

## Perception about the Factors Associated with Smog among Medical Students

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### ABSTRACT

**Background and Objective:** With increasing urbanization, we are getting repeatedly exposed to a number of environmental calamity with dire health consequences. There are many factors associated with rising pollution among which, smog is one of them. To assess the perception of factors related with smog, its health implication and preventive measures among medical students of Fatima Memorial College of Medicine and Dentistry.

**Methodology:** This was across sectional study which was conducted in Fatima Memorial College of Medicine and Dentistry in 2018. The study population was M.B.B.S, 2nd 3rd and 4th year students. Data was collected through a questionnaire using convenient sampling technique. The study was completed in 6 months. The ethical considerations were fulfilled both individual and institutional. SPSS software was used for data compilation and analysis.

**Results:** The total number of participants was 400. The mean age of the participants was 21.29 ( $\pm 1.3SD$ ). Out of all, 195 (97.5%) males and 199 (99.5%) females were familiar with the word smog while 182 (91 %) males and 186 (93%) females could differentiate between fog and smog. Out of all respondents, 144 (72%) males while 160 (80%) females knew that smoke is the basic component of smog. However, 142 (71%) males and 160 (80%) females thought that eye irritation was the most frequent symptom. If precautions were not taken 145 (72.5%) males while 158 (79%) females declared that smog could cause asthma. Mainstream of respondents, males 117 (58.5%) thought, deforestation was the main contributor to smog while 126 (63%) females said that the increase in the number of automobiles were the main reason. Among all, 88 (44%) males and 85 (42.5%) females declared they received information about smog through news/TV followed by social media (143) 36%. Regarding dissemination of awareness, majority considered social media, educational campaign in institutions could play vital role. For this purpose 169 (84.5%) males and 157 (78.5%) females considered wearing a mask as the most useful preventive measure.

**Conclusion:** The results of this study provided information that the medical students had good perception of factors associated with smog, its health implications and preventive measures. Social media and educational campaigns in institutions could be most effective medium for spreading awareness about smog to the general population as well as to those who might not be aware of all the factors that contributed to its production and effects and how smog could affect their health and daily lives

**Keywords:** Smog, eye irritation, automobiles, asthma, social media, educational campaigns.

### INTRODUCTION

With increasing urbanization, we are getting repeatedly exposed to a number of environmental calamity with dire health consequences.<sup>1</sup> There are many factors associated with rising pollution among which smog is one of them.<sup>1</sup> Smog is a type of air pollutant in the atmosphere and is the combination of two types of gaseous phases that are smoke and fog; it is made up of matter divided into primary and secondary parts; primary being the one present in nature like pollen and dust, while secondary contains dangerous gases like ammonia, ozone, organic compounds and nitric

oxide.<sup>2</sup>

There are two types of smog that have been described in the literature<sup>3</sup>. On the basis of composition there is the classical and photochemical smog with differences in the composition depending on different geographical regions, various factors contributing to air pollution and suspension of particulate matter in the atmosphere; as in China, coal burning has been identified as a major reason which led to the major component of smog being sulphur dioxide whereas in Delhi, Nitric oxide and Carbonmonoxide have been identified as the constituents of smog due to increasing tra-

ffic and waste burning.<sup>3</sup>

Documentations of smog go back to 1952 when it was taken into account in London caused by excessive burning of coal<sup>4</sup>. It has been seen that increasing incidence of smog are observed in urban areas.<sup>4</sup> Smog is said to occur due to gases released from fuels when burnt either from automobiles, industries or coal. When paired with deforestation and the consequent decrease in rainfall, these photochemical particles persist in the air.<sup>5</sup> Recently incidents of smog have occurred due to the burning of crops. Smog can have a lot of adverse effects on public health ranging from eye and nose irritation, respiratory difficulties including cough, breathing difficulties, wheezing, cardiovascular effects and allergies. It can also lead to a low immune status and prematurity. Patients with asthma and bronchitis suffer and are more prone to be affected.<sup>5</sup>

Since 2015 Pakistan is facing this environmental hazard. Cities like Faisalabad, Sargodha, Lahore, Multan and Bahawalpur are majorly affected each year and thus smog is declared as a public health emergency in Pakistan also<sup>5</sup>. A study conducted in Lahore concluded that the average PM<sub>2.5</sub> was 136.5 ( $\pm 34.1 \mu\text{g}/\text{m}^3$ ) in the atmosphere which was fourteen times that of WHO guidelines<sup>5</sup>. A study conducted in Dera Ghazi Khan highlighted the same issues in which half of the participants believed that traffic was the main cause of air pollution and this issue needs to be addressed.<sup>6</sup>

