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Public awareness, behavior and preventive practices of the rural people in the adaptation to smog episodes

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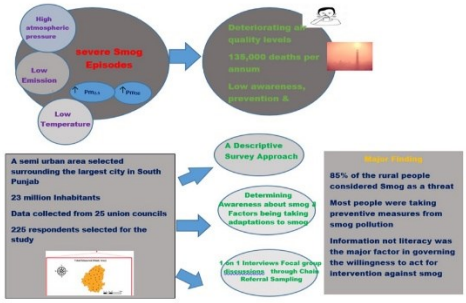
Graphical abstract



Abstract

Smog has emerged as one of the biggest issues facing Pakistan and many other nations in recent decades. However, this crucial environmental issue has received less attentions of measuring public perception and awareness of air pollution and the connections between it and smog prevention in a Pakistani context especially with respect to rural areas. A questionnaire based study was designed to evaluate the rural people perception, awareness and preventive practices to cope with severe episodes of smog in district Kahnewal, South Punjab, to fill this gap. The results indicated that majority of the respondents comes from working in the city accounting for 36.44% of the total income. About 85% of the people in the villages have moderate to a good level of understanding regarding smog pollution. Moreover, around 84% of the people in the villages were considering smog to be a moderate to very severe problem. Television news and weather forecasts (34%) were found to be the most often used source of information on smog. About 44% of respondents were using facemasks while 32% of the participants had reduced their outdoor activities as potential protection measures against smog. The findings of this study can help to improve the understanding of public awareness of smog pollution in rural people of Pakistan, thereby encouraging greater public involvement in smog prevention and management, contributing significantly to the broader goal of sustainable development.

Keywords: Air pollution; health consequences; smog control policies; government performance

1. Introduction

Among various global environmental challenges, smog is at the forefront of causing air pollution and deteriorating the air quality of various mega cities worldwide (Saleem *et al*, 2019). Air quality levels of various cities today are much worse as compared to previous decades (Ghauri *et al* 2013). For example, in India alone, the $PM_{2.5}$ levels rose to 890 ($\mu g/m^3$) in 2020 from 450 ($\mu g/m^3$) in 2010 (Arif *et al* 2016). While in Shanghai, the number of days with good air quality was just a mere 275 days in 2018, with an air quality index good rate of 75.3% (Mukhtar, 2017). Rising levels of population, industrialization, unplanned cities expansion, and increasing numbers of vehicles have enhanced the profile of pollutants. They are affecting the cities and deteriorating the environment of the villages (Khan *et al* 2011; Sharif *et al* 2016; Azam *et al* 2016). Smog levels in the big cities and villages surrounding them are now frequent and much pronounced every coming year (Azam *et al* 2016; Ghauri and Zafar 2016). Smoggy periods are getting so common that smog is now being perceived as the fifth season in most parts of the world (Sadiq, 2016 Omer, 2018). Smog pollution is now one of the most pressing environmental and public health issues of the world (Omer, 2018; Sarfraz, 2020). As smog levels have hit record levels thus currently globally, most parts of the world are observing the most serious air pollution of the current period (Sarfraz, 2020; Dimitriades, 1972).

Smog is responsible for about 135,000 deaths per annum (Muilwijk *et al* 2016; Wilson, 1972). Heavy metals in the atmosphere are the leading cause of life-taking diseases such as Asthma, Bronchitis/emphysema, and Cardiac problems (Tao *et al* 2015). A study in Bangladesh depicted that smog is taking lives and potentially costing around 6% of the country's GDP (Imran, 2020). Studies have shown smog to affect the economic activities of various megacities (Khan, *et al* 2019; Wasif 2016: Iqbal, 2019). Thus, providing financial losses to major businesses around the world (Elsom, 2014; Zhang and Samet, 2015). Smog also imparts loss in terms of productivity (Ashraf *et al* 2019; Ali *et al* 2019). According to the World Bank and Health Metrics and Evaluation institute, the worldwide price for air pollution has accounted for 5.2 trillion dollars, about 7.1% of the yearly GDP (Ali *et al* 2019; Newell, 2017). As per lancet, the cost of decreased efficiency and productivity because of smog-linked diseases has risen from 0.61 to 0.82% (Newell, 2017).

