

ASSESSMENT OF KNOWLEDGE AND PRACTICE AMONG NURSES REGARDING NEBULIZATION THERAPY IN PUBLIC SECTOR HOSPITALS AT CHARSAJDA, KHYBER- PAKHTUNKHWA PAKISTAN: A CROSS-SECTIONAL STUDY

Original Research

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ABSTRACT

Background: Nebulization therapy is a vital mode of drug delivery for patients with acute and chronic respiratory disorders, as it allows medications to reach the lower airways directly. Nurses play a central role in administering this therapy and ensuring its effectiveness and safety. However, inadequate knowledge and improper practices among nursing staff can compromise treatment outcomes, increase infection risk, and reduce therapeutic efficiency. Limited evidence is available from public sector hospitals in Khyber Pakhtunkhwa, particularly Charsadda, highlighting the need for systematic evaluation of nurses' competence in nebulization therapy.

Objective: To assess the level of knowledge and practice regarding nebulization therapy among nurses working in public sector hospitals of Charsadda, Khyber Pakhtunkhwa, Pakistan.

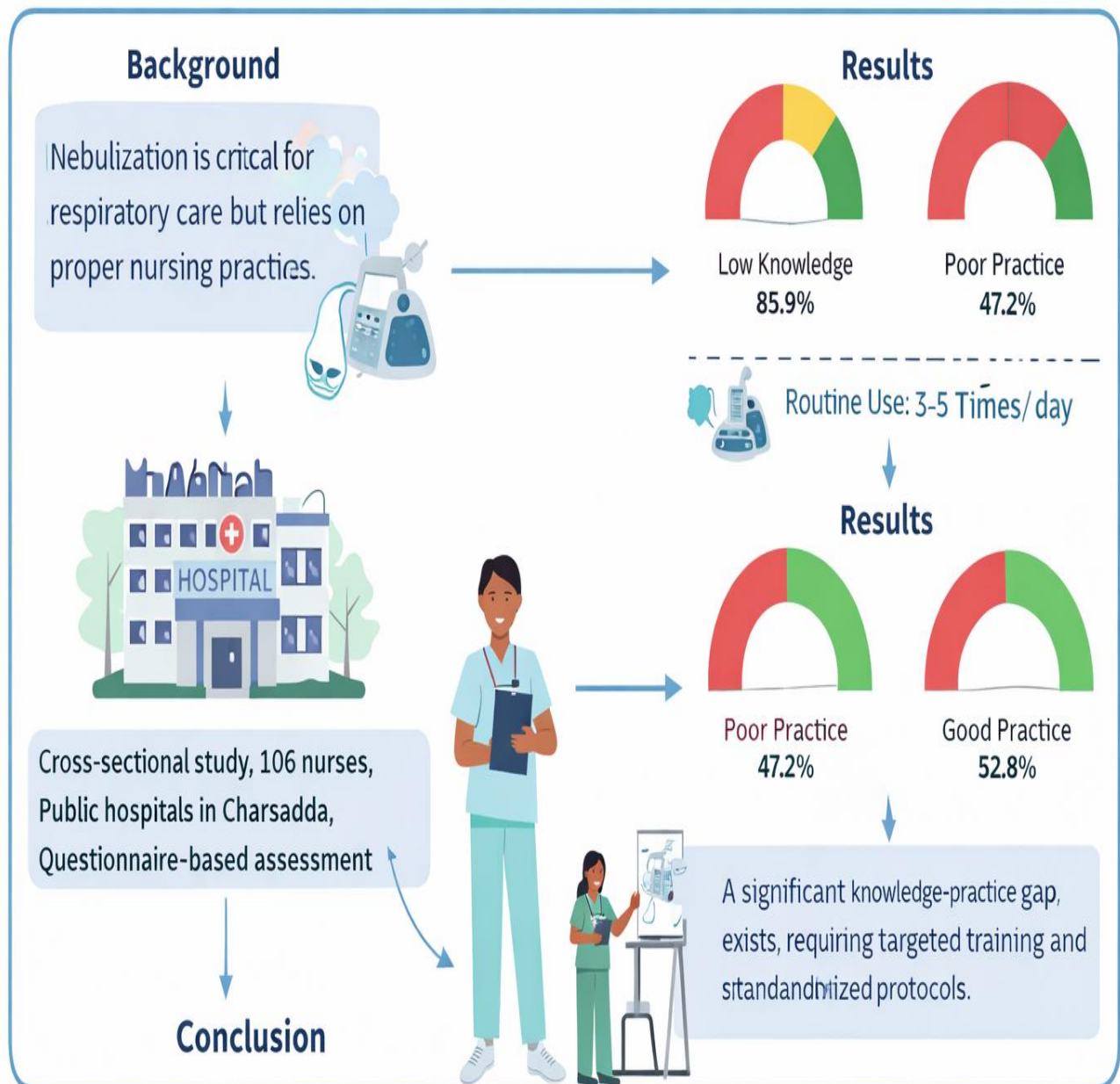
Methods: A descriptive cross-sectional study was conducted over four months in two public sector hospitals of Charsadda. A total of 106 registered nurses involved in direct patient care were enrolled using a convenience sampling technique. Data were collected using a standardized, self-administered questionnaire covering demographic characteristics, knowledge of nebulization therapy, and routine clinical practices. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were analyzed using SPSS version 16.

