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ORIGINAL ARTICLE

SMOG RELATED AWARENESS AND PERCEPTION AMONG MEDICAL STUDENTS

Rabia Rasheed[1], Humayun Mirza[2], Hina Ali[3], Ayesha Mansoor[4],Benish Zia[5]

[1]Medical social officer, Department of Community Medicine Lahore Medical and Dental College Lahore, Pakistan
[2]Associate Professor, Department of Community Medicine Lahore Medical and Dental College Lahore, Pakistan
[3]PG Trainee, Department ofCcommunity Medicine Lahore Medical and Dental College Lahore, Pakistan
[4]Demonstrator, Department of Community Medicine Lahore Medical and Dental College Lahore, Pakistan
[5]Demonstrator, Department of Community Medicine Lahore Medical and Dental College Lahore, Pakistan

Correspondence:
Dr .Rabia Rasheed
Email: *rabia.rasheed@ubas.edu.pk*

Abstract

Background: Smog is a significant environmental and public health issue, particularly in urban areas with high levels of air pollution. It is associated with adverse health effects, including respiratory and cardiovascular diseases, as well as environmental impacts such as damage to crops and ecosystems.

Objective(s): To assess the knowledge of medical students about smog and its associated factors.

Material and Methods: A cross-sectional study was conducted from May to August 2023. Convenience sampling was used to include 111 MBBS students of Lahore Medical & Dental College. A self-structured questionnaire was used for data collection. Data was entered and analyzed in SPSS version 23. Chi-square test was applied to find associations between the variables.

Results: A higher number of male students cited decreased visibility (p=0.024) as a health implication of smog. More male students named crop burning (p=0.043) and burning garbage (p=0.036) as contributing factors to smog. More females than males thought that carbon monoxide played an important role in producing smog (p=0.036). A higher number of males than females recommended increased tree planting (p=0.006) and the use of renewable energy sources (p=0.028) as modes of prevention. Among males, 41 (93%) believed that social media could work as the most effective tool for health education regarding smog.

Conclusion: Medical students have a good understanding of the factors associated with smog, its health implications, and preventive measures. Social media and health awareness campaigns could be the most effective mediums for spreading awareness about smog.

Keywords: Awareness, Smog, Knowledge assessment, Students, Health implications,
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Introduction:

With increasing urbanization, we are getting repeatedly exposed to a number of environmental calamities with dire health consequences.[1]Smog is a mixture of air pollutants 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.[2] Gases released from 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.[3]

A considerable body of data suggests that Smog is emerging as a health issue from the last few decades in Pakistan and its neighboring countries. According to the China Air Quality Management Assessment Report issued in 2017, smog is a prominent issue in most cities of China.[4]New Delhi, the capital city of India, is already recognized as one of the most heavily polluted Asian cities in terms of air quality. Thick smog had reached hazardously high levels in Delhi in 2017.[5] Since2015, Pakistan is facing this environmental hazard. However, smog is not limited to Punjab; it has also been observed in other provinces, including

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Khyber Pakhtunkhwa (KP) and Sindh. For instance, Peshawar and Karachi have reported deteriorating air quality during the smog season, with increasing particulate matter (PM2.5 and PM10) levels contributing to respiratory and cardiovascular health issues[6]. Medical students, as future healthcare providers, play a crucial role in public health education and awareness. Assessing their knowledge and perceptions of smog is essential to identify gaps and improve educational strategies to combat this issue.