In Pakistan, small periods of smog have been recorded for many years now (Qin *et al* 2018; Yasin *et al* 2024). But the more pronounced, intensive, and frequent spells of smog had specifically blown two provinces of the country, i.e., Punjab and KPK. It started in 2012 and has spread on an area ranging from 155000 to 35400 km^2 Calbi *et al* 2017). In most recent times, the largest metropolitan city of Punjab, i.e., Lahore, became the 2nd most polluted city in the entire world (Wei *et al* 2017; Yasin *et al* 2021). This led Pakistan's smog season to be most detrimental for exposed people, especially children (Qin *et al* 2018). Levels of particulate matter in the megacities and their surroundings are rapidly increasing, reportedly having an annual particulate matter 2.5 average of 74 µg/m^3 (Shaw *et al* 2004; Hussain *et al* 2018). According to claims of some experts, smog in Pakistan has been linked with the coal refining industry in the country and crop burning activities by the farmers from the Indian Punjab (Jiang *et al* 2016). On the contrary, both countries are experiencing the same issue, and they must cooperate in this regard to have a smog-free atmosphere (Amann *et al* 2017; Karambelas *et al* 2018).

Amid increasing smog episodes, it is important that not only the communities are fully aware and have sufficient knowledge regarding smog. But also, decision-making processes regarding preventive behavior are understood in order to generate behavioral responses (Mei *et al* 2014; Yasin *et al* 2023). Thus the necessity of this research becomes far more important and pivotal, as it would help to shape the design and implementation of effective and efficient adaptive policies both in urban and rural areas. Further, this study will help to depict perception and aid understanding of the levels of exposure to smog in a specific community. This research makes it easier to infer driving factors underlying various behavioral responses.

A few limited studies in Pakistan have tried to depict awareness levels of smog among urban populations (Qin *et al* 2018; Jiang *et al* 2016; Ahmed *et al* 2019; Ranabhat *et al* 2015, Zhu and Yao, 2018). All of these studies have concluded that due to abrupt, frequent, and long smog events, people in the cities perceive smog as a harmful environmental condition (Jiang *et al* 2016; Ahmed *et al* 2019; Vogel and Rose 2017). A few of the studies in the country also displayed that residents actively participate in preventive and mitigating activities to curb smog (Jiang *et al* 2016; Bacev-Giles and Haji, 2017). Although there are many research on smog in urban settings, there are essentially none in the current literature on smog perception and the factors that contribute to it in rural Pakistan. Few things are known about the variables influencing how individuals in rural areas often perceive and respond to pollution, as well as how these factors affect individual behavior changes in these situations. (Oanh *et al* 2018; Yasin *et al* 2019).

The present study constitutes survey-based research applying a questionnaire that was distributed among the residents of villages in southern Punjab. This study is one of its kind to determine awareness regarding smog and factors behind taking adaptations to smog in rural areas of Pakistan. The next section will provide a methodology for conducting the survey at the study site. After that, several characteristics of awareness levels among the public are presented and discussed The aim is to understand what smogmeans to them, the severity of the problem, the primary cause of smog, and potential mitigation activities. Finally, the conclusion and policy implication is presented.

2. Materials and methods

2.1. Study site and methodological approach

The present study was conducted in district Khanewal located in Southern Punjab, Pakistan. District Khanewal is divided into four Tehsils (townships): Jahania, Kabirwala, Khanewal, and Mianchannu. On its west lies the largest city in southern Punjab: Multan, which harbors the largest population in the region. While on the north, there are districts Jhang and Toba Tek Singh that is also populated and industrialized cities of Punjab. As per the census of 2017, Khanewal had a population of 2376000.

According to Köppen–Geiger classification, the climatic condition of the area is the desert climate (Figure 1) The area receives an average annual rainfall of up to 346 mm and experiences an average annual temperature of 25.2 ^oC. This region has constantly been experiencing heavy smog for the last decade. The smog episodes here start in late November and remain till the end of January. Smog in this region is most dense in mid and late December, lowering visibility even by less than 1 meter. Due to this, motorways and highways are often shut down in order to prevent accidents. According to studies in the national context, high levels of Particulate Matter ($PM_{2.5}$ –PM_{10}), organic aerosols, SO_2 NO_x and trace pollutants are recorded in smog-affected areas (Raza *et al* 2021). Environment departments in the national context have their offices set up in big cities, but in rural areas, such offices are often absent (Anjum *et al* 2021).