Results: Among the participants, 93.4% were female and 6.6% were male. The mean knowledge score was 26.17 ± 4.34 , with scores ranging from 20 to 43. A low level of knowledge was observed in 85.9% of nurses, while only 14.1% demonstrated high knowledge. Regarding practice, 52.8% of participants exhibited good nebulization practices, whereas 47.2% showed poor practice. Nebulization was used routinely, most commonly three to five times per day, indicating frequent clinical reliance despite knowledge gaps.

Conclusion: The study revealed a substantial gap between knowledge and practice of nebulization therapy among nurses in public sector hospitals of Charsadda. Although nebulization was routinely performed, insufficient theoretical understanding may limit safe and effective care. Targeted training programs, standardized protocols, and continuous professional education are essential to improve nursing competence and patient outcomes.

Keywords: Aerosol Therapy, Knowledge, Nebulization, Nurses, Practice, Public Sector Hospitals, Respiratory Care.

Knowledge and Practice of Nebulization Therapy among Nurses in Charsadda Public Hospitals



INTRODUCTION

Nebulization is a well-established method of delivering aerosolized medications directly into the lower respiratory tract by converting liquid drugs into a fine mist that can be inhaled through a mask or mouthpiece. This targeted mode of delivery allows rapid onset of action and higher pulmonary deposition compared with dry powder inhalers (DPIs) and pressurized metered-dose inhalers (pMDIs), particularly in patients who are elderly, critically ill, or unable to coordinate inhalation techniques effectively (1). As a result, nebulization remains a cornerstone in the management of acute and chronic respiratory conditions such as asthma, chronic obstructive pulmonary disease (COPD), lung cancer–related symptoms, and lower respiratory tract infections. Respiratory diseases continue to impose a substantial global health and economic burden. COPD alone affects more than 250 million individuals worldwide and is recognized as a major public health challenge, accounting for significant morbidity, mortality, and healthcare expenditure (2). In several developed regions, COPD ranks among the leading causes of death and contributes to billions of dollars in annual economic losses. Epidemiological data indicate that the prevalence of COPD is particularly high in Asia and the Americas, while asthma affects over 300 million people globally and results in approximately 180,000 deaths each year. Additionally, lung cancer and lower respiratory tract infections such as pneumonia and tuberculosis have shown a marked increase over the past two decades, with South Asia bearing a disproportionate share of chronic respiratory disease–related mortality. Smoking, occupational exposure to dust and chemicals, air pollution, and recurrent childhood respiratory infections remain the most significant risk factors driving this growing burden (3-5). Despite advances in pharmacotherapy, suboptimal disease control persists, often due to improper use of inhalation devices and inadequate patient education. Evidence consistently shows that insufficient knowledge and incorrect technique among patients with asthma and COPD significantly contribute to increased morbidity and mortality. Consequently, contemporary guidelines emphasize structured patient education as an integral component of respiratory disease management, with particular focus on correct inhalation and nebulization techniques. The effectiveness of aerosol therapy, which represents the mainstay of asthma and COPD management, is highly dependent on appropriate administration, as improper breathing patterns and device handling are common and clinically significant problems among affected individuals (6,7).

