
Illiterate/can sign only (0-0.5)	50	8.33
Primary (1-5)	260	43.33
Secondary (6-10)	190	31.67
Upper Secondary (11-17)	100	16.67

The family size of the respondents ranged from 2 to 8 members and average household level was 4.93. In case of villages and city, highest proportion (60% and 53.33% respectively) of respondent belonged to medium family category (Table 3a).

Table 3a. Distribution of the respondents of different areas according to their family size.

Study Area	Categories (Range)	Total Respondents (N = 600)	
		Number	%
Village (300)	Small family (2-4)	70	23.33
	Medium family (4-6)	180	60.00
	Large family (>6)	50	16.67
Town (300)	Small family (2-4)	110	36.67
	Medium family (4-6)	160	53.33
	Large family (>6)	30	10.00

Besides, both areas studied showed that about half (45%) of the respondents had medium families and majorities of the respondents (86.67%) had medium to small families (Table 3b). Reduction of larger family size in the study areas due to increase of economic solvency, communication, consciousness about adoption of family planning measures and people's behavior.

Table 3b. Distribution of the respondents of both study areas according to their family size.

Categories (Range)	Total Respondents (N = 600)	
	Number	%
Small family (2-4)	250	41.67
Medium family (4-6)	270	45
Large family (> 6)	80	13.33

Residence and Communication exposure

Permanent residence of respondents is one of the important criteria to measure awareness of the people. Various facilities are high in urban and semi-urban areas compared to rural areas. About 50% of the respondents live in rural areas, 18.33% live in semi-urban areas and 31.67% live in urban areas (Table 4).

Table 4. Distribution of the respondents of both rural and urban areas according to their residence.

Categories (Scale)	Total Respondents (N = 600)	
	Number	%
Rural (1)	300	50.00
Semi-urban (2)	110	18.33
Urban (3)	190	31.67

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 3 to 12 against the possible range of 0 to 15. In village and

town areas, about 53.33% and 56.67% of the respondents had medium communication exposure compared to 6.67% and 10% who had high communication exposure respectively (Table 5a). Besides, in the both areas 55% of the respondents had medium communication exposure compared to only 18.33% had high communication exposure (Table 5b).

Table 5a. Distribution of the respondents of different areas according to their communication exposure.

Study Area	Categories (Range)	Total Respondents (N = 60)	
		Number	%
Village (300)	Low (up to 5)	120	40.00
	Medium (6-10)	160	53.33
	High (Above 10)	20	6.67
Town (300)	Low (up to 5)	40	13.33
	Medium (6-10)	170	56.67
	High (Above 10)	90	30.00

Table 5b. Distribution of the respondents of both study areas according to their communication exposure.

Categories (Range)	Total Respondents (N = 600)	
	Number	%
Low (upto 5)	160	26.67
Medium (6-10)	330	55.00
High (Above 10)	110	18.33

Perception and awareness of air pollution

Air pollution perception and awareness scores of the respondents ranged from 30 to 112 against the possible range of 0 to 126. The distribution of the respondents according to their awareness of air pollution was shown in Table 6a and 6b. Data presented in Table 6a indicated that, in village areas, about 50% of the respondents had medium compared to 43.33% had low and only 6.67% had high perception and awareness about air pollution; In city areas, about 43.33% of the respondents had medium perception and awareness compared to 36.67% had high perception and awareness and only 20% had low perception and awareness of air pollution.

Table 6a. Distribution of the respondents of different areas according to their perception and awareness on air pollution.

Study Area	Categories (Range)	Total Respondents (N = 600)	
		Number	%
Rural (300)	Low aware (up to 50)	130	43.33
	Medium aware (51-100)	150	50.00
	High aware (Above 100)	20	6.67
Urban (300)	Low aware (up to 50)	60	20.00
	Medium aware (51-100)	130	43.33
	High aware (Above 100)	110	36.67

Table 6b. Distribution of the respondents of both study areas according to their perception and awareness on air pollution.

Categories (Range)	Total Respondents (N = 600)	
	Number	%
Low aware (up to 50)	190	31.67
Medium aware (51-100)	280	46.67
High aware (Above 100)	130	21.66

Relationship between the selected characteristics of the respondents and their perception and awareness on air pollution

The purpose of this section is to explore relationship between each of the selected characteristics of the

respondents and their perception and awareness of air pollution. The selected characteristics include: age, educational qualification, family size, communication exposure and residence. The relationship between the selected characteristics of the respondent and their perception and awareness of air pollution is presented in Table 7.