The current research utilized a descriptive survey approach. This method was used to attain data from the rural population to determine the perception of smog with respect to one or more variables (Schweighart *et al*

2020). Descriptive surveys ensure that all detailed and factual information describing an existing phenomenon can be gathered Glasow, 2005). This particular research design is of key importance when it comes to an understanding human perception regarding a certain issue, especially in observing a large population that could not be observed directly (Sukamolson, 2007). Due to these reasons, this survey approach was selected and employed in the study.

Data from 25 union councils, or administrative divisions, in the chosen district tehsil were gathered for the current study (Figure 2). Fieldwork was done in 2022 between March and July. The timing of the visits was important because this particular area had recently experienced a severe pollution outbreak. From the chosen administrative units, 225 persons were interviewed in all, and everyone of them provided an answer. The general populace of rural villages near large cities was the study's target audience. These were chosen because of periods of extreme pollution brought on by numerous, busy companies in the suburbs of the city.

Respondents were approached in the lead of the local guide from each union council following a snowball sampling technique, also known as chain referral sampling (Zubair *et al* 2019; Yasin *et al* 2024). The selected sampling method is very useful in identifying those parts of the population that usually remain unexplored because of a lack of local knowledge and other socio-economic barriers.

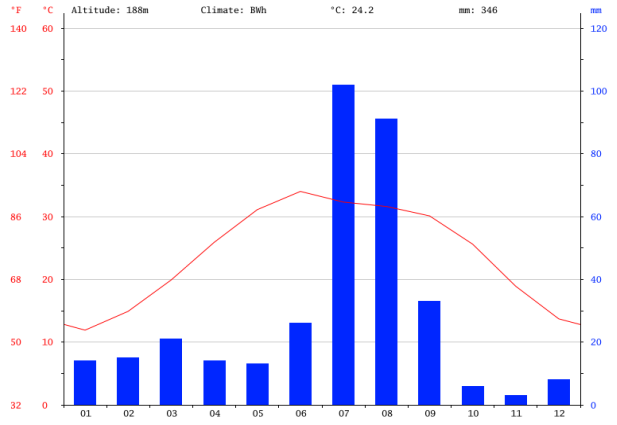


Figure 1. Average annual temperature and precipitation of the study site

2.2. Organization of the questionnaire.

In order to get the public perception and awareness about smog pollution in the rural areas of the selected area, a validated questionnaire was prepared. The reliability of the questionnaire was checked using Cronbach's alpha coefficient for questions related to perceptions, awareness and adaptation with a coefficient score of 0.85, 0.80, and 0.79, respectively, showing the contents of variables included in the questionnaire are reliable. The questionnaire was originally composed of five parts: Demographic information such as age, education, income, income source, etc. The demographics and background information were important to this survey's purpose to clarify public opinions as well as to clarify how people were affected by smog pollution.

The second part was related to the valuation questions (1. Most appropriate reason for smog as per your understanding 2. Source of information regarding smog 3. How severe is smog in your region as per your experience?). In the third section of the questionnaire, respondents were asked whether they were satisfied with the government's performance of smog pollution control. In the fourth section of the survey, the impact of smog on the health of rural people was assessed. This section focused on clarifying how the participants' health is being affected by the smog pollution levels. The purpose of the questions in this section was to get first-hand information on what kind of health effects were experienced in the last year due to smog pollution. The fifth and final part was about the participation and potential of the public to intervene in the smog-causing activities in the study area.

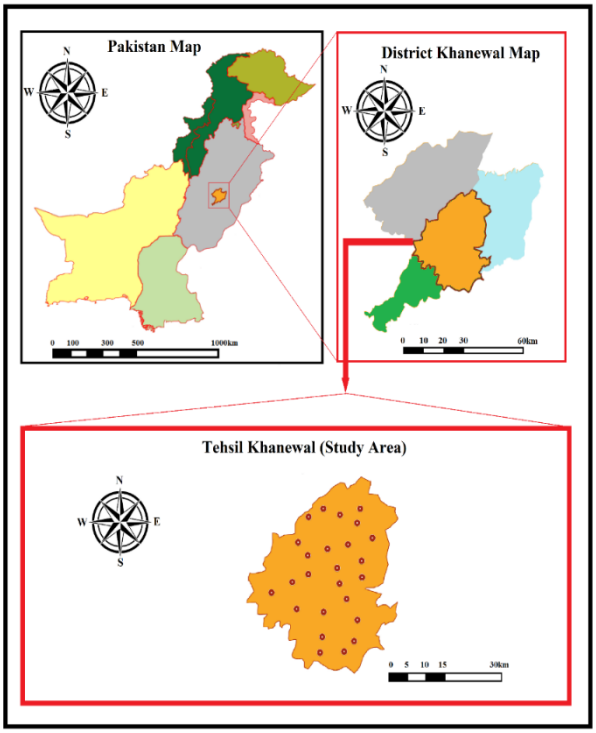


Figure 2. Location map of the study area showing the distribution of union councils in tehsil Khanewal