Within this context, nurses play a pivotal role in respiratory care delivery. As frontline healthcare providers, nurses are directly involved in administering nebulization therapy, monitoring patient responses, and providing education and supportive care, especially during episodes of respiratory distress. Early and appropriate nursing interventions have been shown to reduce the severity and duration of exacerbations. Core nursing responsibilities in respiratory management include aerosol administration, chest physiotherapy, deep-breathing and coughing exercises, and maintenance of airway hygiene. Although physiotherapists may collaborate in respiratory care, nurses remain continuously engaged in patient management and therefore must possess adequate knowledge and skills to ensure safe and effective aerosol therapy (8,9). The physiological integrity of the respiratory system further underscores the importance of correct nebulization practices. The lungs maintain sterility beyond the first-order bronchi despite constant exposure to environmental toxins and microorganisms, largely due to defense mechanisms such as the mucociliary escalator. When these mechanisms are compromised, ineffective clearance of secretions can lead to infection, inflammation, and progressive lung damage, highlighting the need for meticulous aerosol delivery and airway management (10). Optimal nebulization therapy requires comprehensive nursing assessment and vigilant monitoring. Key nursing responsibilities include evaluating the patient's hemodynamic status prior to therapy, avoiding feeding immediately before and after nebulization, ensuring adequate oxygen flow when administered concurrently, training patients in diaphragmatic breathing, maintaining oral hygiene to prevent secondary infections, providing chest physiotherapy, and ensuring proper cleaning and maintenance of nebulizers and compressors. Continuous evaluation of therapeutic effectiveness and patient counseling regarding smoking cessation and pulmonary rehabilitation are also essential components of quality care for patients with COPD and other chronic respiratory diseases (11). These responsibilities become even more critical in mechanically ventilated patients, where nurses must integrate individualized assessment, precise drug delivery, infection prevention, and meticulous equipment care to optimize outcomes (12).

From a public health perspective, the relationship between knowledge and practice is fundamental in shaping health-related behaviors. Knowledge-and-practice–based frameworks are widely used to assess healthcare providers' competencies, as knowledge deficits often translate into unsafe or ineffective clinical practices. Surveys assessing both knowledge and practice provide valuable insights into behavioral gaps that may compromise patient safety and treatment efficacy (13). In public sector hospitals of Charsadda, Khyber Pakhtunkhwa, where resources are limited and patient loads are high, the quality of nebulization therapy delivered by nurses has direct implications for patient outcomes. Despite the widespread use of nebulization in managing common respiratory conditions such as asthma, COPD, and pneumonia, there is limited local evidence assessing nurses' knowledge and practical competence in this area.

Identifying gaps in knowledge and practice is essential to prevent treatment failure, reduce complications, and improve overall standards of respiratory care in this vulnerable population. Therefore, the objective of the present study is to assess the level of knowledge and evaluate the clinical practice of nurses regarding nebulization therapy at public sector hospitals in Charsadda, Khyber Pakhtunkhwa, Pakistan, with the aim of identifying gaps that may inform targeted training interventions and contribute to improved patient outcomes.

