Does Prescription Quality Really Matters? Assessment of Prescription Quality in Chronic Obstructive Pulmonary Disease (COPD) Patients Using Prescription Quality Index (PQI) Tool.

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Abstract
Background: Prescription is a written instruction given to a patient regarding of medicines. Quality of prescription has significant influence on patients' wellbeing and health outcomes. A large number of prescription quality assessing tools have been derived to analyze the quality of prescription.
Objective: This study was conducted to analyze the quality of prescription in patients of chronic obstructive pulmonary disease(COPD) at a tertiary care hospital with the use of Prescription Quality Index (PQI) tool and to evaluate the reliability of PQI tool.
Materials and Methods: A prospective observational cross-sectional study was conducted to medicine outpatient department of tertiary care hospital. All patients of COPD attending for four months were enrolled. All the demographic details and prescription details with medical history were recorded. Total scores and criteria wise PQI scores were obtained for each prescription. As per total PQI scores, prescriptions were categorized as high, medium and poor quality. The internal consistency of PQI was determined with the use of item total correlation. Cronbach's α was applied to estimate the reliability of PQI tool.
Results: Total 66 prescriptions were collected from 66 patients of chronic obstructive pulmonary disease and analyzed for the quality of prescribing. Mean patients' age was 54.3 ± 14.4 years. Mean value of total PQI scores was 32.1 with standard deviation of 6.3. PQI total scores were not showed normal distribution, without of floor or ceiling effects. PQI total scores reflected strong correlation with drug indication, dosage and duration of therapy criteria ($P<0.01$). Cronbach's □ for the entire 22 criteria was 0.71. Total 58% prescriptions were of high quality with PQI score ≥34.
Conclusion: Quality of prescription in patients of chronic obstructive pulmonary disease was good in about more than half of the prescriptions at a tertiary care hospital. The PQI is an easily measurable, unique, valid, consistent and reliable instrument to evaluate the quality of prescription in chronic illnesses.
Key words: Quality of prescription, chronic obstructive pulmonary disease, Prescription Quality Index tool

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I. INTRODUCTION

Prescription of medications is the most common form of therapeutic intervention in health care. Prescription refers to a lawful written order from a licensed physician or other health care professional to a licensed pharmacist relevant to the compounding or dispensing and administration of drug/s or other medical services to the patient.[1] A complete prescription should include the prescriber's details, patient's details, the identity of the drug, dosage form, strength, route of administration, frequency, duration of therapy and instructions to the pharmacist and patient.[2] Assessment of prescription quality is the first step to improve the use of medicines. An ideal prescription should provide the rational medicine to the patient which covers the all aspects of effectiveness (maximum benefit), safety (minimum harm), economy (minimum costs) and treatment acceptance of patient. Rational prescribing means the use of the minimum drugs to obtain the best possible effects with shortest duration of time at a reasonable cost[3]. Rational and appropriate prescribing can improve the patient's well-being and health outcomes, reduces the chances of drug–drug interactions or adverse drug effects, reduces the number of consultations and be more cost effective. While irrational and inappropriate prescribing leads to poor quality of prescription which can cause the therapeutic failure, wastage of resources, adverse drug events, drug-drug interactions, drug related hospital admission and economical harm to both patients and the community.[4]

Prescription quality indicator is a measurable element of prescribing for which there is evidence or consensus that it can be applied to evaluate the quality, and so modify in the quality, of treatment provided.[5] A large number of prescription quality measuring indicators have been developed to evaluate the quality of prescription. The World Health Organization (WHO) core drug use indicators are intended to measure the important aspects of prescribing drugs, patient care, drugs availability and drug information to compare or monitor facilities over time.[6] The Medication Appropriateness Index (MAI) is developed to assess the appropriateness of drug use in individual patients and found to be reliable and valid in many of health care setups. It is framed in the form of questions, to evaluates the basic appropriateness of drug therapy, cost effectiveness and interaction potential.[7,8] The Swedish National Board of Health and Welfare has derived explicit indicators to evaluate the drug therapy among elderly patients.[9] However, there is not any tool which covers the all areas of prescription quality and usable to evaluate the quality of prescription in chronic conditions.