2.3. Data Analysis.

The data collected during the survey was organized into a Microsoft Excel spreadsheet and later on imported into Statistical Package for Social Science (SPSS Inc, IBM Corporation, Somers, NY, USA) version 21. The data were initially analyzed to present a descriptive analysis with respect to different socio-economic aspects, including age, profession, and education on the smog's perception, awareness, and adaptability. Further chi-square analysis was applied for determining an association between the education of the respondents and the smog intervention practices adopted by them. Our study also utilized a binary logistic regression model for depicting the relationship between potential interventions/ adaptations against smog and Respondent perceptions.

2.4. Binary logistic Model explanation

The binary logistic regression model assesses the association among one or more independent variables and a categorical target variable. It allows the researchers to determine how well selected independent variables are predicting the dependent variable and hence finds the model's goodness of fit. These models are particularly used when there is a need to identify key factors having an impact on the selected target variable. It is also important as it describes the nature of association among independent factors and dependent variables. Many similar studies have utilized a binary logistic model in which the relationship of a single categorical dependent variable is depicted with certain independent variables (Zubair *et al* 2019; Haq *et al* 2015; Qazalbash *et al* 2021; Malik *et al* 2021).

The binary logistic regression model is used to determine the relationship between potential interventions/ adaptations against smog and respondent perceptions (i.e., education, the reason for smog, Source of smog information, smog effects on the body, concern about smog, the problem of smog on daily life and government performance) Table 1. While intervention to smog is a dichotomous variable (0= No, 1= Yes) and p, the success of probability assumed as

Logit Model (pi) = Log (pi/1-pi)

Where pi donates the probability of yes and (1-pi) is the probability of no.

Intervention to smog (Yes/No) = (0 + Education + reason of smog + source of smog information+ smog effects on body + concern about smog + problem of smog on daily life + government performance). While all the explanatory/ independent variables were in dichotomous/binary in nature. Education (0 = Illiterate, 1 = literate), reason of smog (0 = industries (construction, brick backing), 1 = others (coal and straw burning etc.) Source of smog information (0 = Conventional Methods, 1 = Modern methods), smog effects on body (0 = respiratory, 1 = eyes/immunity decrease), concern about smog (0 = no concern, 1 = very concerned), problem of smog on daily life (0 = disagree, 1 = agree) and government performance (0 = satisfied, 1 = not satisfied).

3. Results

3.1. Demographic Information of the respondents

Table 1 represents the various demographic characteristics of the sampled population interviewed during the survey. Most of the respondents engaged in the survey were male because females and their families were not comfortable with them taking part in the interview session. The respondents aged between 25 to 35 accounted for 45%, which was the highest proportion. While people aged above 50 had the lowest proportion (8%). It is in accordance with the fact that Pakistan is now identified as the nation having the largest youth population in the world. The empirical evidence showed that the larger proportion of the sampled population had only completed basic education that passed the matriculation examination (24%). There were only 14% of the people had gone to colleges or any university (Table 1).

Table 1. Demographic information of the respondents, including age, education, income, and income source

Selected Characteristics	Categories	Percentage (%) of Respondents
Age	Very young (<25)	15.55 ± 2.62
	Young (25-35)	45.77 ± 4.51
	Middle aged (36-50)	30.66 ± 3.69
	Old (>50)	8 ± 1.88
Education	Illiterate	12 ± 2.3
	Primary	14.22 ± 1.9
	Middle	15.56 ± 2.6
	Matric	24 ± 3.3
	Intermediate	19.56 ± 1.2
	>Intermediate	14.67 ± 2.5
Income per annum	<200(000) PKR	10.22 ± 2.13
	200-300(000) PKR	30.22 ± 3.66
	300-400(000) PKR	40.88 ± 4.26
	>400(000) PKR	18.66 ± 2.88
Income Source	Farming	21.33 ± 3.07
	Farming + Job	14.66 ± 2.01
	Farming + Business	27.55 ± 2.55
	Working in cities	36.44 ± 4.02