METHODS

A cross-sectional descriptive study design was employed to assess the level of knowledge and practice regarding nebulization therapy among nurses working in public sector hospitals of Charsadda, Khyber Pakhtunkhwa, Pakistan. This design was considered appropriate to capture existing knowledge and routine clinical practices at a single point in time without manipulating the study environment. The study was conducted over a period of four months in two major public healthcare facilities, namely District Headquarter Hospital Charsadda and Children and Women Hospital Rajjar, which serve as key referral centers for the local population. The study population comprised registered nurses who were actively involved in direct patient care within the selected hospitals. Nurses who were present during the data collection period, consented to participate, and were engaged in clinical duties were included in the study. Nurses who were on leave, absent during data collection, or not directly involved in patient care were excluded. Based on a total nurse population of 149, the sample size was calculated using the Raosoft sample size calculator with a 95% confidence level and a 5% margin of error, resulting in a required sample of 106 participants. A convenience sampling technique was used to recruit eligible nurses who met the inclusion criteria and were available at the time of data collection. Data were collected using a structured, self-administered questionnaire that was adopted from a previously conducted study in October 2020. The questionnaire consisted of sections assessing demographic characteristics, knowledge related to nebulization therapy, and routine practices associated with its administration. Prior to data collection, formal permission was obtained from the hospital administration, and informed written consent was secured from all participants. Participants were informed about the purpose of the study, assured of confidentiality and anonymity, and informed of their right to withdraw from the study at any stage without any consequences. Ethical principles of research involving human participants were strictly observed throughout the study, and the research protocol was approved by the relevant institutional ethical review authority. Collected data were checked for completeness and consistency before analysis. Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS) version 16, along with Microsoft Excel for data entry and graphical representation. Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables related to nurses' knowledge and practice of nebulization therapy. The findings were presented in tables and figures to enhance clarity and interpretation.

RESULTS

A total of 106 nurses participated in the study, and complete data were obtained from all respondents, yielding a response rate of 100%. The demographic profile showed a clear predominance of female nurses, with 99 participants (93.4%) being female and only 7 (6.6%) male, reflecting the gender distribution typical of the nursing workforce in the study setting. With respect to age, the majority of respondents were middle-aged; 55 nurses (51.9%) were between 31 and 40 years, followed by 35 nurses (33.0%) aged 41–50 years. A smaller proportion belonged to the younger age group of 21–30 years ($n=6$, 5.7%), while 10 participants (9.4%) were older than 50 years, indicating a largely experienced nursing population. Regarding educational qualifications, more than half of the participants held a nursing diploma ($n=62$, 58.5%), whereas 44 nurses (41.5%) had a Bachelor of Science in Nursing or Post-RN qualification. This distribution suggests that although a considerable proportion had higher academic preparation, diploma-level training remained predominant among the workforce. In terms of clinical placement, nurses were distributed across various departments, with the highest representation from intensive care units (20.8%), followed by critical care units (11.3%). Emergency and surgical units each accounted for 9.4% of participants, while ENT and medical units contributed 7.5% each. Smaller proportions were observed from gynecology (6.6%), orthopedics (4.7%), and pediatric, gastroenterology, and minor operating theater units (3.8% each). The frequency of nebulizer use indicated that nebulization therapy was a routine nursing practice. Most nurses reported administering nebulization three to five times per day, while others reported higher frequencies of six to nine times or ten or more times daily. Only a small proportion used nebulizers once or twice per day, confirming the regular and frequent use of this therapy in clinical care. Assessment of knowledge scores revealed a minimum score of 20 and a maximum of 43, with a mean knowledge score of 26.17 ± 4.34 , indicating an overall low to moderate level of knowledge with moderate variability among participants. When categorized, a substantial majority of nurses demonstrated a low level of knowledge ($n=91$, 85.9%), whereas only 15 participants (14.1%) achieved a high knowledge level regarding

nebulization therapy. In contrast, evaluation of practice scores showed relatively better performance; 56 nurses (52.8%) demonstrated good practice, while 50 nurses (47.2%) exhibited poor practice, suggesting that although practical implementation was moderately satisfactory, nearly half of the participants did not meet optimal practice standards.