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 5 variables, the relationships of 3 variables with respondent's perception and awareness of air pollution were significant and positive, 1 was negative and significant and 1 was negative and non-significant. A summary of 5 correlations have been presented in Table 7.

Table 7. Correlation between dependent and independent variables.

Dependent variable	**Independent variable**	**Computed value of 'r' N = 60**	**Table value of 'r' at 58 degrees of freedom**	
			0.05 level	**0.01 level**
Perception and awareness of air pollution	Age	-0.528**	0.256	0.333
	Educational qualification	0.739**		
	Family size	-0.200^{NS}		
	Residence	0.415**		
	Communication exposure	0.804**		

*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 perception and awareness on air pollution

The relationship between age of the respondents and their perception and awareness of air pollution was measured by testing the null hypothesis: "there is no relationship between age of the respondents and their perception and awareness of air pollution". The observed value of the co-efficient of correlation between age of the respondents and their perception and awareness was found -0.528 as shown in Table 7. The following observations were made regarding the relationships between these two variables, based on the co-efficient values:

a. The relationship showed a tendency in the negative direction between the concerned variables.
b. A significant relationship was found between the two variables.
c. The computed value of r (-0.528) was found to be negative but value is higher than the table value (r=0.333) with 58 degrees of freedom at 0.01 level of probability.

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 perception and awareness of air pollution. Sarker (2005) and Roy *et al.* (2014) revealed that the age of respondents had negative and significant relationship with their environmental awareness.

Relationship between educational qualification of the respondents and their perception and awareness on air pollution

The relationship between educational qualification of the respondents and their perception and awareness of air pollution was measured by testing the null hypothesis: "there is no relationship between educational qualification of the respondents and their perception and awareness of air pollution". The observed value of the co-efficient of correlation between educational qualification of the respondents and their perception and awareness of air pollution was

found 0.739 as shown in Table 7. The following observations were made regarding the relationships between these two variables, based on the co-efficient values:

a. The relationship showed a tendency in the positive direction between the concerned variables.
b. A significant relationship was found between the two variables.
c. The computed value of 'r' (0.739) was found to be higher than the table value ('r'=0.333) with 58 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 perception and awareness of air pollution. Educational qualification helps individuals to become rational, conscious and to become familiar with useful information about environmental awareness. An educated person has high opportunity to gather information of various aspects by reading daily newspaper, magazine, pamphlets, leaflets, books and other printed materials than an illiterate person. A truly educated person is more conscious about every aspect of environmental issues, he loves his/her country and does not take part any destructive activities against country. Shalehin (2010), Arfin *et al.* (2012) and Roy *et al.* (2014) found in their study that, there was a positive significant relationship between education level of the respondents and their awareness of environmental issues.

Relationship between family size of the respondents and their perception and awareness on air pollution

The relationship between family size of the respondents and their perception and awareness of air pollution was measured by testing the null hypothesis: "there is no relationship between family size of the respondents and their perception and awareness of air pollution". The observed value of the co-efficient of correlation between family size of the respondents and their perception and awareness of air pollution was found -0.200 as shown in Table 7. The following observations were made regarding the relationships between these two variables, based on the co-efficient values:

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.
c. The computed value of 'r' (-0.200) was found to be less than the table value ('r'=0.256) with 58 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 *et al.* (2014) found negative relationship between the family size and environmental awareness of the respondents in his study.

Relationship between residence of the respondents and their perception and awareness on air pollution

The relationship between residence of the respondents and their perception and awareness of air pollution was measured by testing the null hypothesis: "there is no relationship between residence of the respondents and their perception and awareness of air pollution". The observed value of the co-efficient of correlation between residence of the respondents and their perception and awareness of air pollution was found 0.415 as shown in Table 7. The following observations were made regarding the relationships between these two variables, based on the co-efficient values:

a. The relationship showed a positive trend.
b. A significant relationship was found between the two variables.
c. The computed value of 'r' (0.415) was found to be higher than the table value ('r'=0.333) with 58 degrees of freedom at 0.01 level of probability.

Based on the above findings, the null hypothesis was rejected. Thus, it was concluded that residence of the respondents had a significant positive relationship with their perception and awareness of air pollution. The respondents living in urban areas get more facilities

(High living standard, Educational opportunity, Communication exposure, Use of modern technology etc.) than rural areas. Different fair, exhibition, seminar, show, rally, festival etc. of various occasions are frequently arranged in urban areas and people have high opportunity to attend these fests compared to rural areas. So that, urban people had more perception and awareness of air pollution compared to rural people. Ziadat (2010) found positive significant relationship between residence of the respondents and awareness of the environmental issues.