Public awareness about air pollution and Smog is increasing day by day. In a study conducted at China, respondents reported that they had access to smog information mainly from TV (28.5%) and, radio (24.2%). Most of them (33.7%) thought smog pollution in villages was somewhat severe, while 26.3% agreed that the main contributor to smog pollution was industrial emissions, followed by coal burning at power plants (20.9%) and vehicle emissions (17.7%).[7] It was observed in a study conducted in India that that 79.9% of respondents were worried about the city's air quality and 39.2% of participants perceived that automobile emissions were the primary source of air pollution.[8]Saleem et al., described in their study that 74% respondents had overall adequate knowledge about Smog. Majority had an idea that automobiles, fire and waste treatment are the major causes of smog (76.4%), whereas 81.7% answered correctly about harmful consequences of the Smog.[9] According to research conducted in Pakistan, the majority of respondents were aware that haze was mostly caused by air pollution. It was anticipated that motor bike, car and public transport users had more knowledge about the causes of smog.[10]

Health professionals must have knowledge regarding Smog to educate the masses and help people in overcoming & preventing the harmful effects of this phenomenon. There is a paucity of data to explain student's knowledge and behavior to combat smog from the perspective of risk perception. The study provides important insights about awareness of students regarding Smog, the factors that contribute to its production, health hazards caused by smog and the urgency of spreading awareness about its prevention in Pakistan. This information can be used to for the development of policies and interventions aimed at addressing this pressing public health concern. The study aimed to assess the knowledge of medical students about smog and its associated factors.

Material and Method:

A descriptive cross-sectional study was conducted from May 2023 to August 2023 at Lahore Medical and Dental College (LMDC), Lahore. Approval from the Institutional Review Board (IRB) of Lahore Medical and Dental College was obtained prior to the commencement of the study. Written informed consent was obtained from all participants before their inclusion in the study.

Sample Size Calculation:

The sample size was calculated using the formula for cross-sectional studies:

$$n=\frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

Where:

- n = required sample size
- Z = Z-score for the confidence level (1.96 for 95% confidence interval)
- p = estimated proportion of medical students with adequate knowledge about smog (assumed to be 50% or 0.5 due to lack of prior studies)
- d = margin of error (set at 0.05 or 5%)

Using these values, the calculated sample size was 384. However, due to time and resource constraints, a convenience sampling technique was employed, and 111 fourth-year MBBS students were included in the study. Students who were not willing to participate were excluded.

Data Collection:

A structured questionnaire was developed, consisting of three sections:

1. **Demographic Information:** This section included questions about gender, age, and pre-medical qualifications.
2. **Smog Awareness:** This section assessed participants' knowledge about smog, its causes, health implications, and preventive measures.
3. **Preventive Measures:** This section evaluated participants' perceptions of effective strategies to combat smog.

The questionnaire was pretested on a small group of students to ensure clarity and validity. Data were collected through self-administered questionnaires distributed to participants during their regular academic sessions.

Data Analysis:

Data were entered, cleaned, and analyzed using the Statistical Package for Social Sciences (SPSS), version 23. Descriptive statistics, including frequencies and percentages, were used for categorical variables. Mean and standard deviation were calculated for continuous variables. The Chi-square test was applied to determine associations between variables, and a p-value of ≤ 0.05 was considered statistically significant.

Results:

The study included 111 participants, out of which 67(60%) were female and 44 were male. Most participants93(84%) had completed their pre-entry qualification as F. Sc, while a smaller portion 18(16%)

done A-Level, and none had the American Board qualification.

Table 1 depicts General awareness of respondents about smog, all the respondents were familiar with the word smog and they were able to differentiate between fog and smog. When asked if they had actually encountered the smog season, 42(96%) males and 66 (99%) females gave a positive response and 56(84%) females declared that smog affected their daily activities. A high proportion of the respondent females 65 (97%) whereas 42 (96%) males agreed that smog also affect crops and plants. The results showed that 8(18%) males while 15(22%) females rightly reported the year when Pakistan first time face smog in 2015.Out of 111 participants 60(90%) female thought that smog can cause asthma whereas 29(77%) male said skin allergies, 43(64%) female reported Conjunctivitis and 29(66%) male considered headache as most frequent health problem associated to smog. Eye irritation was reported by 30(68%) male and 42(63%) female students and also other problem faced by students in the smog season. Higher number of male students compared with their female counterparts named decreased visibility (p=0.024) About 32(48%) females and 18(41%) males agreed that smog was severe in Lahore.