Table 1: Descriptive Statistics of Nurses’ Knowledge Scores on Nebulization Therapy

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Total Score	106	20	43	26.17	4.337
Valid N	106	—	—	—	—

Table 2: Distribution of Nurses According to Knowledge Level on Nebulization Therapy

Knowledge Level	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Low	91	85.9	85.9	85.9
High	15	14.1	14.1	100.0
Total	106	100.0	100.0	—

Table 3: Distribution of Nurses According to Practice Level of Nebulization Therapy

Practice Level	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Poor Practice	50	47.2	47.2	47.2
Good Practice	56	52.8	52.8	100.0
Total	106	100.0	100.0	—

Table 4: Total Practice Score of Nurses Regarding Nebulization Therapy

Practice Level	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Good Practice	56	52.8	52.8	100.0
Total	106	100.0	100.0	—

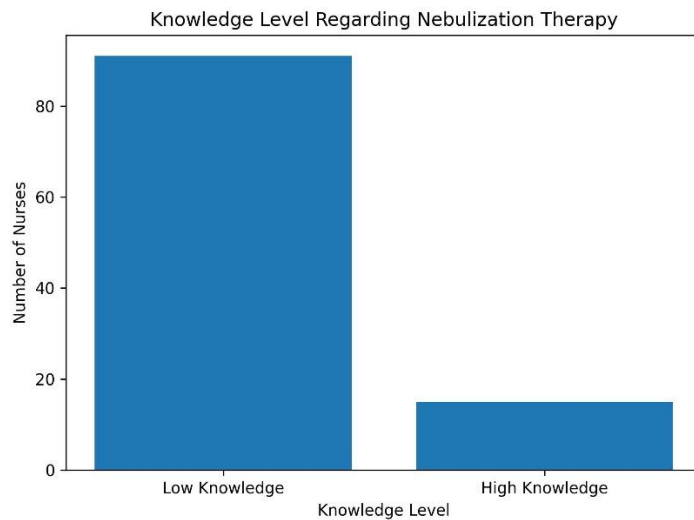


Figure 2 Knowledge Level Regarding Nebulization Therapy

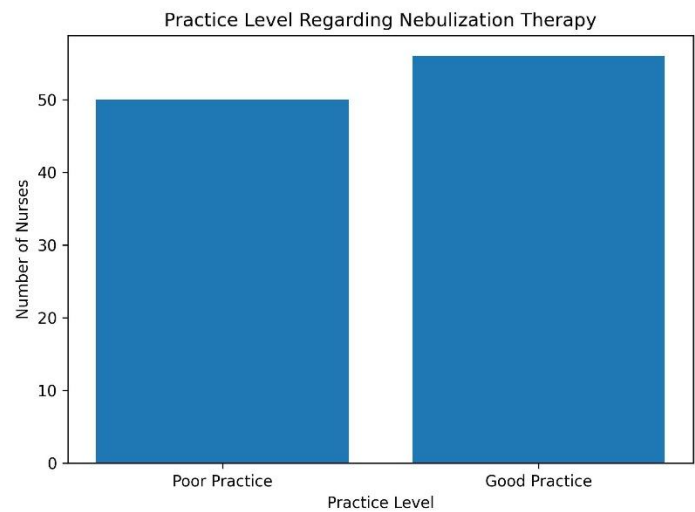


Figure 2 Practice Level Regarding Nebulization Therapy

DISCUSSION

The present study provided an important insight into the level of knowledge and practice regarding nebulization therapy among nurses working in public sector hospitals of Charsadda. The findings demonstrated that although nebulization was frequently used in daily clinical care, nurses' knowledge regarding its appropriate administration was largely inadequate. A substantial majority of participants exhibited low knowledge levels, while only a small proportion demonstrated high knowledge. This gap between frequent clinical use and limited theoretical understanding is clinically significant, as improper nebulization techniques may compromise drug delivery, reduce therapeutic effectiveness, and increase the risk of infection or adverse outcomes. The low knowledge levels observed in this study were consistent with findings reported in similar healthcare settings. A study conducted in a university nursing institution in Egypt reported that nurses achieved only moderate knowledge scores related to nebulization therapy, reflecting insufficient theoretical preparedness despite routine exposure to aerosol therapy in clinical practice (14-16). Likewise, findings from a cross-sectional assessment conducted among healthcare workers in Palestine revealed that a large proportion had very low knowledge regarding nebulization therapy, reinforcing the notion that inadequate education and training in aerosol therapy is a widespread issue in resource-limited settings. Comparable trends were also observed in intensive care settings in Asia, where more than half of nursing staff demonstrated poor understanding and inappropriate use of nebulization therapy, emphasizing that this challenge is not limited to a single region or healthcare system (17,18).