Prescription Quality Index (PQI) tool developed by Hassan *et al.*,[10] based on expert consensus, peer reviews and literatures, contains 22 criteria as questions form. It is the implement intended for health care providers to measure the quality of prescription in chronic illnesses and to quantify whether the right medications are prescribed to the right patients. The PQI is considered to be a valid, consistent and reliable tool usable to a wide variety of medications and clinical situations in different health care setups with limited available information.

This study was conducted to analyze the quality of prescription in patients of chronic obstructive pulmonary disease attending to medicine outpatient department at a tertiary care hospital with the use of PQI tool[10] and to evaluate the reliability of this tool.

II. MATERIALS AND METHODS

A prospective observational cross-sectional study was conducted to medicine outpatient department of Sheth V. S. General Hospital, a tertiary care hospital from December 2012 to November 2013. Institutional Review Board approval was obtained. After obtaining informed consent from each participant, the data were collected. Patients diagnosed of chronic obstructive pulmonary disease with or without comorbid illnesses attending to medicine outpatient department(OPD) who willing to give consent for participation were enrolled.

Data collection was done for a period of four months. All the demographic details and prescription details with medical history were recorded in case record form. The Prescription Quality was analyzed using PQI tool that consists total 22 criteria like indication, dosage, effectiveness, evidence base, correct administration, drug-drug interaction, drug-disease interaction, adverse drug effect, duplication of drugs, duration, cost minimization, use of generic name, selection from hospital drug list, compliance, medicine name, legibility, prescriber information, patient information, diagnosis, requirement of drug therapy and improvement of patient. While compliance of patient was assessed using consultant notes written in patient's case record. If prescription contained more than one drug then each drug was assessed individually.

Each criterion had a specific maximum score based on its importance. In the PQI, the score range varied from 0 to 4 for very important criteria, score of 0 to 2 for important criteria and score of 0 to 1 for the least important criteria. If a drug was given without indication, criterion 1 was scored as '0' (zero). Subsequently, criterion 2 (dosage), criterion 11 (duration) and criterion 12 (cost minimization) were all scored as '0'. When it was not possible to collect certain information, criterion was rated as having no information and score of '0' was given. The total PQI score was derived by summing up all the minimum scores of the 22 criteria for all drugs of a prescription. The possible maximum score of the PQI was '43'. As per PQI tool, prescriptions were categorized as high `quality with PQI total score 34 to 43, medium quality with PQI total score 32 to 33 and poor quality with PQI total score ≤31.`[10]

For the analysis of different criteria in the questionnaire, standard references or publications were used. PQI manual, pharmacological textbooks or internet websites were used as the primary references. Examples are A to Z Drug Facts,[11] articles of Medline or PubMED, WHO essential drug list 2013,[12] National list of Essential medicines of India 2011, National Formulary of India (NFI) 2011,[13] British National Formulary (BNF) 2012[14] and Current Index of Medical Specialties (CIMS).[15]

Data were entered in Microsoft Excel 2007 and analyzed with the use of Statistical Package for Social Science version 20. To describe the samples, descriptive statistics were used. For describe continuous variables, mean and standard deviation (SD) were used. Frequency (%) was used for categorical variables. Kolmogrov-Smirnov test was applied to check the normality of data. Because of skewed distribution of the data Non Parametric tests were applied. Correlations between variables were assessed by Spearman's r correlations. Categories for the correlation were: strong correlation >0.80, moderate correlation 0.50–0.80 and weak correlation <0.50. Correlation of criteria should be between 0.2 and 0.8. For validating the PQI, internal

consistency (reliability) was assessed with the help of item total correlation and Cronbach's α. These two properties show the extent to which items correlate with the total PQI score and how well items measure the same construct.[10] Cronbach's alpha is frequently used to estimate the reliability of a psychometric test for a sample of examinees. It is ranges between 0 to 1. The closer the Cronbach's alpha to 1, the greater the internal consistency (reliability) of the items.[16] Floor effects (percentage of prescriptions with minimum possible score) and ceiling effects (percentage of prescriptions with maximum possible score) were determined. Factor analysis was done to find out the common dimensions between the PQI criteria. Most of factor analysis uses more than one criterion. Therefore, the Scree test and Kaiser's criteria (eigenvalue >1 rule) was applied to evaluate the construct validity of the tool.[17] *P* value less than 0.05 considered as significant.

