European Journal of Clinical Pharmacy
Print ISSN: 2385-409X **Online ISSN**: 3105-0409
Website: https://farmclin.com/

Original Research Article

Awareness and Mask-Use Practices Related to Air Pollution–Induced Respiratory Diseases: A Cross-Sectional Study in Four Tertiary-Level Hospitals of India

Article History:

Name of Author:
Dr. Col. Brij Mohan[1], Uttkarsh Vasu Saini[2], Nandini Jangid[3], Abhinandan Modgil[4], Vaishvi Chaudhary[5], Meeta Sharma[6], Revika Shree[7], Dr. Hemant Kumar Garg[8]*

Affiliation: *[1]Medical Superintendent, Government Institute of Medical sciences, Gautam Buddha Nagar, Greater 201310,Uttar Pradesh, India*
[2,3,4,5,6,7]MBBS student, National Institute of Medical Sciences, NIMS University Rajasthan, Jaipur 303121, Rajasthan, India
*[8]*Professor & HOD of Dept. of Pharmacology, National Institute of Medical Sciences, Jaipur, Rajasthan, NIMS University Rajasthan, Jaipur 303121, Rajasthan, India*

Corresponding Author:
Dr. Hemant Kumar Garg

Received: 04-11-2025
Revised: 12-11-2025
Accepted: 09-12-2025
Published: 31-12-2025

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Abstract: ***Background:*** Air pollution is a major environmental health challenge in India, contributing significantly to respiratory morbidity and mortality. Preventive measures such as mask use can reduce exposure, but awareness and adherence among healthcare students and staff remain variable. Objectives: To assess awareness of air pollution–induced respiratory diseases and evaluate mask-use practices among healthcare students and staff in four tertiary-level hospitals in India. ***Methods***: A cross-sectional study was conducted among 300 participants: 100 MBBS students and interns, 50 BDS students, 50 nursing students, and 100 paramedical staff (nurses and technicians). A structured questionnaire was administered to collect data on awareness, mask-use practices, preferred mask types, and barriers to use. Descriptive statistics and chi-square tests were applied to compare groups. ***Results:*** Awareness of air pollution–related respiratory risks was highest among MBBS students (85%) and lowest among paramedical staff (55%). Regular mask use in outdoor settings was reported by 60% of MBBS students, 50% of BDS students, 45% of nursing students, and 35% of paramedical staff. Preferred mask types included surgical masks (45%), N95 masks (40%), and cloth masks (15%). Reported barriers included discomfort (40%), perceived low necessity (30%), and cost concerns (20%). ***Conclusions:*** Awareness of air pollution–induced respiratory diseases is relatively high among medical students but lower among paramedical staff. Mask-use practices remain inconsistent across groups, with significant barriers to adherence. Implications: Targeted educational interventions, institutional policies, and provision of affordable protective equipment are recommended to improve awareness and mask-use practices among healthcare workers.

Keywords : Mask use awareness, Air pollution, Respiratory diseases, Tertiary hospitals, India.

INTRODUCTION

Air pollution has emerged as one of the leading environmental risk factors for respiratory diseases worldwide. India, with its rapid urbanization and industrialization, faces severe air quality challenges, particularly in metropolitan areas. Exposure to pollutants such as particulate matter (PM2.5, PM10), nitrogen oxides, and sulfur dioxide is associated with asthma, chronic obstructive pulmonary disease (COPD), and increased susceptibility to respiratory infections.

Healthcare professionals and students represent a critical group, both as role models for public health practices and as individuals frequently exposed to polluted environments. Mask use is a simple yet effective preventive measure, but adherence varies widely. This study investigates awareness levels and

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mask-use practices among healthcare students and staff in four tertiary-level hospitals in India.

OBJECTIVES

1. To assess awareness of air pollution–induced respiratory diseases among healthcare students and staff.
2. To evaluate mask-use practices as a preventive measure.
3. To compare awareness and practices across different professional groups (MBBS, BDS, nursing, paramedical staff).