3.2. Income and income source of the respondents

The descriptive statistics show that 30.2% and 40.8% of the participants received annually an income ranging from 200,000-300,000 and 300,000-400,000 Pakistani Rupee, respectively, contributing to the highest percentage of the annual incomes of the family livelihood. A small proportion of the local residents reported their family income to be greater than 400,000 Pakistani Rupees depending upon the success of the cultivated crop (Table 1). The primary income of the respondents in the sampled

population came from working in the cities, accounting for about 36% of the total incomes. Local employment coupled with farming represented the second place for a participant's income sources. It is not a surprise that most of the income of these families comes from working in the city due to increasing modernization, industrialization, and urbanization.

3.3. Information access channel to smog

The empirical evidence depicts that only 5% of the sampled population had never heard about smog (Figure 3). A major proportion of the population was quite aware of the smog and had information about it via various avenues. The most widespread hub of smog information was found to be the news and the weather forecasts aired on television (34%). The other proportion of the population got to find out about the smog through neighbors and relatives in the village (21%). In contrast, only a small part of the sampled population used social media to access information regarding smog (15%).

3.4. Awareness and attitudes on severity degree of smog pollution in villages

The attitude of people regarding smog living in the villages was found out to be moderately severe. Severity is mainly based on knowledge, perception, and subjective feelings and judgments. Further, the level of awareness of people living in various regions could have differed. The results showed mixed attitudes regarding smog pollution in the selected rural sites. It was observed that the highest portion of the respondents (35%) were saying that smog was a little severe for them (Figure 4). While in contrast, 24% and 20% of the residents agreed that smog for them was severe to very severe, respectively.

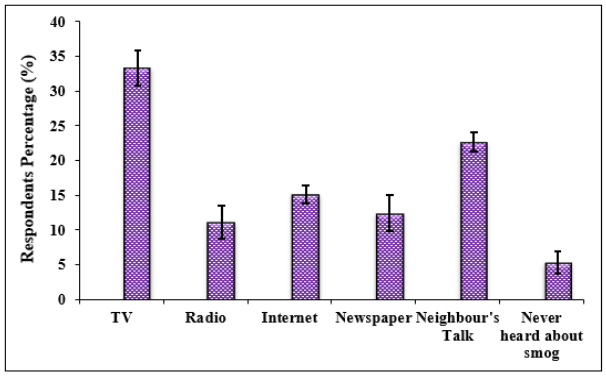


Figure 3. Information source for respondents to access smog pollution in the study area

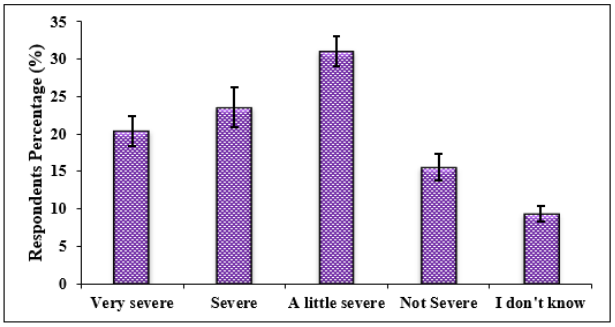


Figure 4. The attitude of respondents about the severity degree of smog pollution in the study area

3.5. Perception and recognition of main causes of smog

The people living in villages near the big city depicted a moderate level of awareness regarding smog pollution. The results show that the residents of these villages perceive anthropogenic activities as the main culprit of inducing smog. Straw burning (24%) is widespread activity in rural Pakistan to dispose of agricultural waste. Most of the farmers burn their agricultural residues in the field or on the site. However, during the survey, it was observed that farmers and other residents in the villages perceived straw burning as the main contributor to smog in the region. Further vehicular emission (21%) and industrial gas emission (20%) were recognized as the 2nd main factors of smog generation. Comparatively, meteorological factors, coal burning and brick kilns were considered as less important factors for heavy smog (Figure 5).

