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RESEARCH ARTICLE

A STUDY OF PRESCRIPTION AUDITING IN A TERTIARY CARE TEACHING HOSPITAL OF EASTERN INDIA

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ABSTRACT

Background: prescription audit is a tool as well as a technique and its application is science as well as an art. Quality of life can be improved by enhancing the standards of medical treatment and that can only be assessed by prescription audit, because it is based on documented evidences to support diagnosis, treatment and justified utilization of hospital facilities. Effective prescription audit is important for health professionals, health service managers, patients, and the public. It supports health professionals in making sure their patients receive the best possible care. It can inform health service managers about the need for organizational changes, or new investment to support health professionals in their practice. Prescription audit is a quality improvement process that seeks to improve patient care. in this background the present study was conducted in this tertiary care teaching hospital of eastern India, as previously no such study conducted at this institution. **Objective: A**ssessment of quality of medical care in a tertiary care teaching hospital, quantifying and describing the appropriateness of medical care by measuring the who core prescribing indicators, and assessment of rational prescription pattern in a tertiary care teaching hospital in eastern India. **Materials and method:** this was an observational study undertaken between 1st may 2012 and 31st august 2013 at the OPD of burdwan medical college, west Bengal, India. Data for only first encounter prescriptions collected from the patients attending the OPD after fulfillment of inclusion criteria with the help of pre-inserted carbon and was analyzed by the parameters based on the objectives. **Results:** General medicine OPD contributing 45.38% patients with the most frequent diagnosis was the disease of the gastro-intestinal system (ICD 10 code- k00-k99) at rate of 12.33%. 19% of prescription contain more than single diagnosis with total numbers of drugs prescribed were 18559. Most frequent antibacterial agent was fluoroquinolones subgroup (ATC code-JOIMA) at the rate of 7.78%. In this study it was observed that in 91.33% of prescription weight is not written, while in-appropriate drugs prescribed in 52.99% of prescription. Average number of drugs per encounter was 4.4; percentage of drugs prescribed by generic name was only 20.99%, while percentage of encounters with an antibiotic prescribed was 28.89%, & percentage of encounters with an injection prescribed was 28.99%. Percentage of drugs prescribed from essential drugs list or formulary was only 60.98%, and overall illegibility of prescription was 22.99%. **Conclusion:** the results of this study show the prevailing prescribing habits at our institution. This study reveals that the auditing of prescription in terms of rationality, it remains poor. The value of such audits in generating and testing hypotheses on inappropriate prescribing will definitely create an intervention to improve prescribing habits and ultimately patient care will be improved.

Key Word: Essential Medicine, Prescription Auditing, International Classification of Diseases (ICD 10)

INTRODUCTION

A wise man once said; “Life is short, and the Art long; the occasion fleeting; experience fallacious, and judgment difficult. The physician must not only be prepared to do what is right himself but also to make patients, the attendants, and the external cooperate”. This man lived 400 B.C. and his name was Hippocrates[1]. Good clinicians have always organized some kind of systemic review of their daily work, recording and assessing the accuracy, of their diagnosis and the outcome of their treatment. We have learnt to call this kind of activity audit [2].

Medical Audit may be defined simply as looking at what we are doing with the aim of making improvements in patient care and use of resources [3]. It is the systematic, critical analysis of the quality of medical care, including the procedures used for diagnosis and treatment, the use of resources, and the resulting outcome and quality of life for the patients and it is a continuous cycle, involving observing practice, setting standards, comparing practice with standards, implementing changes and observing new practice [4]. Thus medical audit is a systematic approach to peer review of medical care in order to identify opportunities for improvements and provide a mechanism for realizing them[5]. Prescription audit is a part of medical audit [6].

Quality of medical care rendered can only be assessed by prescription audit, because it is based on documented evidence to support diagnosis, treatment and justified utilization of hospital facilities. In principle, it is an objective and systemic way of evaluating quality of treatment and care provided by the physicians [7]. Prescription audit is a tool designed for a particular purpose that is the objective documentation by and to the doctors of how far their care conforms to their own standards. Hence prescription audit is a tool as well as a technique and its application is science as well as an art [8]. The study of prescribing patterns seeks to monitor, evaluate and if necessary suggest modifications in

prescribing practices of medical practitioners to make medical care rational and cost effective[9]. Auditing prescriptions also forms part of drug utilization studies, that auditing prescribing indicators but drug utilization study also includes patients care indicators like average consultation time, average dispensing time, % of drugs actually dispensed, % of drugs adequately labeled, patients' knowledge of correct dosage and facility indicators like availability of copy of essential drugs list or formulary, availability of key drugs[10].