MATERIALS & METHODS

- Study Design: A cross-sectional descriptive study was conducted across four tertiary-level hospitals in India
- Setting: Four tertiary-level hospitals in India (National Institute of Medical Sciences Jaipur 303121, Jaipur, Rajasthan, India; Government Institute of Medical Sciences, Gautam Buddha Nagar 201310, Uttar Pradesh, Fortis Hospital, Malviya Nagar, Jaipur 302017, Rajasthan, India; Dental College and Hospital, Bagru, Jaipur, Rajasthan, Rajasthan; College of Nursing, Bagru, Jaipur Rajasthan)
- Sample size: 250 participants (100 MBBS students & interns, 50 BDS students, 50 Nursing students, 50 Paramedical staff including nurses & technicians)
- Sampling method: Stratified random sampling..
- Data Collection tool: A structured questionnaire was administered, covering demographic details, awareness of air pollution and respiratory diseases, knowledge of preventive measures, frequency and type of mask use (surgical, N95, cloth)

Likert scale questionnaire (15 items)

Please rate each item on a 5-point Likert scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree.

- Air pollution harms respiratory health: I understand that air pollution increases the risk of respiratory diseases.
- Specific pollutant awareness: I can identify common air pollutants (e.g., PM2.5, PM10, NOx) associated with respiratory risks.
- Local air quality knowledge: I am aware of air quality levels in my city and how they vary by season.
- Symptoms recognition: I can recognize respiratory symptoms commonly exacerbated by poor air quality (e.g., wheeze, cough, breathlessness).
- Risk perception: I consider myself at risk of air pollution–related respiratory problems.
- Preventive beliefs: Mask use reduces inhalation of harmful particulate matter during high pollution.
- Mask efficacy knowledge: I understand the difference in filtration efficiency between N95, surgical, and cloth masks.
- Consistency of use: I wear a mask consistently outdoors when AQI is poor.
- Institutional influence: Hospital or college policies encourage regular mask use in high-pollution conditions.
- Access to masks: I have easy access to appropriate masks (N95 or equivalent) when needed.
- Comfort and fit: Mask discomfort (heat, breathability, fit) discourages me from regular use.
- Cost barrier: The cost of effective masks (e.g., N95) limits my ability to use them regularly.
- Peer norms: I am more likely to wear a mask if my peers and colleagues do so.
- Training exposure: I have received training or guidance on protecting respiratory health from air pollution.
- Intent to improve: I intend to improve my mask-use practices during high-pollution days.

Inclusion & Exclusion criteria

Inclusion criteria

- **Institutional setting:** Participants currently affiliated with tertiary care hospitals in India (government or private), including teaching hospitals.
- **Professional groups:**
  - **Medical:** MBBS students (clinical years), interns, postgraduate residents.
  - **Dental:** BDS students (clinical years), interns, postgraduate residents.
  - **Nursing:** BSc/GNM students (clinical postings), interns, postgraduate students.
  - **Paramedical staff:** Physiotherapists, occupational therapists, dietitians, clinical psychologists, cardiac technicians working in cardiology/cardiac surgery/ICU/rehabilitation units.
- **Age and consent:**
  - **Age:** 18 years and above.
  - **Consent:** Provides informed consent and agrees to complete the survey.
- **Exposure to cardiac care:** At least minimal clinical exposure (e.g., postings, rotations, or work) in departments likely to encounter post-MI patients (cardiology, cardiac surgery, internal medicine, ICU, rehabilitation).
- **Language and accessibility:** Able to read and respond in the survey language(s) provided (e.g., English/Hindi).

Exclusion criteria

- **Non-clinical or non-affiliated individuals:** Administrative staff, non-clinical personnel, or

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individuals not currently affiliated with the hospital.

- **Pre-clinical students:** Medical/dental/nursing students in exclusively pre-clinical years without clinical postings.
- **Prior specialized training that could bias awareness:** Individuals with formal certification or advanced specialization specifically in cardiac rehabilitation (e.g., fellowship/certification programs), if the study aims to assess baseline awareness among general trainees/staff.
- **Conflict of interest or duplicate participation:** Study investigators, survey designers, or anyone involved in instrument development; duplicate entries identified by IP/time stamps or institutional IDs.
- **Inability to consent or complete the survey:** Cognitive impairment, severe illness during data collection, or language barriers preventing meaningful participation.
- **Recent participation in similar surveys:** Participation in another cardiac rehabilitation awareness survey within the past 3–6 months at the same institution, to avoid contamination.