III. RESULTS

A total of 66 prescriptions with 333 drugs were collected from 66 patients of chronic obstructive pulmonary disease(COPD). From total of 66 patients, there were 53(80%) male and 13(20%) female. Male: Female ratio was 4.1:1. Mean patients' age was 54.3±14.4 years. The most frequent medical illnesses were chronic obstructive pulmonary disease(COPD) 51(77%), followed by chronic obstructive pulmonary disease with hypertension 9(13%), with ischemic heart disease 8(12%), with diabetes mellitus 1(1%) and with hypothyroidism 1(1%). The mean number of medical illnesses per patient was 1.3±0.6. A total of 333 drugs were prescribed in 66 patients, ranged from three to eight per prescription with the mean value of 5.1±1.2. The demographical and clinical features of patients are shown in Table 1.

The mean value of total PQI scores was 32.1 with standard deviation of 6.3. While the PQI score can range from minimum '0' to maximum '43', there was only 1(1.5%) patient with a minimum score of 18, whereas 2(3.0%) patients with a maximum score of 40. However, no patient with a score of '0' or '43', suggesting the absence of floor or ceiling effects respectively. None of the 22 criteria were showed normal distribution with the PQI total scores. All criteria reflected a skewed distribution as determined with the use of Kolmogrov-Smirnov test (for all *P* < 0.001). Table 2 shows the mean PQI scores ± SDs for each criterion. [Table 2]

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The exploratory principal components analysis of the total PQI scores reflected
a six factor solution with the use of minimum Eigenvalue criteria of ≥1. An 80.4%
of variance was explained by these six factors. Scree plot was plotted for six
values of components. [Figure 1] Cronbach's α value for the entire 22 criteria
was 0.71.
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There was significant and negative correlation was found with PQI total scores and number of drugs in the prescriptions (correlation coefficient $r = -0.076$, $P = 0.045$) and also with the patient's age (correlation coefficient $r = -0.310$, $P = 0.011$). No correlation was observed with total PQI scores and number of chronic illnesses per prescription (correlation coefficient $r = 0.144$, $P = 0.249$). [Table 3]

The PQI total scores reflected strong correlation with drug indication, dosage and duration of therapy criteria. The criteria namely drug effectiveness, evidence based, correct directions, practical directions, prescriber's information, patient's information and improvement of patient showed moderate correlations. There were no correlations with PQI total scores and the criteria namely drug–drug interactions, drug–disease interactions, cost and generic prescribing. The remaining criteria reflected weak correlations with the PQI total scores. [Table 4]

Table 5 shows the total PQI scores and prescription quality. From total of 66 prescriptions, 38(58%) were of high quality and 28(42%) were of poor quality prescriptions. [Table 5]

IV. DISCUSSION

The study was carried out to analyze the quality of prescription in patients of chronic obstructive pulmonary disease (COPD) attending to outpatient department of medicine at a tertiary care hospital with the use of Prescription Quality Index (PQI) tool.[10] PQI tool has been considered as consistent, valid and reliable and therefore, it was selected for analysis of prescription quality in chronic obstructive pulmonary disease.

A total of 66 prescriptions with 333 drugs were collected from 66 patients. Mean patients' age was 54.3±14.4 years in our study which is similar to previous studies.[10,18] Male: female ratio was 4.1:1 in our study which is higher as compared to previous study reporting 1.1:1[10] and 1.07:1[18]. The difference could be related to the geographical and epidemiological variations in health care seeking behaviour of the patients.