Table 1: Awareness about health issues due to smog among fourth year MBBSstudents (N=111)

Awareness about health issues due to smog		**Male44 (40%)**	**Female67 (60%)**	**P value**
In your opinion which of the following health problem scan occur, if precaution sere not taken during a smog season?	Asthma	39(88.6%)	60(89.6%)	.879
	Bronchitis	34(77.3%)	46(68.7%)	.322
	Skin allergies	29(65.9%)	46(68.7%)	.762
	Angina	3(6.8%)	6(9.0%)	.687
	Conjunctivitis	26(59.1%)	43(64.2%)	.589
	Gastritis	2(4.5%)	4(6.0%)	.745
	Hypertension	3(6.8%)	3(4.5%)	.594
	Diabetes	1(2.3%)	2(3.0%)	.821
	Headache	29(65.9%)	34(50.7%)	.115
If you have evener countered smog season, what did you experience?	Eyeirritation	30(68.2%)	42(62.7%)	.553
	Itchyskin	10(22.7%)	15(22.4%)	.967
	Breathing problem	26(59.1%)	36(53.7%)	.578
	Decreasedvisibility	28(63.6%)	28(41.8%)	.024
	Nauseaandvomiting	3(6.8%)	3(4.5%)	.594
	Headach	19(43.2%)	28(41.8%)	.885
	Flu	18(40.9%)	23(34.3%)	.482
	Skinrash	5(11.4%)	12(17.9%)	.349
	Noeffect	2(4.5%)	5(7.5%)	.536

