

**ASSESSMENT OF PRESCRIPTION PATTERN, DRUG RELATED PROBLEMS AND
RISK FACTORS AMONG PATIENTS WITH RESPIRATORY DISORDERS**

¹Dr. Vaishnavi S. Shetty, ²Dr. Sahana G., ^{*3}Manoj S. Gowda, ⁴Pallavi P. G., ⁵Rashi Reddy P., ⁶Soofiya Nazneen,
⁷Dr. Anup Banur

^{1,2}Assistant Professor, Department of Pharmacy Practice, Bapuji Pharmacy College, Davangere.

^{3,4,5,6}Pharm D Intern, Bapuji Pharmacy College, Davangere.

⁷HOD & Professor, Department of Pulmonary Medicine, SSIMS & RC, Davangere.



***Corresponding Author: Manoj S. Gowda**

Pharm D Intern, Bapuji Pharmacy College, Davangere.

DOI: <https://doi.org/10.5281/zenodo.23118121>

How to cite this Article: ¹Dr. Vaishnavi S. Shetty, ²Dr. Sahana G., ^{*3}Manoj S. Gowda, ⁴Pallavi P. G., ⁵Rashi Reddy P., ⁶Soofiya Nazneen, ⁷Dr. Anup Banur. (2026). Assessment of Prescription Pattern, Drug Related Problems And Risk Factors Among Patients With Respiratory Disorders. European Journal of Pharmaceutical and Medical Research, 13(10), 338-347.

This work is licensed under Creative Commons Attribution 4.0 International license.



Article Received on 05/09/2026

Article Revised on 25/09/2026

Article Published on 01/10/2026

ABSTRACT

Respiratory disorders are a major cause of illness and death. Treating them often involves taking medicines, which can lead to problems. This study was done over a period of six months with 128 patients in Pulmonology Department at S.S. Institute of Medical Sciences and Research Centre in Davangere. The goal was to see how medicines were prescribed, check for polypharmacy and related problems and to find risk factors. Most patients were men from rural areas with common symptoms, like cough and breathlessness. The main diagnosis were infectious lung diseases. Patients were prescribed with antibiotics, bronchodilators, corticosteroids and other supportive medications, which showed high polypharmacy. The World Health Organizations prescribing indicators showed that on average patients took 7.6 drugs per encounter with generic prescribing and excessive use of antibiotics and injectables. Polypharmacy was common, linked to drug interactions. The study found that patients had respiratory symptoms, prior illnesses, hospital stays, smoking exposure and occupational hazards. The study suggests that doctors should prescribe medicines carefully review prescriptions regularly and involve pharmacists more to improve patient safety and outcomes with Respiratory disorders and its treatment.

KEYWORDS: Respiratory disorders, Prescription pattern, Drug-related problems, Polypharmacy, Drug-drug interactions, Risk factors.

INTRODUCTION

Respiratory diseases have continued to be some of the major contributors to sickness and admission to hospitals globally. Diseases such as asthma, COPD, pneumonia, and tuberculosis are still affecting millions of individuals around the world and putting pressure on health care systems.^[1,2] Such respiratory problems do not just affect normal breathing but also cause a lot of hindrances in daily routine and activities. Chronic respiratory conditions, especially COPD and asthma, donate greatly to global disease rate and death rate.^[3] The problem is especially common among the elderly because of the high probability that they will suffer from recurrent respiratory complaints, chronic diseases, and a number of concurrent disorders. The incidence of respiratory disease depends on several environmental, occupational,

and lifestyle factors. Excessive exposure to cigarette smoke, air pollutants, dust, fumes, and other respiratory irritants is frequently associated with respiratory disease.^[16,20] Poor living conditions, lack of proper ventilation, overcrowded housing, and indoor air pollution are additional factors that make the problem even more serious in many developing regions. The workers who have been engaged in occupations where they are exposed to dust, smoke, pesticide, or any other chemicals used in industries are also at greater risk of suffering from breathing problems.^[17,22] Respiratory diseases usually have symptoms that include coughing, production of mucus, wheezing, chest pain, and difficulty breathing due to the kind of the disease, treatment of the participants usually entails long-term treatment and multiple admissions into hospitals and

whereas there have been many changes to the ways respiratory diseases are managed in recent years.^[1,2] Among the commonly used medications are antibiotics, bronchodilators, corticosteroids, mucolytics, and expectorants, whereas oxygen therapy, pulmonary rehabilitation, vaccinations, and lifestyle changes are crucial for improving participants outcomes.^[2,4] Though such treatment methods have facilitated improved control over diseases, they have complicated treatments even further, especially for those participants suffering from respiratory diseases along with other diseases.