The mean number of drugs per prescription was 5.1±1.2 in this study which is higher than previous study reporting 3.6±1.81.[10] Hence, Polypharmacy was evident in our study. The difference might be related to the disease patterns and prescribing behaviour of two study area. Previous study stated that polypharmacy

(>2 drugs) was common in almost all the public health care setups in India[19]. Large number of patients, more complicated diseases and more number of prescribers and drugs availability might lead to polypharmacy at tertiary health care facility which can increases the risks for inappropriate drug use, adverse drug effects, drug-drug interactions and non-compliance of patients.

The mean PQI total score was 32.1±6.3 for chronic obstructive pulmonary disease (COPD) in this study which is in consistent with previous studies[10,18] of chronic conditions. PQI total scores and individual criterion were not showed normal distribution in this study which is differs from previous study,[10] which stated that two criteria namely generic prescribing and diagnosis were showed normal distribution, while other criteria showed skewed distribution. There was only one (1.5%) prescription with a minimum score of '18', and two (3.0%) prescriptions with a maximal score of '40', suggesting the absence of floor and ceiling effects respectively in our study which is similar to the previous studies. [10,18,20]

The exploratory components analysis of the total PQI scores showed a six factor solution with the use of minimum Eigenvalue criteria of ≥1 in our study. An 80.4% of the total variance was explained by these six factors which is comparable to previous study.[21] A study by Hassan *et al.*,[10] showed an eight-factor solution and that eight factors explained for 66% of the total variance and Reddy et al.,[20] showed a six factor solution and that six factors explained for 58.2% of the total variance. The exploratory components analysis determined the multiple factors influencing to the quality of prescription. The Cronbach's α value for the entire 22 criteria was 0.71 in this study which is consistent with previous studies[18,21] indicating the PQI tool is valid and reliable for applicable in our facility also. Cronbach's alpha is used to provide an estimate of the internal consistency of a test or scale. A low value of alpha can be because of a low number of questions or poor interrelations between items. If alpha is too high it suggests that some items are redundant as they are testing the same question but in a different guise.[22]

A significant and inverse correlation of total PQI total score with number of drugs in the prescriptions was observed in this study which is in accordance with previous studies[10,18,20,21,23] and with another study, which stated that polypharmacy is an important risk factor for inappropriate medication prescribing[24-26] and so, lower the quality of prescription. Availability of the large number of prescribers and less effective communication between healthcare providers and patients may lead to polypharmacy[27] at a tertiary health care facility. There was a significant and inverse correlation of total PQI score with age of the patient found in our study which is in consistent with previous studies [10,18] and with another study, which reported that with increasing age patient suffers from more complicated diseases, so the prevalence of polypharmacy increases[28] which may lead to more risks of inappropriate drug use, less use of effective drugs, medication errors, poor compliance, drug–drug interactions and most importantly adverse drug reactions[24,25,29-31] and hence, decreases the quality of prescription. Most of COPD patients were above the age of 50 years and so more complex prescription led to medium quality of prescribing. There was no correlation of total PQI score with number of diseases per prescription in our study which is similar to previous studies [20,23] and in contrast from study by Hassan et al.[10], who reported negative correlation between PQI total score and number of chronic diseases. Previous study reported that polymorbidity has been estimated to range from 55 to 98% in the elderly.[32] As polymorbidity triggers the polypharmacy,[27] it can decreases the quality of prescription. The numbers of associated conditions did not exceed three in this study, which might be the possible reason for no correlation with number of diseases.