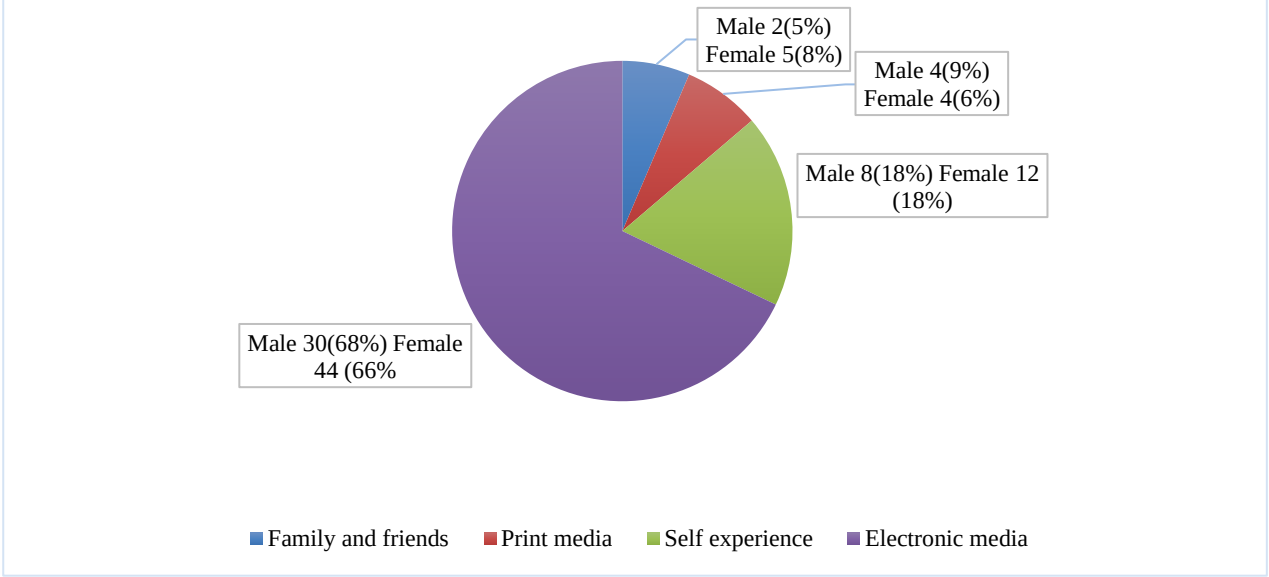

Figure 1: Sources of information about smog among students

Table 2 showed awareness regarding the contributing factors of smog. Higher number of male students compared with their female counterparts named crop burning (p=0.043) and burning garbage (p=0.036).
Deforestation was also reported by 23(52%) male and 40(60%) female. Similarly, more females than male students identified availability of large number of automobiles as a contributing factor of smog. When asked about the combination of smog more female than male thought carbon mono oxide play an important role in producing smog(p=0.036) and also Helium (p=0.036) significantly associated.

Table 2: Awareness about contributory factors and components of smog among fourth year MBBS students (N=111)

Awareness about contributory factors and components of Smog		Male 44(40%)	Female 67(60%	P value
Which of these factors do you think are the most important in contributing to smog?	Crop burning	26(59.1%)	26(38.8%)	.036
	Smoking	9(20.5%)	22(32.8%)	.155
	Air pollution coming from across border	25(56.8%)	32(47.8%)	.350
	Deforestation	23(52.3%)	40(59.7%)	.440
	Burning garbage	28(63.6%)	29(43.3%)	.036
	Large number of automobiles	23(52.3%)	45(67.2%)	.115
	Large number of factories	29(65.9%)	35(52.2%)	.154
	Urbanization	14(31.8%)	24(35.8%)	.664
	Poor sanitation	6(13.6%)	6(9.0%)	.437
	Lack of rain	9(20.5%)	16(23.9%)	.673
	Global warming	19(43.2%)	34(50.7%)	.435
In your opinion smog is a combination of which of the following?	Dust	24(54.5%)	36(53.7%)	.933
	Sculpture dioxide	18(40.9%)	38(56.7%)	.103
	Nitrogen oxides	20(45.5%)	33(49.3%)	.695
	Smoke	33(75.0%)	51(76.1%)	.893
	Water droplets	20(45.5%)	23(34.3%)	.239
	Helium	0(0.0%)	6(9.0%)	.041
	Carbon di oxide	9(20.5%)	24(35.8%)	.083
	Carbon mono oxide	16(36.4%)	38(56.7%)	.036

In terms of the suitable preventive measures that can be taken against smog, higher number of males than females recommended increase tree planting (p=0.006) and use of renewable energy source(p=0.028) as mode of prevention.

Table 3: Awareness about preventive measures against smog among fourth year MBBS students (N=111)

Awareness about preventive measures		Male 44(40%)	Female 67(60%	P value
What do you think are the preventive measures?	Wear mask	39(88.6%)	56(83.6%)	.458
	Avoid going out	9(20.5%)	20(29.9%)	.270
	Decrease number of cars on the road	21(47.7%)	38(56.7%)	.353
	Increase better public transport	17(38.6%)	27(40.3%)	.861
	Encourage car pooling	3(6.8%)	8(11.9%)	.377
	Discourage open air burning	30(68.2%)	38(56.7%)	.225
	Increase tree planting	36(81.8%)	38(56.7%)	.006
	Automobile maintenance	14(31.8%)	17(25.4%)	.459
	Uphold industries to better environmental standards	20(45.5%)	22(32.8%)	.180
	Use of renewable energy sources	20(45.5%)	17(25.4%)	.028

Table 4: Preferred media for health education regarding smog among fourth year MBBSstudents (N=111)

Preferred media for health education		Male 44(40%)	Female 67(60%	P value
What medium will you use for health education regarding smog	Newspapers	17(38.6%)	23(34.3%)	.644
	Social media	41(93.2%)	58(86.6%)	.272
	Blogs	9(20.5%)	17(25.4%)	.550
	Magazines	8(18.2%)	12(17.9%)	.971
	Inter personal	12(27.3%)	19(28.4.%)	.901
	TV advertisements	27(61.4%)	30(44.8%)	.087
	Brochures/pamphlets	7(15.9%)	12(17.9%)	.784
	Awareness campaigns in educational institutions	17(38.6%)	35(52.2%)	.160
	Others	2(4.2%)	0(0.0%)	.078

Among all males, 41 (93%) believed that social media could work as the most effective tool for health education regarding smog followed by 35 (52%) females who realized that awareness campaigns should be raised through educational institutions to achieve this purpose.