In clinical practice, participants with respiratory diseases usually take more than one drug at once because it becomes necessary due to several reasons. However, the administration of more than one medicine increases the possibility of developing drug-related problems where the practice of taking numerous drugs is on the rise and has been common among the elderly and those suffering from chronic respiratory disease conditions.^[8] Though there may be valid medical reasons for taking a number of medicines, such a measure can place participants at risk of experiencing side effects of medicines, drug interaction, medication mistakes, and decreased adherence.^[9] Drug use is still one of the main problems in the medical practice because therapy involves combination of various drugs where this problem might appear at any point in the course of treatment and make it more difficult to achieve the therapeutic goals.^[10,11] Medication adverse effects and duplication can also happen, especially among people who take several drugs, early detection and resolution of such issues are crucial to maintaining the safety of medication and improving the health of the individual. For this reason, prescription evaluation is important to see if medications are being prescribed correctly.^[11,14] Pharmaceutical prescribing patterns offer important data in relation to the usage of medicines within healthcare institutions. Such studies can help in assessing the present-day trends in prescription, evaluating the rationality of such practices, and revealing shortcomings.^[5,6] In order to encourage rational prescribing, the World Health Organization (WHO) developed a set of core indicators of prescribing practice.^[7] These indicators evaluate factors such as the mean number of drugs prescribed during a consultation, generic prescribing, use of antibiotics, use of injections, and Essential Drug List compliance. Evaluation of these indicators allows health professionals to measure prescription patterns and promotes the evidence-based application of medications.^[7] In addition to drug usage assessment, risk factor assessment plays an equally important role in identifying the variables that cause respiratory diseases. Risk factor assessment helps identify the factors that play an influential part in the development of diseases. In epidemiology, risk can be described as the likelihood of developing an illness or adverse health outcome in a population.^[15] Details related to smoking exposure, air pollution, occupational risks, living environment, and past respiratory infections can be used to determine in such people.^[16,22] These

assessments are especially valuable in formulating plans that focus on reducing disease burden and improving respiratory function in communities. Despite many investigations that have been conducted to investigate respiratory diseases and treatment thereof, there is still a need to assess prescription practices, polypharmacy, medication problems, and related risks in certain participants groups. Comprehension of these parameters is important for enhancing the quality of healthcare services and rational medication use.^[1] In this context, the current study has been conducted to determine the prescription pattern among participants suffering from respiratory diseases, and to evaluate the risk factors related to polypharmacy and other drug related issues by using an established questionnaire. The inference of this study may contribute to safer prescribing practices, improved medication management, and better clinical outcomes among participants with respiratory disorders. The management of respiratory diseases often involves a combination of medications. It is therefore crucial to have knowledge about how these medications are prescribed and used in the clinical setting. An analysis of prescription practices will give an insight on the identification of polypharmacy, drug-related problems, and possible improvements in drug usage. On the other hand, the assessment of the environment, lifestyle, and clinical risk factors gives a clearer idea on the aspects that could be responsible for disease development and progression.

METHODOLOGY

Observational prospective study was done in participants with respiratory disorders admitted to the Department of Pulmonology, S.S. Institute of Medical Sciences and Research Centre, Davangere, Karnataka for a period of six months. The study was designed to evaluate prescription patterns, polypharmacy, drug-related problems and risk factors by validated questionnaires.

Sample Size Calculation

The sample size was calculated using the formula $[N = Z^2 \times P(1-P) / I^2]$, where $[Z = 1.96]$, $[P = 86.1\%]$, and $[I = 6\%]$. Based on this calculation, the required sample size was approximately 128 participants.

Ethical approval was obtained from the Institutional Ethics Review Board (IERB No. 244-2025) before the study began. Participants privacy and confidentiality was maintained throughout the study in accordance with ethical guidelines.

The inclusion criteria were in-participants diagnosed with respiratory disorders, history of respiratory disorder, participants above 18 years of age, and those who gave informed consent. The exclusion criteria were incomplete case sheets, chronic non-respiratory conditions affecting lung function, pregnant and lactating women, and participants with psychiatric illness and/or cancer.

The study was carried out in three phases. Phase I included literature review, questionnaire design and validation, sample size calculation, and a pilot study. Phase II involved participant enrolment and data collection using data collection forms and questionnaires. Phase III included data analysis and documentation of the collected information.

Data Collection Procedure

Demographic details, participants history, medication details, and the number, frequency, and dose of prescribed drugs were recorded in the data collection form. Drug-related problems such as potential drug–drug interactions, inappropriate prescriptions, and adverse drug reactions were evaluated. Polypharmacy was also assessed. Risk factors were identified using self-designed questionnaires covering medical history, environmental and lifestyle factors, and housing conditions. The collected data were entered into MS Excel 2021, represented graphically, and analysed statistically.

Statistical Analysis

Statistical analysis was performed using SPSS 23.0. Descriptive statistics were expressed as mean and standard deviation for numerical variables, and frequency and percentage for categorical variables. Categorical variables were analysed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Reliability Testing of Questionnaires

The test-retest reliability of the questionnaire was assessed using Pearson's correlation coefficient. The correlation between the test and retest scores was 0.978 ($p < 0.001$), indicating very high reliability and strong consistency.

Readability Testing of Questionnaires

Readability was assessed using the Flesch Reading Ease and Flesch-Kincaid Grade Level scores. The FRE score was 69.4 and the FKGL score was 6, indicating that the questionnaire was easy to read and suitable for the target population.

RESULT

Socio-Demographic Profile of the Study Population

With 128 participants, the study revealed a high prevalence of respiratory disorders among older persons, particularly those between the ages of 58 and 77, who made up about 60% of the population. The majority of the patients were male (59.37%) and came from rural areas (57.81%), indicating that respiratory infections are more common in rural areas. A significant percentage of participants had a history of respiratory disease, while a smaller percentage had no recorded respiratory illness, according to an evaluation of medical history. This result suggests the existence of recurrent or chronic respiratory conditions.

Table 1: Socio-Demographic Profile Of The Study Population (N=128).