The total PQI scores reflected strong correlation with drug indication, dosage and duration of therapy criteria(P<0.01) in this study which is comparable to previous studies.[10,21,23] Seven criteria were moderately correlated and eight criteria were weakly correlated with total PQI scores. Previous study[10] reported that there was not any correlation observed with the total PQI scores and four criteria namely unnecessary duplication, formulary/essential drug, legibility, and adequate patient information. Still they were kept in the PQI for clinical and legal purpose.[10] Three of these criteria namely unnecessary duplication, formulary/essential drug and adequate patient information showed correlation with total PQI score in our study indicating of regional variation in the factors affecting PQI score and quality of prescription. In our study, drug indication criterion reflected strong correlation with total PQI score which can have significant influence on the quality of prescribing which is in consistent with findings of previous studies.[10,21,23]

From out of 66 prescriptions, 38(58%) were of high quality and 28(42%) were of poor quality prescriptions which is comparable with previous study by Suthar et al.,[18] who reported about 46% were of high quality and 36% were of poor quality prescriptions. Both studies were conducted at tertiary care hospitals reflecting similar prescribing quality. The prescribing quality in our study is better than previous study,[23] which reported around 28% and 25% prescriptions were of high quality at primary and secondary health care setups respectively. Our study was conducted in tertiary care hospital where medicines are prescribed by consultant doctors as well as resident doctors. Hence, it might be possible to change the prescribing quality by

discussing these findings with them. The educational intervention is frequently used as a principal-targeted approach to ensure good quality of prescribing which improves the prescribers' knowledge and awareness.[33] It will be good if educational intervention is initiated as early as possible especially during undergraduate level to develop good prescribing skill.[34]

More than half of the prescriptions of chronic obstructive pulmonary disease were good quality at tertiary health care hospital. The criteria like correct indication, correct dosage and evidence base therapy contributing score of 10 out of maximum 43 in PQI, reflected lower score compared to previous study.[10] The criteria namely adverse drug reactions, unnecessary duplication, duration of therapy, drug availability in essential drug list and medication's name writing also scored lower compared to previous study.[10] This could be the possible reason for medium quality of prescribing at our facility.

In this study, we have accumulated data prospectively in a limited time period with the benefits of accurate and complete data, hence there is no chance of missing of any information regarding to quality of prescribing analysis. We have selected only one chronic disease to decreases the disease variation that reflected better reliability in form of higher Cronbach's α as compared to previous studies.[10,20] The results of this study are relevant for only one condition and limited to tertiary health care setting, therefore acceptability and applicability cannot be expected for other setups. So, further studies with other chronic conditions in different health care facilities can be conducted with the use of PQI tool for complete overview of quality of prescribing at different health care facilities. Further strategies like clinical governance, electronic computerized system for prescribing and continuing professional educational programs are recommended to improve the quality of prescriptions.

V. Conclusion

More than half of the prescriptions of chronic obstructive pulmonary disease were of good quality at a tertiary health care facility. The PQI is an easily measurable, unique, valid, consistent and reliable instrument to evaluate the quality of prescription in chronic illnesses. PQI can be applicable for evaluation of quality of prescription in different chronic situations at different level of health care facilities.