The government of Pakistan also brought this into consideration and launched various projects for its control including ban on burning of crop residue, shutting major smoke emitting industries, low-sulphur fuels, adopting Euro-II standards for vehicular emission, installation of vehicular pollution control devices, better traffic management and controlling the burning of municipal waste etc.<sup>6</sup>

The rationale of conducting this research is to

**Table 1:** Knowledge about factors related to smog.

Factors	Male n (%)200(50%)	Female n (%)200(50%)
<i>Knowledge about smog</i>	195 (97.5%)	199 (99.5%)
<i>Differentiation between fog and smog</i>	182 (91%)	186 (93%)
<i>Exposure to smog season</i>	191 (95.5%)	195 (97.5%)
<i>Smog adverse effects encountered</i>	157 (78.5%)	172 (86%)
<i>Smog is a combination of the following:</i>		
Dust	117 (58.5%)	122 (61%)
Sulphur dioxide	106 (53%)	105 (52.5%)
Nitrogen oxide	88 (44%)	84 (42%)
Smoke	144 (72%)	160 (80%)
Water droplets	85 (42.5%)	98 (49%)
Carbon dioxide	81 (40.5%)	74 (37%)
Carbon monoxide	47 (23.5%)	43 (21.5%)
Helium	22 (11%)	13 (6.5%)
<i>Severity of smog in Lahore during the past few years</i>		
Mild	18 (9%)	10 (5%)
Moderate	74 (37%)	52 (26%)
Severe	78 (39%)	110 (55%)
Very severe	30 (15%)	28 (14%)
<i>Pakistan first encounter of smog</i>		
2001	20 (10%)	13 (6.5%)
2005	25 (12.5%)	12 (6%)
2010	43 (21.5%)	32 (16%)
2015	56 (28%)	74 (37%)
2016	41 (20.5%)	54 (27%)
2017	13 (6.5%)	13 (6.5%)
2018	2 (1%)	2 (1%)
<i>Factors contributing to smog</i>		
Crop burning	106 (53%)	102 (51%)
Smoking	70 (35%)	89 (44.5%)
Cross border Pollution	84 (42%)	77 (38.5%)
Deforestation	117 (58.5%)	115 (57.5%)
Growing Automobiles	113 (56.5%)	126 (63%)
Growing factories	197 (98.5%)	109 (54.5%)
Urbanization	79 (39.5%)	81 (40.5%)
Burning garbage	107 (53.5%)	96 (48%)
Poor sanitation	41 (20.5%)	42 (21%)
Lack of rain	78 (39%)	85 (42.5%)
Global warming	58 (29%)	85 (42.5%)
Adverse effects on crops and plants	170 (85%)	191 (95.5%)

determine the perception of smog among the medical students of Fatima Memorial College of Medicine and Dentistry as to determine how well aware the students are regarding the factors that contribute to its production and associated health hazards caused by smog and the urgency of spreading awareness about its prevention in Pakistan as they are the health professionals and their knowledge regarding this issue will help the people in overcoming the harmful effects and preven-

ting them in the future.

**PARTICIPANTS AND METHODS**

This was a cross sectional study conducted in Fatima Memorial College of Medicine and Dentistry enrolling 400 MBBS students (2<sup>nd</sup> 3<sup>rd</sup> and 4<sup>th</sup> year) from December 2017 to May 2018 with equal male to female ratio. Data was collected after taking an informed consent and through a structured questionnaire which did not disclosed their identity and using convenient sampling technique. Sample size was calculated keeping Z<sup>2</sup> at 95%, confidence level = 3.84 by keeping the prevalence at 50% with absolute precision d = 5% (0.05). The students were asked about their demographic profile and the perception of factors associated with smog, its health implication and preventive measures. The ethical considerations were fulfilled both individual and institutional (IRB # FMH-02-2019-IRB-584-M). The completed questionnaires were entered in the computer software SPSS version 21. Mean and standard deviations were calculated for quantitative variables. For categorical variables like question focusing the perception about different factors associated with smog; proportions and percentages were calculated.