Variable	Category	Number of patients (n)	Percentage (%)
AGE GROUP	18-27	5	3.90%
	28-37	7	5.46%
	38-47	6	4.68%
	48-57	22	17.18%
GENDER	Male	76	59.37%
	Female	52	40.62%
RESIDENCE	Rural	74	57.81%
	Urban	54	42.18%
MEDICAL HISTORY OF RESPIRATORY DISEASES	Present	31	24.2%
	Absent	24	18.8%

Clinical profile of the study population

Among the study participants, coughing with expectoration and Breathlessness on exertion, either alone or in conjunction with other respiratory symptoms, were the most common presenting complaints among

study participants. The most common diagnosis was obstructive lung disease (38.2%), followed by infectious lung illness (32.8%).

*Note: Percentages for complaints exceed 100% as patients presented with multiple overlapping symptoms.

Table 2: Dominant Clinical Presentations And Diagnoses (N=128).

Category	Clinical parameters	Frequency	Percentage
MAJOR COMPLAINTS	• Cough with expectoration	104	81.25%
	• Breathlessness on exertion	73	57.03%
	• Others (chest pain, wheezing etc.)	55	42.97%
PRIMARY DIAGNOSIS	• Obstructive lung disease	49	38.20%
	• Infectious lung disease	42	32.80%
	• Overlapping of obstructive and infectious lungs diseases	11	8.50%

PRESCRIPTION PATTERN ANALYSIS AMONG PATIENTS

The pharmacological management was intensive, focusing on multi-drug regimens to address both primary respiratory pathologies and the prevention of therapy-related complications

a) Distribution of Antibiotics and Bronchodilators Other Supportive Medications Prescribed Among Study Participants

Cephalosporins and β -lactamase inhibitors were used most often as a combination of antibiotics (39.06%), and then their combination with macrolides (10.93%), indicating broad-spectrum antibiotic therapy is strongly preferred for the treatment of respiratory infections.

Methylxanthines (11.71%) and inhaled β_2 agonist-anticholinergic combinations (10.93%) formed the majority of bronchodilator therapy. Mucolytics, expectorants, and bronchodilators were frequently prescribed as combination therapy, indicating that patients with respiratory diseases needed airway control and symptomatic alleviation. The most often given corticosteroid regimen was systemic corticosteroids (50%), whereas (17.18%) of patients received a combination of inhaled and systemic treatment. Furthermore, the extensive use of supportive drugs and proton pump inhibitors for comorbid conditions emphasizes the difficulty of patient care and adds to the high rate of polypharmacy observed in patients.

Table 3: Pattern Of Antibiotic And Bronchodilator Therapy, And Other Supportive Medications (N=128).

Therapeutic Class	Drug Category	No of Patient	Percentage (%)
ANTIBIOTICS	• Cephalosporins + β -lactamase inhibitors	50	39.06%
	• Cephalosporins + β -lactamase inhibitors + Macrolides	14	10.93%
	• Cephalosporins	8	6.25%
	• Penicillins + β -lactamase inhibitors	7	5.46%
	• Penicillins + β -lactamase inhibitors + Tetracyclines	5	3.90%
BRONCHODILATO	• Methylxanthines	15	11.71
	• Inhaled β_2 agonists + Anticholinergics	14	10.93
	• Mucolytic + Expectorant + Bronchodilator combinations	11	8.59
	• Inhaled β_2 agonists + Anticholinergics + Methylxanthines	10	7.81
Medication Category	Prescription Status/Route	Patients(n)	Percentage (%)
CORTICOSTERIODS	• Systemic Administration	64	50%
	Inhaled (alone or in combination with systemic)	33	25.77%
PPIS	• Prescribed	53	41.40%
	• Not Prescribed	75	58.5%
CONCOMITANT MEDICATIONS	• Prescribed	119	92.9
	• Not Prescribed	9	7.03

b) Analysis of prescription using who prescribing indicators

Assessment of prescription patterns using WHO prescribing indicators revealed that with an average of 7.6 medications prescribed per encounter, polypharmacy was evident. Generic prescribing was low (23.43%), whereas antibiotic (93.09%) and injectable (96.87%) use

were markedly high, indicating intensive pharmacological therapy among hospitalized respiratory patients. Furthermore, a moderate adherence to essential medicine prescribing procedures was shown that 73.79% of the prescribed medications came from the Essential Drug List.

Table 4: Prescription Pattern Analysis Using Who Prescribing Indicators(N=128).

WHO PRESCRIBING INDICATORS	TOTAL	OBTAINED VALUE	OPTIMAL VALUE
THE AVG No. OF DRUGS PER ENCOUNTER	973	7.6	1.6 - 1.8
% OF DRUGS PRESCRIBED BY GENERIC NAME	228	23.43%	100
% OF ENCOUNTERS WITH ANTIBIOTICS PRESCRIBED	123	93.09%	20.0 - 26.8
% OF ENCOUNTERS WITH INJECTABLE PERSCRIBED	124	96.87%	13.4 - 24.1
% OF DRUGS FROM ESSENTIAL DRUG LIST	718	73.79%	100

EVALUATION OF DRUG RELATED PROBLEMS AND IT'S ASSOCIATION WITH POLYPHARMACY

a) Distribution of Drug Related problems among study Participants

In 75% of the study participants, polypharmacy was the most often reported drug-related issue, followed by drug

interactions in 65.6% of cases (Figure:1). Only three individuals had adverse pharmacological reactions, such as hypokalaemia linked to spironolactone and liver damage caused by anti-tubercular medication. Contraindication was observed in one patient with documented hypersensitivity to rifampicin.