Data analysis: Responses were analyzed using descriptive statistics and chi-square tests to compare groups.

RESULTS

Awareness Levels

- **MBBS students & interns:** 85% demonstrated high awareness of air pollution–related respiratory risks.
- **BDS students:** 70% showed moderate awareness.
- **Nursing students:** 65% showed moderate awareness.
- **Paramedical staff:** 55% demonstrated low-to-moderate awareness.

Mask-Use Practices

- **Regular mask use (**daily in outdoor settings**):**
  - MBBS: 60%
  - BDS: 50%
  - Nursing: 45%
  - Paramedical staff: 35%
- **Preferred mask type:**
  - N95: 40% (mostly MBBS students)
  - Surgical masks: 45% (common among nursing and paramedical staff)
  - Cloth masks: 15% (mostly paramedical staff)

Barriers to Mask Use

- Discomfort during prolonged use (reported by 40%)
- Perceived low necessity in hospital premises (30%)
- Cost concerns for N95 masks (20%)
- **Participant groups and sample sizes**

Group	Sample size
MBBS & interns	100
BDS	50
Nursing	50
Paramedical	100
Total	300

- **Awareness and mask-use results**
- **Awareness levels by group**

Group	Awareness (%)	Category
MBBS	85	High
BDS	70	Moderate
Nursing	65	Moderate
Paramedical	55	Low to moderate

- **Regular mask use (daily in outdoor settings)**

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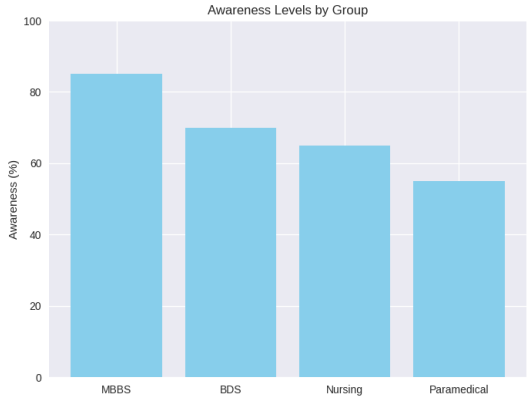
Group	Regular mask use (%)
MBBS	60
BDS	50
Nursing	45
Paramedical	35

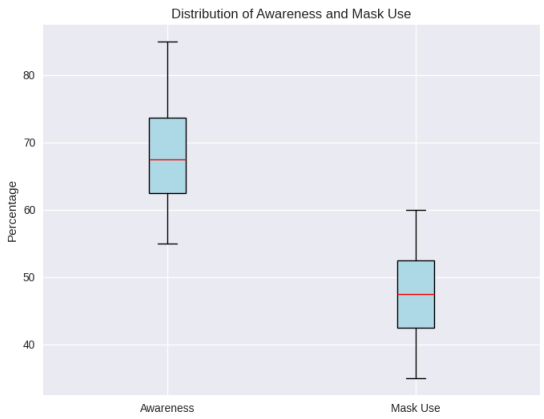
- **Preferred mask type (overall distribution)**

Mask type	Percentage
N95	40
Surgical	45
Cloth	15

- **Reported barriers to mask use (overall)**

Barrier	Percentage
Discomfort	40
Perceived low necessity	30
Cost concerns	20





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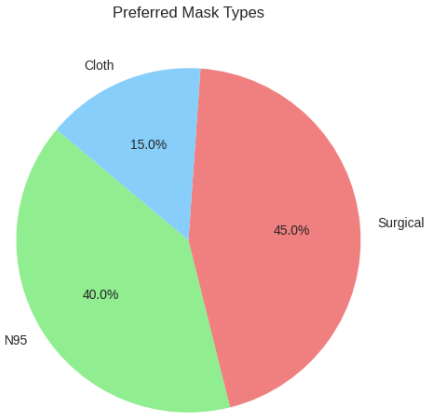