Conflict of interest: NIL

REFERENCES

[1]. Stoll H. Physician Assistant. A guide to Clinical practice. Chapter 12 -Pharmacology. The use of Medications. W. B. Saunders Company Ltd. Philadalphia, 2007. p. 206-19.
[2]. De Vries TPGM, H. R., Hogerzeil HV, Fresle DA 1994. Guide to good prescribing. In: Organization, W. H. (ed.). Geneva
[3]. Barber, N.: What constitutes good prescribing? *Brit. Med. J.* 1995, 310, 923–925.
[4]. Kumar J, Shaik M. Appraisal of prescription writing skills of preclinical undergraduate students in a medical institute of Nepal. JCMS Nepal. 2010;6(4):7–13.
[5]. Lawrence, M. & F. Olesen: Indicators of quality in health care. *Eur. J. Gen. Pract.* 1997, **3**, 103–108.
[6]. WHO. How to Investigate Drug Use in Health Facilities: selected Drug Use Indicators. Action Programme on Essential Drugs, WHO/DAP/93.1. Geneva: WHO; 1993: 1-87.
[7]. Fitzgerald LS, Hanlon JT, Shelton PS, Landsman PB, Schmader KE, Pulliam CC, Williams ME. Reliability of a modified medication appropriateness index in ambulatory older persons. Ann Pharmacother 1997; 31: 543–8.
[8]. Samsa GP, Hanlon JT, Schmader KE, Weinberger M, Clipp EC, Uttech KM, Lewis IK, Landsman PB, Cohen HJ. A summated score for the medication appropriateness index: development and assessment of clinimetric properties including content validity. J Clin Epidemiol 1994; 47: 891–6.
[9]. Socialstyrelsen [Swedish National Board of Health and Welfare]. Indicators for Evaluation of the Quality of Drug Therapy Among Elderly REPORT; 2003. p. 110-20.
[10]. Hassan NB, Ismail HC, Naing L, Conroy RM, Abdul Rahman AR. Development and validation of a new Prescription Quality Index. Br J Clin Pharmacol 2010;70:500-13.
[11]. Tatro DS. A to Z Drug Facts. 5th ed. Philadelphia: Wolters Kluwer Health Inc.; 2004.
[12]. WHO essential drug list. 17th ed. The International Pharmacopoeia; 2013.
[13]. National Formulary of India. 4th ed. Government of India, Ministry of Health and family welfare, Indian Pharmacopoeia Commission; 2011.
[14]. British National Formulary (BNF). Pharmaceutical Press; 2012.
[15]. Current Index of Medical Specialities. India: UBM Medica India Private Limited; 2012.
[16]. Mohsen Tavakol, Reg Dennick .Making sense of Cronbach's alpha, International Journal of Medical Education. 2011; 2:53-55.
[17]. Skyggedal Rasmussen HM, Søndergaard J, Sokolowski I, Kampmann JP, Andersen M. Factor analysis improves the selection of prescribing indicators. Eur J Clin Pharmacol 2006;62:953-8.
[18]. Suthar JV, Patel VJ, Vaishnav B. Quality of prescribing for hypertension and bronchial asthma at a tertiary health care facility, India using Prescription Quality Index tool. J Basic Clin Pharma 2015;6:1-6.

[19]. Kumari R, Idris MZ, Bhushan V, Khanna A, Agrawal M, Singh SK. Assessment of prescription pattern at the public health facilities of Lucknow district. Indian J Pharmacol. 2008;40(6):243-7.

[20]. Nagi Reddy Pooja Reddy et al. Assessment of Prescription Quality In Patients With Chronic Diseases Using The Prescription Quality Index Tool. Indo American Journal of Pharmaceutical Research.2015:5(09).

[21]. Suthar JV, Patel VJ. Assessment of quality of prescribing in patients of hypertension at primary and secondary health care facilities using the Prescription Quality Index (PQI) tool. Indian J Pharmacol 2014;46:480-4.

[22]. Streiner D. Starting at the beginning: an introduction to coefficient alpha and internal consistency. Journal of personality assessment. 2003;80:99-103.

[23]. Suthar JV, Patel VJ. Prescribing quality in patients with chronic diseases at primary and secondary health care facilities using prescription quality index tool. Int J Basic Clin Pharmacol 2014;3:553-9

[24]. Mangoni AA, Jackson SHD. Age-related changes in pharmacokinetics and pharmacodynamics: basic principles and practical applications. Br J Clin Pharmacol 2004;57(1):6–14.

[25]. Hilmer SN, Gnjidic D. The effects of polypharmacy in older adults. Clin Pharmacol Ther 2009;85(1):86–98.

[26]. Beer C, Hyde Z, Almeida OP, Norman P, Hankey GJ, Yeap BB, et al. Quality use of medicines and health outcomes among a cohort of community dwelling older men: an observation study. Br J Clin Pharmacol 2011;71(4):592–9.

[27]. Schuler J, Dückelmann C, Beindl W, Prinz E, Michalski T, Pichler M. Polypharmacy and inappropriate prescribing in elderly internal-medicine patients in Austria. Wien Klin Wochenschr. 2008;120(23-4):733-41.