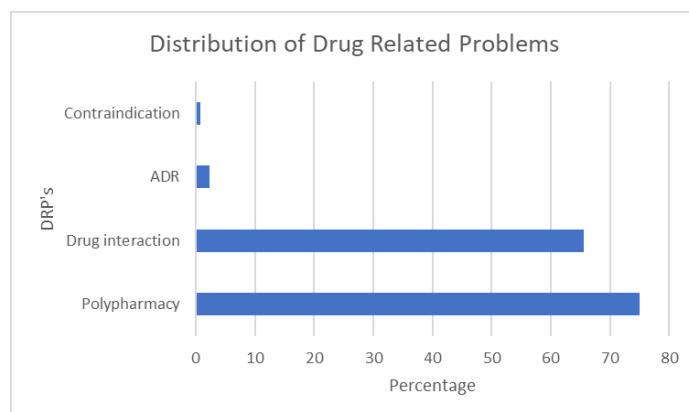


Figure 01: Percentage Distribution Of Drug-Related Problems Identified Among Study Participants(N=128).

b) SEVERITY OF DRUG- DRUG INTERACTION

This distribution indicates that moderate interactions are the predominant concern (figure 2) seen in 49 patients,

emphasising the importance of careful monitoring and intervention to prevent potential harm.

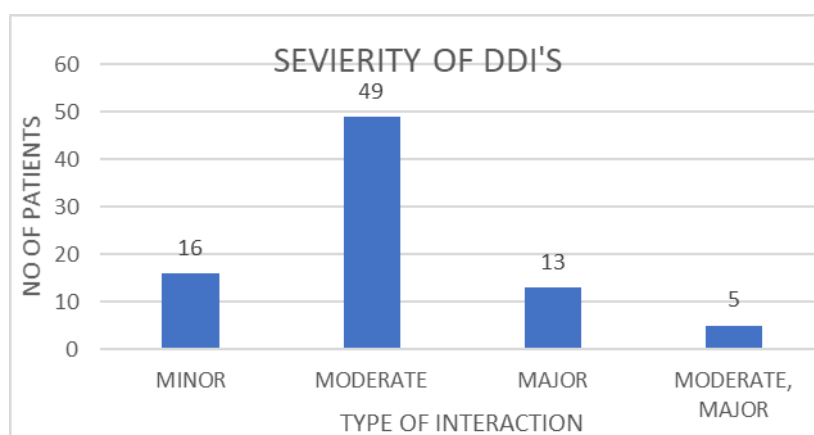


Figure 02: Severity Of Drug- Drug Interaction.

c)ASSOCIATION BETWEEN POLYPHARMACY AND DRP'S

The chi-square test showed a statistically significant association between polypharmacy and drug interactions

($\chi^2 = 41.558$, $p < 0.001$), with drug interactions being more frequent among patients with polypharmacy. However, no significant association was identified between polypharmacy and other drug-related problems.

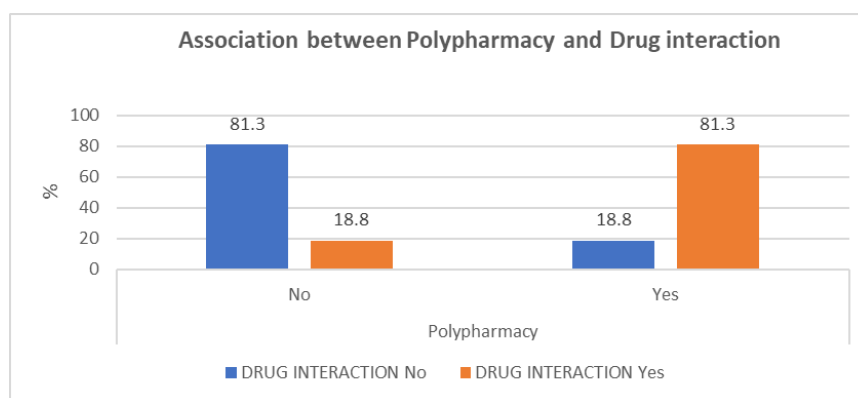


Figure 3: Association Between Polypharmacy And Drug Interactions.

Evaluation of risk factors and its association using questionnaire

Table 7: Distribution Of Study Participants Based On Medical, Environmental, Lifestyle, Housing, And Healthcare Factors.

MEDICAL HISTORY (RISK)		FREQUENCY	PERCENT
Diagnosed with a respiratory disease	No	59	46.1
	Yes	69	53.9
Experience frequent respiratory symptoms	No	11	8.6
	Yes	117	91.4
Family history of respiratory diseases	No	122	95.3
	Yes	6	4.7
ENVIRONMENTAL AND LIFESTYLE FACTORS(RISK)		FREQUENCY	PERCENT
Anyone in your household smoke	No	63	49.2
	Yes	65	50.8
Often exposed to air pollution	No	32	25.0
	Yes	96	75.0
Ventilation methods while cooking	No	110	85.9
	Yes	18	14.1
Work in an environment with high exposure to dust, smoke, or chemicals	No	57	44.5
	Yes	71	55.5
HOUSING CONDITION AND HEALTH CARE AWARENESS		FREQUENCY	PERCENT
Treat your drinking water before consumption	No	44	34.4
	Yes	84	65.6
Frequently experience dampness or mould in your house	No	115	89.8
	Yes	13	10.2
Live near any industrial areas, factories, or highways	No	93	72.7
	Yes	35	27.3
Received any vaccinations for respiratory diseases	No	29	22.7
	Yes	99	77.3

MEDICAL HISTORY (RISK)

The analysis of risk factors shows that out of 128 participants, 69 were previously diagnosed with a respiratory disease, while 59 were not. A large majority (91.4%), reported experiencing frequent respiratory symptoms, compared to 8.6% who did not. Family history of respiratory diseases was reported by only 6 participants (4.7%).