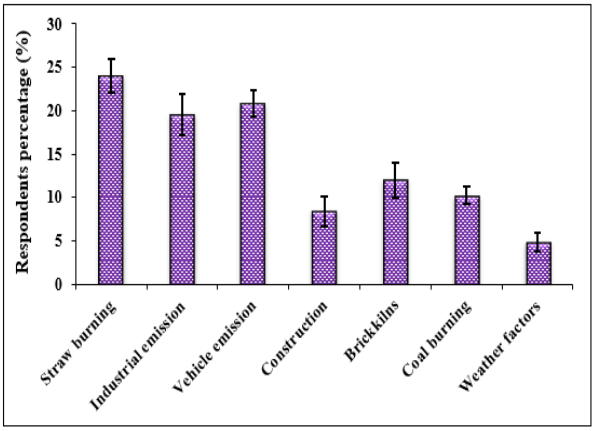


Figure 5. Respondent's percentage about the recognition of main causes of pollution in the study area

3.6. Potential protection measures against smog

It was observed that the people with more concerns regarding smog episodes wanted to take protection measures and intervention against it. There were 44% of respondents that were using facemasks during a smog episode. While about 32% of the participants believed that they had reduced their outdoor activities during the smog period (Figure 6)

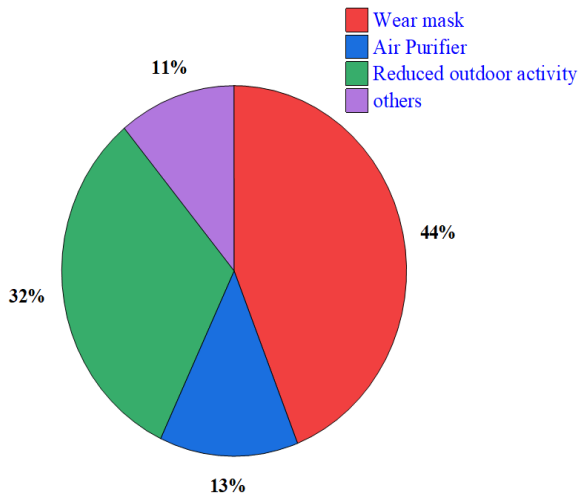


Figure 6. Potential protection measures taken by respondents to protect themselves from smog pollution

3.7. Perception of government performance in smog control

The government role from the lens of the study sites was very minimal in the control of smog episodes in the region. It appeared that about 61% of the people in the survey site were only a little satisfied with the government's role in curtailing smog. Further, 23% were not at all satisfied with the government's performance (Figure 7). While only 16% of the people were showing signs of satisfaction regarding the role of government in controlling smog.

3.8. Nexus of education and smog intervention practices

The Chi-square analysis was applied to the data for determining an association between the education of the respondents and the smog intervention practices adopted by them. The results showed a significant relationship; it displayed that the intervention practices adopted by the community in order to curtail the effects of smog were certainly dependent upon the education of the people in the rural settings (Table 2).

Table 2. Chi-square analysis regarding education and protection measures

		Potential protection measures about smog		χ^2 Statistics
		Yes	No	
Education of respondents	Illiterate	12	15	
	Primary (5th standard)	9	22	
	Middle (8th standrad)	16	19	20.631
	Matric (10th standard)	36	18	(0.001)
	Intermediate	29	15	
	Graduation	25	9	
Total		127	98	

3.9. Empirical findings based on the logistic model

The study incorporated a binary logistic regression model including maximum likelihood evaluation utilizing the chi-squared test. The model analyzed how perception regarding smog influences the intervention/adaptation to smog of the residents in the villages present near big, industrialized cities.

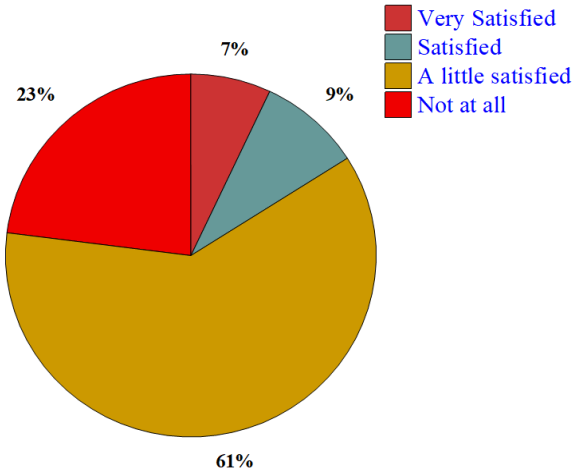


Figure 7. Satisfaction regarding the government performance in the study area to control smog pollution

The model assesses how the choice of taking interventions against smog is affected by education, the reason for smog, sources of smog information, smog effects on the body, concern about smog, the problem of smog in daily life, and government performance. The maximum likelihood is a typical method utilized for evaluating probability functions as the results of the model are concordant, asymptomatically, and satisfactorily disseminated. In this model, a total of 7 variables were used, among which about 5 variables showed a significant relationship in the model. Education, the reason for smog, smog concern, smog effects on the body, and the problem of smog on daily life came out to be significant. The present research results show that the perception of smog is a significant determinant of smog-related interventions and adoption practices (Table 2).