[28]. Bjerrum L, Søgaard J, Hallas J, Kragstrup J. Polypharmacy: correlations with sex, age and drug regimen. A prescription database study. Eur J Clin Pharmacol. 1998;54(3):197-202.

[29]. Corsonello A, Pedone C, Corica F, Mussi C, Carbonin P, Antonelli Incalzi R, et al. Concealed renal insuffi ciency and adverse drug reactions in elderly hospitalized patients. Arch Intern Med 2005;165(7):790–5.

[30]. Gurwitz JH. Polypharmacy: A new paradigm for quality drug therapy in the elderly? Arch Intern Med 2004;164(18):1957–9.

[31]. Steinman MA, Landefeld CS, Rosenthal GE, Berthenthal D, Sen S, Kaboli PJ. Polypharmacy and prescribing quality in older people. J Am Geriatr Soc 2006;54(10):1516–23.

[32]. Marengoni A, Angleman S, Melis R, Mangialasche F, Karp A, Garmen A, et al. Aging with multimorbidity: A systematic review of the literature. Ageing Res Rev 2011;10(4):430–39.

[33]. Herbert CP, Wright JM, Maclure M, Wakefield J, Dormuth C, Brett-MacLean P, *et al.* Better prescribing project: A randomized controlled trial of the impact of case-based educational modules and personal prescribing feedback on prescribing for hypertension in primary care. Fam Pract 2004;21:575-81.

[34]. Wilcock J, Strivens J. A study to enhance medical students' professional decision-making, using teaching interventions on common medications. Med Educ Online 2015;20:27097.

Patients' details	Parameters	No. of Patients n(%)	Mean ± SD
Age group			54.29 ± 14.41
	≤30 years	4(6.06)	
	31-50 years	26(39.39)	
	51-70 years	28(42.43)	
	>71 years	8(12.12)	
Gender			
	Male	53(80.30)	
	Female	13(19.70)	
No. of drugs per prescription			5.05 ± 1.22
	3 drugs	3(4.55)	
	4 drugs	23(34.85)	
	5 drugs	21(31.81)	
	6 drugs	8(12.12)	
	7 drugs	9(13.64)	
	8 drugs	2(3.03)	
No. of diseases per prescription			1.29 ± 0.60
	1	51(77.27)	
	2	12(18.18)	
	3	3(4.55)	

Table 1: Demographical and clinical characteristics of patients (n=66)

SD: Standard deviation

Table 2: Criteria wise mean PQI score (n=66)

Sr. No	Criterion	Maximum Score for criterion	Obtained Score (Mean±SD)
1	Is there an indication for the drug?	4	2.30±1.99
2	Is the dosage correct?	4	2.30±1.99
3	Is the medication effective for the condition?	2	1.85±0.44
4	Is the usage of the drug for the indication supported by evidence?	2	1.83±0.45
5	Are the directions for administration correct?	2	1.83±0.51
6	Are the directions for administration practical?	2	1.82±0.52
7	Are there clinically significant drug-drug interactions?	2	2.00±0.00
8	Are there clinically significant drug-disease/condition interactions?	2	2.00±0.00
9	Does the patient experience any adverse drug reaction (s)?	2	1.65±0.48
10	Is there unnecessary duplication with other drug(s)?	1	0.71±0.46
11	Is the duration of therapy acceptable?	2	1.21±0.99
12	Is this drug the cheapest compared to other alternatives for the same indication?	1	0.00±0.00
13	Is the medication being prescribed by generic name?	1	0.00±0.00
14	Is the medication available in the formulary or essential drug list?	1	0.06±0.24
15	Does the patient comply with the drug treatment?	2	1.85±0.53
16	Is the medication's name on the prescription clearly written?	2	1.05±0.71
17	Is the prescriber's writing on the prescription legible?	2	2.00±0.00
18	Is the prescriber's information on the prescription adequate?	2	1.86±0.43
19	Is the patient's information on the prescription adequate?	2	1.88±0.37
20	Is the diagnosis on the prescription clearly written?	2	1.08±0.99
21	Does the prescription fulfil the patient's requirement for drug therapy?	1	0.98±0.12
22	Has the patient's condition (s) improved with treatment?	2	1.85±0.47
	Total score	**43**	**32.12±6.28**