Environmental and Lifestyle factors (Risk)

The analysis of environmental and lifestyle risk factors shows that 65 participants reported having someone in their household who smokes. A majority (75.0%), were often exposed to air pollution, whereas (25.0%) were less likely exposed. 110 participants, did not use proper

ventilation methods while cooking, with only 18 reported using chimney, open windows as a ventilation method. In terms of occupational exposure, 71 worked in environments with high exposure to dust, smoke, or chemicals.

HOUSING CONDITION AND HEALTH CARE AWARENESS

The analysis of housing conditions and health care awareness shows that 84 participants treated their drinking water before consumption, in which few heated the water whereas few used purified water for consumption. Only 13 participants frequently experienced dampness or mould in their houses, whereas 115 participants reported no such issue. Living near

industrial areas, factories, or highways was noted in 35 participants, while the majority, 93 (72.7%), did not live near such areas. Vaccination coverage for respiratory diseases was reported by 99 participants, compared to 29 who had not received any vaccination.

ASSOCIATION BETWEEN RISK FACTORS AND SOCIODEMOGRAPHIC, MEDICAL, AND RESIDENTIAL CHARACTERISTICS OF STUDY PARTICIPANTS

Significant connections were found between the risk factors and certain demographic and clinical

characteristics. Older individuals were more likely to have worse housing conditions ($p = 0.026$). Males had higher scores related to environmental and lifestyle risks compared to females ($p < 0.001$). People with a history of respiratory illness or positive social history also had higher risk scores in those respective areas ($p < 0.001$). No significant connections were found for other medical history, environmental, lifestyle, or housing condition factors.

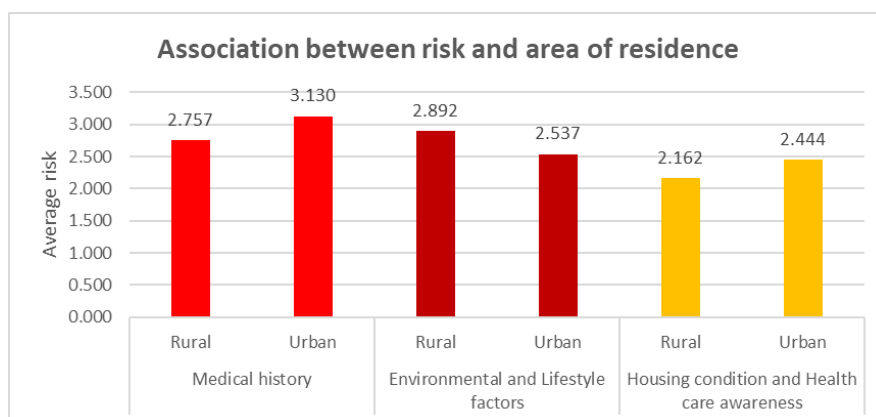


Table 8: Association Between Risk And Area of Residence.

Participants from **urban areas** had a higher mean medical history risk score (3.13 ± 1.05) compared to rural participants (2.76 ± 1.32). For **environmental and lifestyle factors**, rural participants had a slightly higher mean score (2.89 ± 0.99) than urban participants (2.54 ± 1.15). For **housing condition and health care awareness**, urban participants (2.44 ± 0.97) had higher mean scores compared to rural participants (2.16 ± 1.22). None of the risk domains demonstrated a statistically significant difference between rural and urban participants.

DISCUSSION

In this study differs from earlier studies because most previous studies have primarily focused on analysing prescription patterns, polypharmacy, or their prevalence in a specific age group or patient population. In contrast, the present study provides a comprehensive assessment of prescription patterns, drug-related problems, and associated risk factors among inpatients with respiratory disorders.

In our study 31.2% of the patients belonged to 58-67year age group, whereas 28% belonged to 68-77% years age group. It suggests that majority (60%) of the study population were above the age of 58year age distribution was similar to a study published Kumar S et al^[24] where around above 46age of the patient.

There was a slight male prepondence in our study (59.37%), which was similar to study by Beg MA et al.^[38]

In our study 24.2% of the patients had history of smoking. In a study published by Kumar S et al 39.63% had history of smoking. Mattei MJ et al.^[38] reported 20% of their study population had history of smoking where majority of their study population had sedentary life style. Leung LT et al.^[19] reported an increased risk of respiratory symptoms even among non-smokers, with women showing a higher risk mainly because of exposure to second-hand smoke from neighbouring apartments.

Among bronchodilators, long-acting β_2 -agonists (LABA) and long-acting muscarinic antagonists (LAMA) were the most commonly prescribed in this study. In contrast, methylxanthines (11.7%) and inhaled β -agonists combined with inhaled anticholinergics (10.9%) were prescribed less frequently. Shiv Kumar et al.^[23] reported that beta-sympathomimetics and anticholinergics (43.33%) were the most commonly prescribed medications among hospitalized patients, while methylxanthines (13.33%) were prescribed less frequently.