**RESULTS**

Total 400 participants were interviewed having a mean age of 21.29 (±1.3SD); 195 (97.5%) males and 199 (99.5%) females were familiar with the word smog while about 182 (91%) males and 186 (93%) females could differentiate between fog and smog (Table 1). When asked if they had actually encountered the smog season, 191 (95.5%) males and 195 (97.5%) females gave a positive response and 172 (86%) females declared that smog affected their daily activities (Table 1). A high proportion of the respondent males 144 (72%) whereas 160 (80%) females had a perception that smoke is the basic component

**Table 2: Symptoms and complications of smog.**

Associations	Male n (%)200(50%)	Female n (%)200(50%)
<i>Symptoms experienced during smog season:</i>		
Eye irritation	142 (71%)	160 (80%)
Itchy skin	59 (29.5%)	55 (27.5%)
Breathing problems	110 (55%)	104 (52%)
Decreased visibility	100 (50%)	95 (47.5%)
Nausea and vomiting	22 (11%)	26 (13%)
Nothing	13 (6.5%)	9 (4.5%)
Headache	78 (39%)	84 (42%)
Flu	52 (26%)	60 (30%)
Rash	34 (17%)	13 (16.5%)
<i>Health problems encountered</i>		
Asthma	145 (72.5%)	158 (79%)
Bronchitis	123 (61.5%)	119 (59.5%)
Skin allergies	108 (54%)	122 (61%)
Angina	13 (6.5%)	8 (4%)
Conjunctivitis	106 (53%)	119 (59.5%)
Gastritis	15 (7.5%)	12 (6%)
Hypertension	27 (13.5%)	15 (7.5%)
Diabetes	9 (4.5%)	8 (4%)
Headache	78 (39%)	115 (57.5%)

**Table 3: Awareness about smog.**

Health Education Measures	Male n (%)200(50%)	Female n (%)200(50%)
<i>Knowledge about smog</i>		
News/TV	88 (44%)	85 (42.5%)
Social media	81 (40.5%)	64 (32%)
Friends/family	44 (22%)	41 (20.5%)
Personal Experience	122 (61%)	140 (70%)
<i>Knowledge about preventive measures</i>		
Wearing mask		
Outdoor activities avoidance	169 (84.5%)	157 (78.5%)
Reduction of cars on the road	101 (50.5%)	81 (40.5%)
Increase better public transport	81 (40.5%)	73 (36.5%)
Encourage car pooling	72 (36%)	72 (36%)
Discourage burning	66 (33%)	49 (24.5%)
Reforestation	86 (43%)	84 (42%)
Uphold industries to better environmental standards	103 (51.5%)	121 (60.5%)
Use of renewable energy sources	73 (36.5%)	75 (37.5%)
Automobile maintenance	64 (32%)	74 (37%)
65 (32.5%)	76 (38%)	
<i>Medium for dissemination of health education regarding smog</i>		
Newspapers	101 (50.5%)	93 (46.5%)
Social media	136 (68%)	133 (66.5%)
Blogs	44 (22%)	44 (22%)
Magazines	41 (20.5%)	41 (20.5%)
In person	59 (29.5%)	45 (22.5%)
TV advertisements	99 (49.5%)	106 (53%)
Brochures/pamphlets	47 (23.5%)	53 (26.5%)
Awareness campaigns in educational institutions	117 (58.5%)	112 (56%)

of smog. Eye irritation was the major concern of both the males 142 (71%) and females 160 (80%) in the smog season (Table 2). The results showed that 110 (55%) females and 78 (39%) of the male respondents thought that the smog was somewhat severe in Lahore during past few years (Table 1) and 56 (28%) males while 74 (37%) females believed that Pakistan encountered smog for the first time in 2015 (Table 1). Out of 400 participants 145 (72.5%) males and 158 (79%) females thought that if precautions were not taken, smog could cause asthma whereas 123 (61.5%) males said that bronchitis was the next most frequent health problem encountered (Table 2). Recognition regarding the cause of smog revealed that majority of males 117 (58.5%) thought the main contributor to smog lay in the increasing deforestation day by day however on the contrary 126 (63%) females said that the increase in the number of automobiles were the main reason (Table 1). On raising the question of awareness, (262) 65.5% were aware of it merely because they experienced it and 88 (44%) males and 85 (42.5%) females declared they received information about smog through news/TV followed by social media (143) 36%. In terms of the suitable preventive measures that can be taken against smog, the findings in the study revealed that 169 (84.5%) males and 157 (78.5%) females considered wearing a mask as the most useful preventive measure (Table 3). Among all females, 133 (66.5%) believed that social media could work as the most effective tool for health education regarding smog followed by 117 (58.5%) males who realized that awareness campaigns should be raised through educational institutions to achieve this purpose (Table 3).