PQI: Prescription quality index, SD: Standard deviation

Table: 3 The PQI total score correlation with age, number of drugs prescribed and number of diseases/conditions

PQI total Score Correlation with		
Age	**Number of drugs Prescribed**	**Number of diseases/conditions**
-0.310(P=0.011)*	-0.076(P=0.045)*	0.144(P=0.249)

*P value based on spearman's r correlation, P value less than 0.05 was considered as significant.
PQI=Prescription quality index

Table 4: PQI total score correlation with 22 criteria

Sr. No.	Criterion	Correlation with PQI total score(n=66)	
		Correlation coefficient	P value
1	Indication	0.863	<0.001*
2	Dosage	0.863	<0.001*
3	Effectiveness	0.568	<0.001*
4	Evidence-based	0.597	<0.001*
5	Correct directions	0.518	<0.001*
6	Practical directions	0.561	<0.001*
7	Drug–drug interactions	1	-
8	Drug–disease/condition interactions	1	-
9	Adverse drug reaction	-0.156	0.212
10	Unnecessary duplication	0.270	0.028*
11	Duration of therapy	0.802	<0.001*
12	Cost	1	-
13	Generic prescribing	1	-
14	Formulary or essential drug list	0.393	<0.001*
15	Compliance	0.435	<0.001*

| 16	Medication's name	-0.216	0.082
17	Legibility	0.151	0.226
18	Prescriber's information	0.529	<0.001*
19	Patient's information	0.531	<0.001*
20	Diagnosis	-0.217	0.080
21	Requirement for drug therapy	0.154	0.216
22	Patient's improvement	0.532	<0.001*

*Correlation significant at 0.05 level (two-tailed) Spearman's correlation. PQI=Prescription   quality index

Table 5: Prescription Quality Index score and quality of prescription (n=66)

Quality	PQI Score	No. of Patients n(%)
High	34-43	38(57.58)
Medium	32-33	0(0)
Poor	≤31	28(42.42)

PQI=Prescription quality index

Figure 1: Scree plot showing the components of the PQI total score against Eigen values in patients with chronic obstructive pulmonary disease
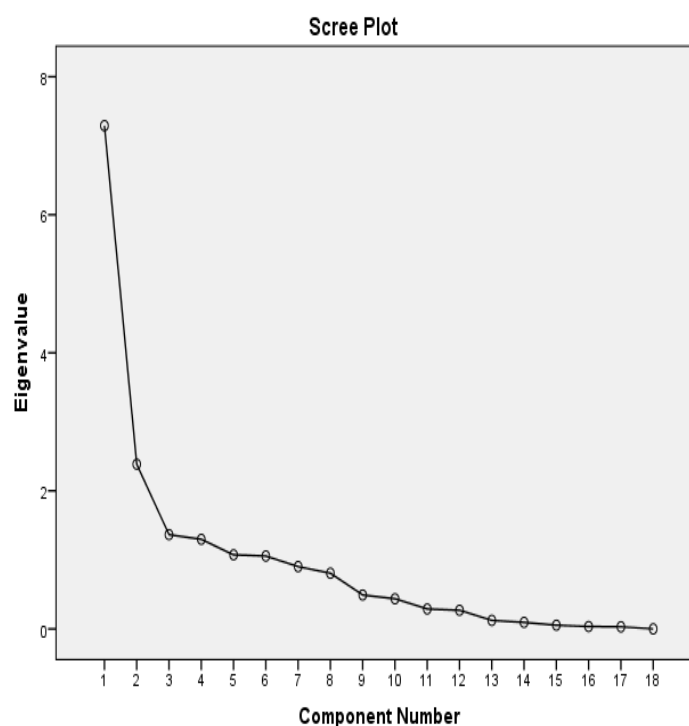
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