Systemic corticosteroid therapy was prescribed to 50% of the study population, whereas combined systemic and inhaled corticosteroid therapy was administered to 17.2% of the patients. These results are consistent with those reported by Cheng et al.,^[40] who demonstrated improved clinical outcomes with systemic corticosteroid therapy in patients with respiratory diseases. Similar study observations were also revealed by de Jong YP et al.,

who observed frequent use of intravenous prednisolone (61.7%) and oral prednisolone (56.3%).

Assessment of prescribing practices using the WHO prescribing indicators revealed that the average number of drugs prescribed per encounter was 7.6, which is considerably higher than the WHO recommended standard of 1.6–1.8 drugs per encounter. Similar observations were documented by Dawalji S, et al.,^[42] who observed an average of 9.68 drugs per prescription. However, Hailesilase GG^[43] et al. reported a much lower average of 1.8 ± 0.83 medicines per encounter.

The proportion of drugs prescribed by generic name in this result was 23.34%, which is considerably lower than the WHO recommended standard of 100%. This result is comparable with observations by P. Galappaththy et al.^[44] who observed that 35.5% of the drugs were prescribed by their generic names. In contrast, B. Mosisa et al.^[45] reported 100% generic prescribing. These variations across studies highlight the need to encourage generic prescribing, as it not only enhances patient safety but also promotes cost-effective healthcare delivery. Antibiotics accounted for 93.09% of the prescriptions in the present study, which is considerably higher than the 77% identified by Atif M, et al.^[46] and the 25.70% reported by Kumar S et al.^[24] The higher proportion in our study can be attributed to the fact that it was conducted on patients with respiratory diseases, where antibiotics are frequently prescribed due to the risk of bacterial involvement. Nevertheless, ensuring the rational use of antibiotics preferably guided by culture and sensitivity testing remains essential to prevent the emergence of antimicrobial resistance.

The proportion of injections prescribed in this study was 96.87%, which is much higher than the 13.9% reported by Wendie TF et al. and is comparable to the 98% reported by Atif M et al.^[46]

Regarding adherence to the Essential Drug List (EDL), 73.79% of the prescribed drugs were from the EDL. This finding is similar to that reported by Ahsan M,^[48] who observed an EDL compliance of 79.2%.

Polypharmacy was one of the major observations in the present study. The prevalence of polypharmacy was comparable to that reported in the South Indian pharmacoepidemiological study by Mohammed et al.,^[9] where 59.8% of patients were exposed to polypharmacy, defined as the use of five or more medications. The study also indicated the prevalence of polypharmacy enhanced with advancing age, particularly among individuals older than 60 years.

Similarly, polypharmacy has been shown to be significantly associated with drug-drug interactions. Another study reported an odds ratio of 65.6 for predicting drug-drug interactions associated with polypharmacy ($P < 0.001$), while another investigation

identified polypharmacy as a significant risk factor for drug-related problems ($P < 0.005$).

Overall, the results obtained are consistent with those obtained by the previous studies in reporting multifactorial etiology of respiratory diseases and a significant contributory role of elder age, smoking habit, occupational exposure, environmental factor and polypharmacy for respiratory disease.

CONCLUSION

Bronchodilators and corticosteroids were most commonly prescribed medication in patient with underlying respiratory disorder. Polypharmacy strongly correlated with increased drug interactions. Complying with WHO prescribing guidelines, reducing polypharmacy will help in preventing drug related problems, and reducing occupational & environmental hazard is a very important factor in patients with underlying respiratory disorder.

CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

REFERENCES

1. Hansen-Flaschen J, Bates DV. Respiratory disease. Encyclopedia Britannica, 2025 Feb 26; Available from: <https://www.britannica.com/science/respiratory-disease>
2. Jacob E. An overview of respiratory diseases and their management. Int J Clin Skills, 2022; 16(12): 394-8. [https://doi.org/10.37532/1753-0431.2022.16\(12\).279](https://doi.org/10.37532/1753-0431.2022.16(12).279)
3. Soriano JB, Kendrick PJ, Paulson KR, et al. Prevalence and attributable health burden of chronic respiratory diseases, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet Respir Med., 2020; 8(6): 585-96.
4. World Health Organization. Global Alliance against Chronic Respiratory Diseases (GARD): WHO report. Geneva: World Health Organization, 2007.
5. Jain S, Upadhyaya P, Goyal J, Abhijit K, Jain P, Seth V, et al. A systematic review of prescription pattern monitoring studies and their effectiveness in promoting rational use of medicines. Perspect Clin Res., 2015; 6(2): 86-90. doi:10.4103/2229-3485.154005.
6. Vakade KP, Thorat VM, Khanwelkar CC, Jadhav SA, Sanghishetti VM. A study of prescribing pattern of drugs in patients of cardiovascular emergencies at a tertiary care hospital of Western Maharashtra. Int J Res Med Sci., 2016; 4(2): 556-61. Available from: <https://doi.org/10.18203/2320-6012.ijrms20160314>.
7. Chenchula S, Gupta R, Gupta SK, Padmavathi R, Pathan S. Assessment of WHO core drug use indicators at a tertiary care Institute of National importance in India. Bioinformation, 2022; 18(10): 888-893. doi:10.6026/97320630018661.