Prescription auditing has the enormous potential to promote the rational usages of drugs and essential medicine. Essential medicines are one of the vital tools needed to improve and maintain health. However, for too many people throughout the world medicines are still unaffordable, unavailable, unsafe and improperly used. An estimated one-third of the world's population lack regular access to essential drugs, with this figure rising to over 50% in the poorest parts of Africa and Asia. When available, the medicines are often used incorrectly: around 50% of all medicines are prescribed, dispensed or sold inappropriately, while 50% of patients fail to take their medicines appropriately[11].

Since the beginning of the 1980s the essential drugs concept has become one of the cornerstones of international and national health policy – influencing decision making in not only developing but also industrialized countries. The selection and rational use of medicines are accepted as key principles of health service quality and management in both the public and private sectors. WHO has vigorously promoted the rational use of drugs through the Action Programme on Essential Drugs[12]. According to WHO, definition of rational use of drugs is, "Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community"[13], and it is the National list of Essential Medicines which can promote the rational use of drugs.

Essential medicines are those that satisfy the priority healthcare needs of majority of the population. The essential medicines list needs to be country specific addressing the disease burden of the nation and the commonly used medicines at primary, secondary and tertiary healthcare levels. The medicines in National List of Essential Medicines (NLEM) should be available at affordable costs and with assured quality. The medicines used in the various national health programmes, emerging and reemerging infections should be addressed in the list. The Government of India, Ministry of Health & Family Welfare (MOHFW) is mandated to ensure the quality healthcare system by assuring availability of safe and efficacious medicines for its population[14].The primary purpose of NLEM is to promote rational use of medicines considering the three important aspects i.e. cost, safety and efficacy. Furthermore it promotes prescription by generic names. The National list of essential medicines is one of the key instruments in balanced healthcare delivery system of a country which inter alia includes accessible, affordable quality medicine at all the primary, secondary, tertiary levels of healthcare. Realizing this GOI, MOHFW decided to have its own essential medicines list. The first National List of Essential Medicines of India was prepared and released in 1996. This list was subsequently revised in 2003. In India total Medicines are 348 according to NLEM 2011, out of that at the Tertiary care level (Category T) is 61, at the level of both Tertiary & Secondary care (Category ST) -106 and at the level of Primary, Secondary & Tertiary care[14] (Category PST) -181.

Medicines are one of our most cost-effective health interventions. Billions of people take them every year. However, they are only effective if used correctly and there is evidence suggesting that more than half of all medicines are not used in an appropriate way. Such inappropriate use endangers lives and wastes money. Inappropriate use of prescription medicines is a global problem with serious consequences for patients in terms of poor health outcomes, increased adverse drug events, accelerating rates of antimicrobial resistance, spread of blood-borne infections due to non-sterile injections, and waste of scarce health resources. Many of these sources of wastage could be reduced only by prescription auditing[15].

Different studies conducted on the prescription auditing[16-19] in different parts of the World produced their own database for the future comparative study. In this perspective the present study was conducted in this part of the World at the Burdwan Medical College& Hospital, West Bengal, India to create our own database for future comparative study on the impact of auditing, with the following objectives. (1) Socio-demographic characteristic of the patients with the current morbidity pattern in this tertiary care teaching hospital of Eastern India. (2) OPD contributing the maximum number of patients. (3) Prevalence pattern of prescribing major drug groups at our institution. (4) Assessment of Rational Prescription pattern in this Tertiary Care Teaching Hospital in Eastern India by measuring the WHO Core Prescribing Indicators. (5) To quantifying and describing the appropriateness of medical care by analysis of Errors of the Mechanics of Prescription Order Writing.

MATERIALS AND METHODS:

Study Place: Out Patients Department of Burdwan Medical College & Hospital, West Bengal

Duration of the Study: From 1st May 2012 to 31st August 2013.

Design of the Study: Prospective observational cross sectional study.

Ethical Consideration: Prior to conduct, the study was approved by the Institutional Ethical Committee in the Dec'2011, but this study had been started late due to some technical reasons.