Discussion:

All participants were familiar with the term "smog" and could differentiate it from fog. In another study conducted in Pakistan 77% respondents knew that Smog is the mixture of Smog and Fog.[9] This disparity can be attributed to different study settings. According to another research, 195(97.5%) males and 199(99.5% female were familiar with the word smog while182 (91%) males and 186(93%) females Could differentiate between fog and smog[11].The encounter with smog seasons was high between both genders, 191(95.5%)of males and195(97.5%) in female Students. Significant number of respondents in another study 172 (86%) females declared that smog affected their daily activities.

Interestingly, there was a varied understanding of when Pakistan first encountered smog. The year 2015 was correctly identified by 818.2% of males and 15(22.4%) of females the year when smog was first observed in Pakistan. These findings of another study also correlated with present study where 56 (28%) males while 74 (37%) females believed that Pakistan encountered smog for the first time in 2015.

Both genders were highly aware that smog could cause asthma (88.6% males, 89.6% females). Awareness of other health problems such as bronchitis, skin allergies, conjunctivitis, and headaches was also notable, although no statistically significant gender differences were found. Notably, males (43.2%) reported decreased visibility as a more significant issue compared to females (41.8%), with a p-value of (0.024).[12]The primary source of information about smog for both genders was electronic media, with 68.1% males and 65.6% females relying on it. Social media was another significant source. There was no significant gender difference in the sources of information, indicating a uniform reliance on digital media among students for health information.[13]

Regarding the severity of smog in Lahore, a higher percentage of males (52.3%) perceived it as very severe compared to females (43.3%), while more females (47.8%) considered it severe. The p-value of 0.643 indicates no significant difference in perception between genders.[14]

Males more frequently identified crop burning (59.1%) and burning garbage (63.6%) as significant contributors compared to females (38.8% and 43.3% respectively). Additionally, more females (56.7%) than males (36.4%) identified carbon monoxide as a component of smog. This association was statistically significant. Deforestation was recognized as a contributory factor by 52.3% of males and 59.7% of females. According to a study conducted in Malaysia students felt that the biggest pollutants were coming from construction work (49.1%) and traffic emissions (36.4%). Fewer students were concerned about the factory industry (8.9%), pollen (5.0%) and wood or forest fire burning (5.1%).[15]

More males than females recommended increasing tree planting (81.8% vs. 56.7%, p=0.006) and using renewable energy sources (45.5% vs. 25.4%, p=0.028) as preventive measures. This suggests that male students may have a stronger inclination towards environmental interventions as preventive strategies against smog .[16-17] Social-media was the top choice for both genders (93.2% males, 86.6% females). A higher percentage of females preferred awareness campaigns in educational institutions compared to males (52.2% vs. 38.6%). This indicates a shared preference for digital platforms for disseminating health education, though with a higher inclination among females towards institutional campaigns.[18]

Conclusion:

The findings indicate a high level of awareness about smog and its impacts among fourth-year MBBS students, with minimal significant differences between genders. Both male and female students are well-informed about the health risks and preventive measures associated with smog. The reliance on digital media for information and health education highlights the importance of leveraging these platforms for effective communication and awareness campaigns. The study underscores the need for continued education on environmental health issues and the incorporation of practical preventive measures in the medical curriculum to prepare future healthcare professionals in mitigating the impacts of environmental pollutants like smog.

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