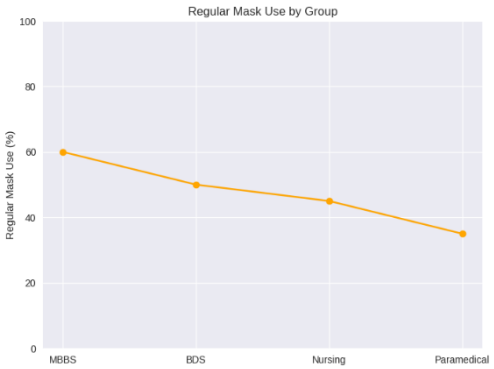

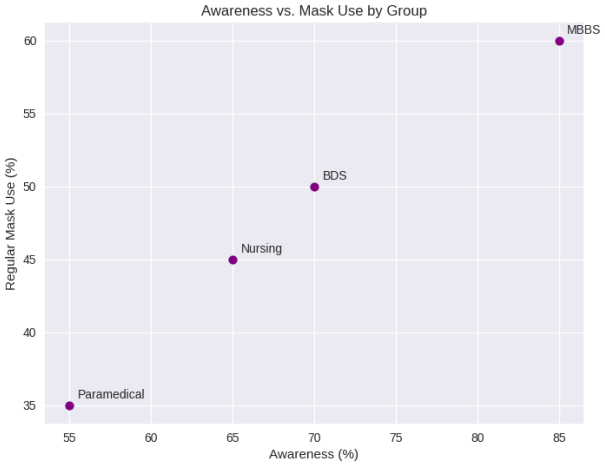

- **Bar chart:** Awareness levels by group (MBBS, BDS, Nursing, Paramedical).
- **Pie chart:** Distribution of preferred mask types (N95, surgical, cloth).
- **Line chart:** Regular mask use percentages across groups.
- **Box plot:** Comparison of awareness vs. mask-use distributions.
- **Scatter plot:** Relationship between awareness and mask use, annotated by group.

DISCUSSION

The study highlights a gap between awareness and practice. While MBBS students and interns demonstrated higher awareness, actual mask-use adherence was suboptimal across all groups. Paramedical staff showed the lowest awareness and compliance, reflecting the need for targeted training. Barriers such as discomfort and cost suggest that

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institutional support (e.g., provision of masks, awareness campaigns) could improve adherence. Given the rising burden of air pollution–related respiratory diseases in India, healthcare institutions must prioritize preventive education and protective measures.

CONCLUSION

Awareness of air pollution–induced respiratory diseases is relatively high among medical students but lower among paramedical staff. Mask-use practices remain inconsistent, with significant barriers to adherence. Strengthening institutional policies, providing affordable protective equipment, and conducting regular awareness programs are essential to safeguard healthcare workers and promote public health.

Limitations

Cross-sectional design: The study captures a single time point, preventing causal inferences between awareness and mask use.

Self-reported measures: Awareness and behaviors are based on self-report, which may introduce social desirability and recall bias.

Sampling frame: Participants were drawn from four tertiary hospitals and may not represent other healthcare settings or regions.

Operational definitions: "Regular mask use" was defined as daily use outdoors, which may not reflect duration, proper fit, or correct usage.

Mask type attribution: The distribution of mask types reflects overall preference and may obscure within group variability.

Confounders unmeasured: Factors like local AQI, commuting mode, occupational exposure, and prior respiratory conditions were not systematically adjusted.

Seasonality: Pollution levels vary seasonally; if data collection spanned limited months, results may reflect seasonal skew.

Resource access: Institutional policies and free mask provision vary by site, potentially confounding group comparisons.

Small subgroup sizes: BDS and nursing samples (n = 50 each) limit statistical power for subgroup analyses. No objective adherence: Mask use was not validated by observation or device logs; correct donning/doffing and fit were not verified.

RECOMMENDATIONS

Educational interventions targeting paramedical staff and nursing students.

Provision of masks (especially N95) by hospitals to reduce cost barriers.

Awareness campaigns emphasizing the link between air pollution and respiratory health.

Policy enforcement for mask use in high-risk environments.

ACKNOWLEDGEMENTS: The authors thank the authorities of National Institute of Medical Sciences Jaipur 303121, Jaipur, Rajasthan, India; Government Institute of Medical Sciences, Gautam Buddha Nagar 201310, Uttar Pradesh, Fortis Hospital, Malviya Nagar, Jaipur 302017, Rajasthan, India; Dental College and Hospital, Bagru, Jaipur, Rajasthan, Rajasthan; College of Nursing, Bagru, Jaipur Rajasthan for their permission for conducting this study in their respective institutions.

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