8. Chan DC, Chen JH, Kuo HK, Wei CJ, Lu IS, Chiu LS, Wu SC. Drug-related problems (DRPs) identified from geriatric medication safety review clinics. *Arch Gerontol Geriatr*, 2012; 54(1): 168-74. Available from: <https://doi.org/10.1016/j.archger.2011.02.005>.
9. Mohammed Saji S, et al. The prevalence of polypharmacy in South Indian patients: A pharmacoepidemiologic approach. *Indian J Pharm Pract.*, 2012; 5:
10. Ni X-F, Yang C-S, Bai Y-M, Hu Z-X and Zhang L-L (2021) Drug-Related Problems of Patients in Primary Health Care Institutions: A Systematic Review. *Front. Pharmacol.*, 12: 698907. doi: 10.3389/fphar.2021.698907
11. Kommu S, Carter C, Whitfield P. Adverse drug reactions [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [updated 2024 Jan 10; cited 2025 Aug 26]; Available from: <https://www.ncbi.nlm.nih.gov/books/NBK599521/>
12. Nelson, Lewis H., et al. Goldfrank's Toxicologic Emergencies. McGraw-Hill Medical Publishing Division, 2015
13. Zeenath Unnissa, Farha Naseer, Majida Begum. "Drug Interactions: A Review Article." *International Journal of Pharmaceutical Sciences Review and Research*, 80(1): May–June 2023; Article No. 06, Pages: 29-40
14. Huynh I, Rajendran T. Therapeutic duplication on the general surgical wards. *BMJ Open Quality*. 2021;10: e001363. doi:10.1136/bmjopen-2021-001363.
15. Bhopal, Raj S. The concept of risk and fundamental measures of disease frequency: Incidence and prevalence. In: *Concepts of Epidemiology: Integrating the ideas, theories, principles, and methods of epidemiology*. 3rd ed. Oxford: Oxford Academic, 2016. Available from: https://doi.org/10.1093/med/9780198739685.003.0007_16
16. Workman B, Nabors L. Risk factors for adults with chronic obstructive pulmonary disease in the United States, utilizing state-based surveillance. *COPD.*, 2024; 21(1): 2413712. doi:10.1080/15412555.2024.2413712
17. Kaukiainen A, Riala R, Martikainen R, Reijula K, Riihimäki H, Tammilehto L. Respiratory symptoms and diseases among construction painters. *Int Arch Occup Environ Health*, 2005 May 14; 78(6): 452-458.[1][2]
18. Wimalasena NN, Chang-Richards A, Wang KI-K, Dirks KN. Housing risk factors associated with respiratory disease: a systematic review. *Int J Environ Res Public Health*, 2021; 18(6): 2815. doi:10.3390/ijerph18062815
19. Leung LT, Ho SY, Wang MP, Lo WS, Lam TH. Exposure to second-hand smoke from neighbours and respiratory symptoms in never-smoking adolescents in Hong Kong: a cross-sectional study. *BMJ Open*, 2015; 5(11): e008607. doi:10.1136/bmjopen-2015-008607
20. Fairbairn AS, Reid DD. Air pollution and other local factors in respiratory disease. *Br J Prev Soc Med.*, 1958; 12(3): 94-103
21. Nordgren TM, Bailey KL. Pulmonary Health Effects of Agriculture. *Curr Opin Pulm Med.*, 2016; 22(2): 144-149. doi:10.1097/MCP.0000000000000247
22. Mamane A, Baldi I, Tessier JF, Raherison C, Bouvier G. Occupational exposure to pesticides and respiratory health. *Eur Respir Rev.*, 2015; 24(136): 306-319. doi:10.1183/16000617.00006114[1][1][2].
23. Kumar, Shiv, Nasreen Sultana, Mudgal Shankarappa, and H. Doddappa. "Prescription Pattern of Drugs Used for Respiratory Diseases in a Tertiary Care Teaching Hospital." *International Journal of Pharmacy and Pharmaceutical Research*, 30(11): 2024; 317-322.
24. Kumar S, Madhuri G, Wilson A, George TS. Study of prescribing pattern of drugs in chronic obstructive pulmonary disease in tertiary care teaching hospital. *Indian Journal of Pharmacy Practice*, 2019; 12(3).
25. Al-Khaldi YM, Diab MMAA, Al-Gelban KS, Al-Asmari AS, Al-Amin S, Al-Shahrani MS. Prescribing patterns for acute respiratory infections in primary health care, Aseer Region, Saudi Arabia. *J Fam Community Med.*, 2005; 12(3): 121–126
26. Khanna A, Bajad P, Pahuja S, Agarwal S, Goel I. Analysis of physician prescription patterns in patients with advanced chronic obstructive pulmonary disease. *Indian J Respir Care*, 2023; 12(4): 325–329. doi:10.5005/jp-journals-11010-1079
27. Hung CT, Hung YC, Suk CW, Liu DC. Polypharmacy among adults with asthma in the United States, 2005-2020. *J Am Pharm Assoc.*, (2003). 2024 Sep-Oct; 64(5): 102154. doi: 10.1016/j.japh.2024.102154. Epub 2024 Jul 2. PMID: 38964590.
28. Baniyadi S. Metabolism-based Drug-drug Interactions in Patients with Chronic Respiratory Diseases: A Review Focusing on Drugs Affecting the Respiratory System. *Curr Drug Metab.*, 2020; 21(9): 704-713. doi: 10.2174/1389200221999200820164038. PMID: 33109058.
29. Li, Qin et al. "Drug-related problems among hospitalized patients with COPD in mainland China." *International journal of clinical pharmacy*, 41(6): (2019); 1507-1515. doi:10.1007/s11096-019-00913-4
30. Apikoglu-Rabus, Sule et al. "Drug-related problems and pharmacist interventions in a cohort of patients with asthma and chronic obstructive pulmonary disease." *Respiratory medicine*, 120: (2016); 109-115. doi: 10.1016/j.rmed.2016.10.006
31. Maqbool M, Zehravi M, Maqbool R, Ara I. Study of adverse drug reactions in pulmonary medicine department of a Tertiary care hospital, Srinagar,