Among significant independent variables, education was displaying a negative correlation (B= -1.052, Wald= 5.064. $p<0.05$) with the variable held dependent (i.e., intervention to smog). The negative sign of beta depicts that the people who had only a basic education were more likely to take immediate interventions against smog. It is because most populations in the sampled villages were mainly illiterate and recently had suffered the wrath of intense smog episodes. The reasons for smog show a negative correlation with the intervention practices to smog (B= -.659 Wald= 4.010 $p<0.05$). It was observed that people who perceived smog as a result of industrial and agricultural emissions were more active in taking interventions against smog as compared to the people who believed smog as a result of various meteorological factors. The community's concern about smog was considered significant and displayed a positive correlation (B=.570 Wald=3.100 $p<0.05$). As it was observed that the people who thought of smog as a deep concern would quickly react and take preventive practices against smog. Smog effect on the body was another variable that displayed a negative correlation against the dependent variable (B=-1.403 Wald= 17.336 $p<0.05$). The people who considered that the smog had considerable effects on their respiratory system were depicted to take more and intermediate interventions against the smog. Furthermore, the problem of smog in daily life had a significant relationship (B= -.307 Wald= 3.262 $p<0.05$). The model suggests that the participants in the study considering smog a significant problem in their life were more active in taking interventions while the people perceiving it as a little problem were not active participants in interventions and adoption to smog.

4. Discussion

The current study investigates awareness of smog and its interventions from the rural communities inhabiting around the proximities of mega industrialized cities in Pakistan. The research has revealed some interesting results and new implications for policymakers to control and mitigate both direct and indirect effects of smog at rural levels. Although there have been a few studies in Pakistan investigating the perception and awareness of smog among the major urban centers of Pakistan (Hussain *et al* 2018; Saleem *et al* 2019). The literature has shown that the nexus of smog and rural areas are yet to be appropriately explored (Jiang *et al* 2016). Many of the smog and other pollution studies conducted in the countries are solely based on the urban population, thus neglecting the rural population (Hussain *et al* 2018). Pakistan is usually considered an agricultural country, having a larger proportion of the population in the villages Thus the current study has tapped into smog perceptions of the rural population and the factors behind their willingness to take interventions against smog.

Table 3. Binary Logistic Model (Dependent Variable: Do you have Potential for intervention/Adaptation (Yes/No)? / Predictors: Respondent's perceptions

Variables	B	S. E	Wald	df	Sig.
Education	-1.052	.468	5.064	1	0.024
Reasons of smog	-.659	.329	4.010	1	0.045
Source of Smog information	1.186	.872	1.852	1	0.174
Smog effects on body	-1.403	.337	17.336	1	0.001
Concern about smog	.570	.324	3.100	1	0.048
Problem of smog on daily life	-.307	.170	3.262	1	0.049
Government Performance	.056	.436	.016	1	0.898
-2 Likelihood			247.607[b]		
Chi-Square			3 4.485		
df			7		
Significance			0.000		

B = Beta, S.E = Standard Error, Wald = Wald Chi Square, Df = Degrees of Freedom, Sig = Significant p<0.050

The main highlight of the study is a depiction of a good level of understanding of smog among the rural population. It is a widespread myth that the villages are cleaner and greener; thus, the effects of air pollution and smog in these areas are often reduced (Amann *et al* 2017; Karambelas *et al* 2018). But according to Karambelas *et al* (2018), a study conducted in north India depicted that the death counts in rural India due to air pollution were equal or more as compared to urban India This is in compliance with the current study as quite a few people in the study site were aware of the problem and had described pertinent reasons that were playing a part in smog generation. Our results showed that the information regarding smog was induced mainly from electronic and social media. This is attributed to the fact that most of the villages in the study area were adjoining a big city, so communications and social media were in the grasp of most of the people (Mei *et al* 2014). Furthermore, we found that considerable people in the villages considered smog a severe problem. These findings contrast with Jiang *et al* (2016) which describes that the knowledge of smog and its factors was quite minimal in the rural population of various Chinese villages. Our results suggest that the people in the villages in south Punjab, Pakistan, have displayed efficient smog literacy, which conforms to people's knowledge and smog literacy in much developed and informed urban centers such as Lahore (Saleem *et al* 2019).