Relationship between communication exposure of the respondents and their perception and awareness on air pollution

The relationship between communication exposure of the respondents and their perception and awareness of air pollution was measured by testing the null hypothesis: "there is no relationship between communication exposure of the respondents and their perception and awareness of air pollution". The observed value of the co-efficient of correlation between communication exposure of the respondents and their perception and awareness of air pollution was found 0.804 as shown in Table 7. The following observations were made regarding the relationships between these two variables, based on the co-efficient values:

a. The relationship showed a positive trend.
b. A significant relationship was found between the two variables.
c. The computed value of 'r' (0.804) was found to be higher than the table value ('r'=0.333) with 58 degrees of freedom at 0.01 level of probability.

Based on 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 perception and awareness of air pollution. The respondents having more exposure with communication media had more perception and awareness on environmental issues like air pollution, water pollution, soil pollution, biodiversity degradation etc. This means that communication exposure of the respondents exerted influence for increasing their perception and awareness 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 perception and awareness of air pollution. Arfin *et al.* (2012) and Shalehin (2010) observed a positive significant relationship between communication exposure of the respondents and their awareness on environmental pollution.

Comparison of peoples' perception level and awareness of air pollution between rural and urban areas

The present study was conducted in six selected areas (both rural and urban areas) in Mymensingh Sadar Upazila. One of the major objectives of the study was to compare people perception level in rural and urban areas. In this research work, researcher attempted to find out the comparison about perception level between above concerned groups. Urban (and sub-urban) people generally have high opportunity to exposed different people, different cultures and more educated. Rural people are more locally interdependent; they are not exposed to different people and culture frequently and they are less educated. All kinds of opportunities (Economical, Social, Cultural, Political and many others) are also higher in urban than rural areas. So it is clear that, the level of perception and awareness about air pollution is tending to be high in urban areas. The comparison related to perception level and awareness of air pollution between above mentioned areas is shown in Figure 2 and briefly described below.

Data presented in Figure 2 showed that, in rural areas, 43.33% respondents had low perception and awareness of air pollution, while 20% had low perception and awareness in urban areas; about half (50%) of the respondents had medium perception and awareness of air pollution in rural areas compared to 43.33 percent in urban areas. Only 6.67% had high perception of air pollution in rural areas while a considerable percent

(36.67%) of respondents had high perception and awareness of air pollution in urban areas. In rural areas, majority of the respondents (93.33%) were lack of proper perception and awareness of air while 63.33% in urban areas.

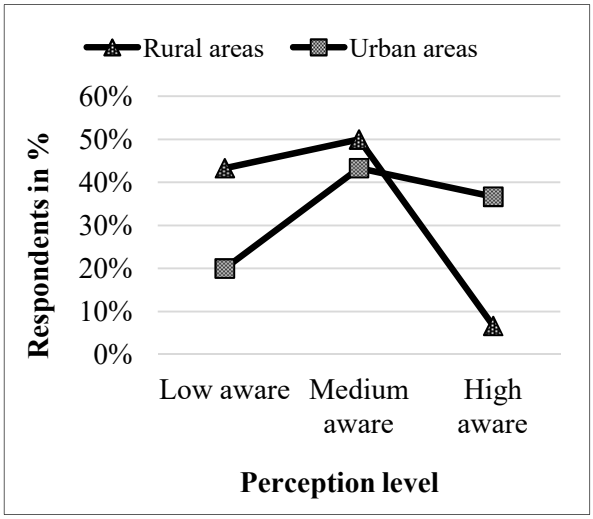

Figure 2. Comparison of perception and awareness of air pollution in rural and urban areas.

Conclusion

The people of urban or rural area have poor perception and awareness about the issue of air pollution. A major portion of the people unaware about the environmental crisis or atmospheric phenomena along the villages or cities. Based on the findings it can be concluded that majority of the respondents are still in darkness about perception (cause, effect, management) of air pollution. Again in comparison with rural and urban (both semi-urban and urban) people, urban people is advanced than the rural people about air quality and exposure. Strategic steps should to take for developing the awareness ability of the rural people with a great emphasis. Proper education helps an individual to realize and concern about environmental issues (air pollution) at the personal, social and national levels. In this regard, educational programs and mass literacy programs should be arranged regularly in rural areas. Environmental education should be included in the formal education systems at all levels. Finally it can be concluded that, proper attempts should be taken to raise literacy level, communication exposure to increase the perception and awareness of air pollution among people. Extra care with above concerned fields should be taken to increase perception and awareness of air pollution in rural areas.

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