Data Collection and methodology: The study was carried out prospectively over a period of sixteen months in General medicine, Surgery, Gynecology& Obstetrics', Pediatrics, Orthopedics, Skin, ENT, Eye, Psychiatry OPD of our tertiary care teaching hospital. A specially designed pro-forma was used with pre-inserted carbons which were quite similar to the OPD cards. The forms were given only to the new cases, as the study was aimed at First Encounter Prescription. Before the start of the

study all the doctors were explained the objectives of the study and method of using the specially designed pro-forma. The doctors retained the carbon copy of all the prescriptions which were collected from time to time. Out of the 4500 filled-up pro-forma collected, only 4180 were analyzed. Diagnoses in the filled-up pro-forma were coded using International Statistical Classification of Diseases & Health Related Disorders-10 (ICD-10)[20] and the drugs were coded using the Anatomical Therapeutic and Chemical Classification (ATC)[21] adopted by the World Health Organization.

Parameters: Details of each prescription was analyzed as per as the following parameters

A. Demographic Characteristics of the patients involved.
B. Morbidity Pattern of the Prescription.
C. Prevalence pattern of prescribing major drug groups.

D. The Mechanics of Prescription Order Writing[22]: The prescription consists of the superscription, the inscription, the subscription, the signa, and the name and signature of the prescriber, all contained on a single form.

(a) **Superscription:** The superscription includes the date the prescription order is written; the name, address, weight, and age of the patient; and the Rx. The symbol "Rx" is said to be an abbreviation for the Latin word recipe, meaning "take" or "take thus," as a direction or order to a pharmacist, preceding the physician's "recipe" for preparing a medication. **Purpose:** The patient's name and address are needed on the prescription order to ensure that the correct medication goes to the proper patient and also for identification and recordkeeping purposes. For medications whose dosage involves a calculation, a patient's pertinent factors, such as weight, age, or body surface area, also should be listed on the prescription. Prescribers should view this effort as one that serves their goal of protecting their patient from errors rather than a burden (safety first).

(b) **Inscription:** The body of the prescription. It contains the name and amount or strength of the drug to be dispensed, or the name and strength of each ingredient to be compounded. The point noted as (i) Appropriateness of the prescribed drug according to the clinical condition - inappropriateness or not. (ii) Legibility of writing the prescription. Poor handwriting is a well-known and preventable cause of dispensing errors. Accuracy and legibility are essential. (iii) Avoiding confusion of term e.g. µg. for microgram, mg. for milligram, tablespoonful, teaspoonful. (iv)Abbreviation of medicine. (v) Usage of Arabic (decimal) numerals rather than Roman numerals (e.g., does "IL-II" mean "IL-11" or "IL-2"?); in some instances, it is preferable for numerals to be spelled out. Others parameters among the inscription noted in **WHO core prescribing indicators[23]** as mentioned below.

(c) Subscription: The subscription is the instruction to the pharmacist, usually consisting of a short sentence such as: "make a solution," "mix and place into 30 capsules," or "dispense 30 tablets."

(d) Signa: The signa or "Sig" is the instruction for the patient as to how to take the prescription, interpreted and transposed onto the prescription label by the pharmacist. The abbreviation "Sig" for the Latin Signatura, is used on the prescription to mark the directions for administration of the medication. Use of abbreviations in direction, particularly Latin, is discouraged, because it leads to dispensing errors, also “take as directed” like direction.

(e) Signature: Prescriber identity, name, address and qualification. It requires that prescriptions for controlled substances include the name, address, and registration number of the physician.

B. WHO core prescribing indicators[23]: The indicators of prescribing practices measure the performance of health care providers in several key dimensions related to the appropriate use of drugs. The indicators are based on the practices observed in a sample of clinical encounters taking place at outpatient health facilities for the treatment of acute or chronic illness. These encounters can be observed from a group of patients attending the clinic on the day the data collected. The core prescribing indicators do not require the collection of any information on signs and symptoms. Because the samples of clinical encounters cover a broad spectrum of health problems, the core prescribing indicators measure general prescribing tendencies within a given setting, independent of specific diagnoses.

(1**) Average number of drugs per prescription**:

a) Purpose: To measure the degree of poly-pharmacy b) Prerequisite: Combination drugs are counted as one. c) Calculation: Average, calculated by dividing the total number of different drug products prescribed, by the number of encounters (meaning prescription) surveyed. It is not relevant whether the patient actually received the drugs.

(2**) Percentage of drugs prescribed by generic name**:

a) Purpose: To measure the tendency to prescribe by generic name. b) Prerequisite: One must be able to observe the actual names used in the prescription c) Percentage, calculated by dividing the number of drugs prescribed by generic name by the total number of drugs prescribed, multiplied by 100.