It was observed that people in the villages of south Punjab were equipped with the same knowledge and concern level from smog as some of the improved and developed people residing in the cities (Saleem *et al* 2019; Ahmed *et al* 2019). The findings in the current research depicted that the people in the villages perceived straw burning as a major source of smog generation as they thought the smoke and pollution created from this type of burning is more as compared to the brick kilns and vehicular emissions. These results were in accordance with other studies in which they depicted that the people in various south Asian villages also perceived straw burning as a major cause of smog generation (Jiang *et al* 2016; Ahmed *et al* 201; Ranabhat *et al* 2015). An important thing that the study depicts is the willingness of the rural people to act against the smog in order to protect themselves and their families. The findings contrast with the research in some Chinese villages where people were not taking any preventive measures to protect themselves from the smog effects (Jiang *et al* 2016). These findings were similar to the willingness of people in major smog-stricken cities where the use of masks and reduced outdoor activities were on top to avoid smog (Saleem *et al* 2019; Zhu and Yao, 2018).

The binary logistic regression model used in the study suggests that there are a few extremely important factors that induce such a willingness to take interventions against smog. The model suggests that literacy levels had no role to play in taking prevention actions against smog (B= -1.052, Wald= 5.064. p<0.05) As most of the illiterate people in the villages were more concerned hence taking protective measures. This is attributed to the fact that knowledge regarding a specific issue has more capacity to form perceptions as compared to general education

(Vogel *et al* 2017). Further, the channel of smog information was observed to be a strong predictor in taking preventions against smog (B= 1.186 Wald= 1.852, p < 0.05). The model suggests that the people who had obtained information from media had been more likely to take protective measures.

This could be explained by the fact that the influence of social media is so deep and strong that various researchers prove it as a tool to form perceptions and trends in human society in this era (Bacey-Giles and Haji, 2017). Evidence suggests the local community that perceives smog to be caused due to straw burning was more likely to take preventive measures (B= -.659 Wald= 4.010 p<0.05). It is a crucial factor as this conventional practice releases huge amounts of incomplete combustion products that generate lots of particulate matter, thus increasing the pollution index of that specific area (Oanh *et al* 2018). The concern of smog is a critical factor that governs the willingness of the people to take preventive measures (B=.570 Wald=3.100 p<0.05). It is supported by various studies around the world in which health is the main concern that lead people to take a special interest in protecting themselves from the menaces of air pollution Qin *et al* 2018; Wang *et al* 2019).

5. Conclusion

The present study depicts awareness levels of smog among the general rural population residing near big cities. Further relationships among smog literacy and information source with preventive measures against smog practiced by these rural communities were studied. Our study concluded that the targeted rural community in the vicinity of the big city had enough understanding of smog, understood its sources, and mildly practiced general preventive measures. It was observed that social and digital media were major drivers in providing the source of smog-related information. The research concluded that education was a significant factor when it comes to preventive practices. Somehow educated people were more inclined towards practicing preventive measures. The main finding of this study is the willingness of rural communities to participate in smog preventive activities. The logistic model employed in the study also depicted that the education and problems of smog in daily life were the major factors that encouraged rural communities to adapt to smog.

The rural communities in the selected sites had shown moderate awareness of smog literacy. This is an important sign and implies that the related government departments must involve the people in the villages for smog awareness and adoption activities. The perception of people regarding smog differs mainly from monitoring results; people are liable to have biases in their judgment depending upon the longevity of smog episodes and the demographic of the people Thus it is recommended that in order to change people's confirmed convictions, heavy investment in resources regarding publicity and education must be focused on. Our findings have shown that the people in the rural areas were considering straw burning as the major cause of smog generation So it is important to understand the major sources of pollution demand of a certain policy in various regions depending upon the scientific analysis and public opinion. Implementing strict control of agricultural residue burning is necessary, and an alternative residual elimination method must be introduced. It is pressed through this research that local conditions must be considered when developing atmospheric policies.

It is concluded in the study that people in the villages are willing to take precautionary measures in order to avoid smog. Alongside disaster management authorities, the environment department must collaborate with the local pro smog adopters to develop effective and efficient smog control policies to lessen the smog effect in coming smog episodes.

Conflicts of interest

The authors declared that there are no conflicts of interest.

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