- Jammu & Kashmir, India. *Cell Med.*, 2021; 11(2): 8-1.
32. Khan A, Adil MS, Nematullah K, Ihtisham S, Aamer K, Aamir S. Causality assessment of adverse drug reaction in Pulmonology Department of a Tertiary Care Hospital. *J Basic Clin Pharma.*, 2015; 6:848.
 33. Bergs I, Just KS, Scholl C, Dreher M, Stingl JC. Inhalation therapies in COPD—adverse drug reactions impact on emergency department presentations. *Eur J Clin Pharmacol.*, 2023; 79(2): 219–227. doi:10.1007/s00228-022-03433-9
 34. Hoppin, Jane A et al. “respiratory disease in United States farmers.” *Occupational and environmental medicine*, 71(7) (2014); 484-91. doi:10.1136/oemed-2013-101983
 35. Spanakis M, Ioannou P, Tzalis S, A et al. Evaluation of drug interactions in hospitalized patients with respiratory disorders in Greece. *Adv Respir Med.*, 2023; 91(1): 74–92. doi:10.3390/arm91010008
 36. Hoge SP, Tudorache E, Fildan AP, Fira-Mladinescu O, Marc M, Oancea C. Risk factors of chronic obstructive pulmonary disease exacerbations. *Clin Respir J.*, 2020 Mar; 14(3): 183–197. doi: 10.1111/crj.13129. Epub 2020 Jan 21. PMID: 31814260.
 37. Mattei J, Tamez M, Ríos-Bedoya CF, Xiao RS, Tucker KL, Rodríguez-Orengo JF. Health conditions and lifestyle risk factors of adults living in Puerto Rico: a cross-sectional study. *BMC Public Health*, 2018; 18: 491.
 38. Beg MA, Dutta SB, Bawa S, Kaur A, Vishal S, Kumar U. Prescribing trends in respiratory tract infections in a tertiary care teaching hospital. *Int J Res Med Sci.*, 2017; 5(6): 2588–2591.
 39. Spina D. Current and novel bronchodilators in respiratory disease. *Curr Opin Pulm Med.*, 2014; 20(1): 73–86.
 40. Cheng T, Gong Y, Guo Y, Cheng QJ, Zhou M, Shi GC, Wan HY. Systemic corticosteroid for COPD exacerbations, whether the higher dose is better? A meta-analysis of randomized controlled trials. *Clin Respir J.*, 2013; 7: 305–318.
 41. de Jong YP, Uil SM, Grotjohan HP, Postma DS, Kerstjens HAM, van den Berg JWK. Oral or IV prednisolone in the treatment of COPD exacerbations: A randomized, controlled, double-blind study. *Chest.*, 2007; 132(6): 1741–1747.
 42. Dawalji S, Venkateshwarlu K, Thota S, Venisetty PK, Venisetty RK. Prescribing Pattern in Coronary Artery Disease: A Prospective Study. *Int J Pharma Res Rev.*, 2014 Mar; 3(3): 24-33
 43. Hailesilase GG, Welegebrial BG, Weres MG, Gebrewahd SA. WHO/INRUD prescribing indicators with a focus on antibiotics utilization patterns at outpatient department of Adigrat general hospital, Tigray, Ethiopia: a retrospective cross-sectional study. *Antimicrob Resist Infect Control*, 2024; 13: 133. doi:10.1186/s13756-024-01490-6
 44. Galappatthy P, Ranasinghe P, Liyanage CK, Wijayabandara MS, Mythily S, Jayakody RL. WHO/INRUD Core drug use indicators and commonly prescribed medicines: a National Survey from Sri Lanka. *BMC Pharmacol Toxicol.*, 2021; 22: 67. doi:10.1186/s40360-021-00535-5
 45. Mosisa B, Sherefudin R, Bayisa G. Assessment of prescribing practices through WHO prescribing indicators at Nekemte Health Center, West Ethiopia. *Mahidol Univ J Pharm Sci.*, 2016; 43(3): 107-114.
 46. Atif M, Azeem M, Sarwar MR, Shahid S, Javaid S, Ikram H, Baig U, Scahill S. WHO/INRUD prescribing indicators and prescribing trends of antibiotics in the Accident and Emergency Department of Bahawal Victoria Hospital, Pakistan. *SpringerPlus*, 2016; 5: 1928. doi:10.1186/s40064-016-3615-1
 47. Wendie TF, Ahmed A, Mohammed SA. Drug use pattern using WHO core drug use indicators in public health centres of Dessie, North-East Ethiopia. *BMC Med Inform Decis Mak.*, 2021; 21: 197. doi:10.1186/s12911-021-01530-w
 48. Ahsan M, Shaifali I, Mallick AK, Singh HK, Verma S, Shekhar A. Prescription auditing based on World Health Organization (WHO) prescribing indicators in a teaching hospital in North India. *Int J Med Res Rev.*, 2016 Oct; 4(10): 1847-1852. doi:10.17511/ijmrr.2016.i10.22
 49. Hailu BY, Berhe DF, Gudina EK, Gidey K, Getachew M. Drug related problems in admitted geriatric patients: the impact of clinical pharmacist interventions. *BMC geriatrics*, 2020 Dec; 20: 1-8.