## DISCUSSION

In the recent decades smog has been a growing environmental and health issue worldwide which has garnered a lot of international attention.<sup>7</sup> In Pakistan, smog was first encountered in 2015 and has become a significant concern which has afflicted environmentalists and health professionals<sup>5</sup>.

When assessing which factor contributed the most to the production of smog, more than half of the female participants felt that large number of automobiles was the major factor which is also supported in a study conducted in China.<sup>4</sup> However, an older study conducted in Beijing in 2013, mentioned coal burning to be the major contributing factor for smog production.<sup>7</sup> With the introduction of newer technologies, this environmental disaster can be reduced by adopting all those measures which are environmental friendly. For this purpose, people should be educated regarding maintenance of their automobiles and replacement of sources of energy with less environmental damaging resources.<sup>7</sup>

This study found that 78.5% males whereas 86%

females felt that their daily activities were affected by smog. This compares with the results of a study conducted in an Asian country which depicted that normal daily activities of the participants were strongly influenced by smog.<sup>8</sup> Thus due to the irritating quality of its constituent elements; smog can affect the daily activities of people.<sup>9</sup>

Asthma was found to be the major health problem by 72.5% males and 79% of our female participants which is supported by findings of a study conducted in a district of Punjab<sup>6</sup>. The medical literature has identified respiratory and cardiovascular disorders to be the main diseases caused or exacerbated by smog.<sup>10,11</sup> Smog can irritate the respiratory system and lead to coughing and irritation of the throat; it can reduce lung function and aggravate asthma.<sup>12</sup> A comparative study of the literature regarding these diseases has shown how different periods of exposure elicit different health effects revealing that short-term exposure aggravates the illnesses of patients with respiratory and cardiovascular problems, whereas long term exposure directly affects mortality.<sup>14</sup> Knowledge and education about ill effects of smog can encourage the public and concerned authorities to take stronger action to control it.<sup>14</sup>

The results of our study showed that 81.5 % of the participants considered wearing masks to be the most important preventive measure. Another study conducted in China mentioned masks to be a simpler and easier preventive measure.<sup>12</sup> In countries such as England, China and Pakistan smog is a regular and ongoing concern and for those exposed to it on a daily basis, it can be more harmful to health,<sup>5,14</sup>. Knowledge about preventive measures that one should take during smog must be spread as it will help people to cope up from the situation in a better way next time.<sup>4,6</sup>

This study reflected that 95.5% of the female respondents believed that smog had adverse effects on crops and plants, which showed a high level of awareness among the participants regarding how diverse the ill effects of smog were. A study conducted in Tehran supports the results of the study mentioning that smog stunts crop and plant growth.<sup>11</sup> Plant life is easily harmed due to the ozone and peroxyacetyl nitrates present in smog which damage leaves, reduce growth and make plants more susceptible to insects and diseases.<sup>14</sup>

It is **concluded** that the results of this study provided information that the medical students had good perception of factors associated with smog, its health implications and preventive measures. Social media and educational campaigns in institutions could be most effective medium for spreading awareness about smog to the general population as well who might not be aware of all the factors that contributed to its production and effects and how smog could affect their health and daily lives.

**Limitations**

- Only students of MBBS were enrolled in the study through convenient sampling.
- Data was collected from a single medical college so the results cannot be generalised.

**RECOMMENDATIONS**

- In future, study with larger sample size should be planned in which perception of common people, students of other medical colleges and universities can be enrolled by randomization.

**Author's Contribution**

MUB: Conceptualization of main concept of this project. Literature search. Data collection. Data compilation and analysis. Development of the discussion and conclusion. RFW: Conceptualization of main concept of this project. Literature search. Data collection. Data compilation and analysis. Development of the discussion and conclusion. HA: Conceptualization of main concept of this project. Data compilation and analysis. Development of the discussion and conclusion.

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**Conflict of Interest**

No conflict of interest.

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