In contrast to the markedly low knowledge levels, practice scores in the current study were moderately satisfactory, with slightly more than half of the nurses demonstrating good practice. This discrepancy between knowledge and practice may reflect task-based learning and reliance on routine or peer-guided practices rather than evidence-based understanding. While experiential learning can support skill acquisition, the absence of strong theoretical foundations may limit nurses' ability to adapt practices to complex clinical situations or emerging guidelines. Similar observations were reported in international studies, where practice levels were higher than knowledge levels, suggesting that nurses often perform nebulization as a routine procedure without comprehensive understanding of its indications, mechanisms, and infection control principles. The findings carry important implications for patient safety and quality of respiratory care. Nebulization therapy is a critical intervention in managing asthma, COPD, pneumonia, and acute respiratory distress, particularly in public hospitals with high patient loads. Inadequate knowledge among nurses may lead to incorrect dosing, poor device handling, inadequate cleaning of equipment, and increased risk of nosocomial infections (19,20). Given that nurses are primarily responsible for administering nebulization and monitoring patient responses, strengthening their competence is essential for improving clinical outcomes.

One of the strengths of this study was its inclusion of nurses from multiple departments, including intensive care, emergency, and medical units, which enhanced the representativeness of routine hospital practice. The use of a standardized questionnaire and complete response rate further strengthened the internal validity of the findings. However, several limitations should be acknowledged. The cross-sectional design limited the ability to establish causal relationships between knowledge, practice, and influencing factors. The use of convenience sampling may restrict generalizability beyond the study setting, and reliance on self-reported practices may have introduced reporting bias. Additionally, the absence of inferential analysis prevented assessment of associations between demographic variables and knowledge or practice levels, and the relationship between knowledge and practice could not be statistically explored. Future research should address these limitations by employing probability sampling techniques, larger sample sizes, and analytical designs that allow examination of predictors of knowledge and practice. Interventional studies evaluating the effectiveness of structured training programs on nurses' competence in nebulization therapy would be particularly valuable (21,22). Incorporating observational assessments alongside self-reported data may also provide a more accurate reflection of clinical practice. Overall, the findings underscored a critical need for targeted educational interventions and standardized protocols to bridge the observed knowledge–practice gap and enhance the quality of respiratory care delivered by nurses in public sector hospitals.

CONCLUSION

This study concluded that nurses working in public sector hospitals of Charsadda routinely administer nebulization therapy; however, their practice is not consistently supported by adequate theoretical knowledge. The findings highlighted a clear knowledge–practice gap, suggesting that nebulization is often performed based on routine experience rather than evidence-based understanding. This gap may compromise the quality and safety of respiratory care delivered to patients. Addressing this issue requires structured in-service training, continuous professional education, and the integration of standardized nebulization protocols into routine nursing practice to enhance competency, ensure patient safety, and improve overall clinical outcomes.

AUTHOR CONTRIBUTIONS

Author	Contribution
Malik Aman*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Adnan Ahmad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Faiz Ur Rahman	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Wajahat Ullah	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Iftikhar Ahmad	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Amir Dawood	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Hamza Naeem	Contributed to study concept and Data collection

Author	Contribution
	Has given Final Approval of the version to be published
Hazrat Ullah	Writing - Review & Editing, Assistance with Data Curation
Doonya Dar	Writing - Review & Editing, Assistance with Data Curation

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