(3) Percentage of prescriptions with an antibiotic prescribed

(4) Percentage of prescription with an injection prescribed

a) Purpose: To measure the overall level of use of two important, but commonly overused and costly forms of drug therapy. b) Prerequisite: a list must be available of all the drug products which are to be counted as antibiotics; and immunization are not to be counted as injections. c) Calculation: Percentage, calculated by dividing the number of patients encounters during which an antibiotic or an injection are prescribed, by the total number of encounters surveyed, multiplied by 100.

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(5) Percentage of drugs prescribed from essential drug list.

a) Purpose: To measure the degree to which practices conform to a national drug policy, as indicated by prescribing from the national essential drugs list or the formulary for the type of facility surveyed. b) Copies of a published national essential drugs list to which data on prescribed drugs can be compared; procedures are needed for determining whether or not brand name products are equivalent to ones appearing in generic form on the drug list or formulary c) Calculation: Percentage, calculated by dividing the number of products prescribed which are listed on the essential drugs list by the total number of products prescribed, multiplied by 100.

C. Legibility and or clarity of prescriptions.

Statistical Analysis: Microsoft Excel was used for data analysis.

Exclusion Criteria: Prescriptions of the admissible patients were excluded.

RESULTS AND ANALYSIS

In this study total 4500 prescriptions collected during the study period. Out of that only 4180 prescriptions analyzed. Proportions of male patients were higher (54.80%) than female while children constituted 25.11% and the patients aged between 12 years to 75 years constituted 72.70%. But age was not mentioned in 2.17% of patients, while in 2.03% of patients sex was not written. The demographic profiles of patients are shown in the table number 1.

Table 1: Showing the socio demographic profile of the patients (n= 4180).

Characteristic	Number of patients	% (n=4180)
Age, below 12 years	1050	25.11%
Age, 12- 60 years	1850	44.25%
Age , 61- 75 years	1189	28.44%
Mean Age 41.19 ± 13.18 years		
Nationality: Indian	4180	100%
Gender: Male	2291	54.80%
: Female	1804	43.15%
Marital Status: Married	2431	58.15%
: Unmarried	1749	41.84%
Religion: Hindu	1678	40.14%
: Muslim	2502	59.85%
Educational Status :Below the Secondary Education	1312	31.38%
At the level of Secondary Education	1443	34.52%
At the level of Higher Secondary Education	1113	26.62%
At the level of University Education	312	7.46%
Occupation: Unemployed	2879	68.87%
: Employed	1301	31.12%
Family Income: < Rs. 5000 per month	3116	74.54%
: > Rs. 5000 per month	1064	25.45%

Majority of the patients were unemployed and not at the level of higher secondary education. Majority of the patients (45.38%) found from the General Medicine Out Patient Department (OPD), followed by Pediatrics, Surgery and Gynecology & Obstetrics.

Table 2: Showing the Contribution of Prescription by Different OPD

Name of the OPD	No. of Prescription	% (n=4180)
General Medicine	1897	45.3827751196172%
Surgery	550	13.1578947368421%
Gynecology & Obstetrics	291	6.9617224880383%
Pediatrics	1259	30.1196172248804%
Orthopedics	490	11.7224880382775%
Dermatology	131	3.13397129186603%
ENT	181	4.33014354066986%
Eye	271	6.48325358851675%
Psychiatry	110	2.63157894736842%

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Morbidity Pattern of the Prescriptions: Out of the total 4180 prescriptions 77.91% contains single diagnosis while 11% contain two diagnoses, 8% containing three diagnosis and remaining 3.79% contains no diagnosis, treatment based on only symptom and signs.

The details of the morbidity pattern are shown on the **Table no. 3** with ICD 10 Code.

The following are the most frequent diagnosis.

- Disease of the Digestive System ICD 10 code K00-K99 – 12.33%
- Infectious and Parasitic Diseases ICD 10 code A00-B99 --11.39%
- Diseases of the Circulatory System ICD 10 code I00-I99 –10.99%
- Diseases of the Respiratory System ICD 10 code J00-J99- 10.93%

In the 19% of prescription contain more than single diagnosis, so the total number of morbidity pattern (4791) exceed the total number of prescription (4180). In this study it was observed that total numbers of drugs prescribed were 18559 and is shown with ATC Code in Table 3.

Table 3: showing the details Morbidity Pattern:

S.N.	Morbidity Pattern	ICD 10 Code	No. of Prescription	%
1.	Diseases of the Digestive System	K00-K99	591	12.33%
2.	Diseases of the Respiratory System	J00-J99	524	10.93%
3.	Infectious and Parasitic Diseases	A00-B99	546	11.39%
4.	Diseases of the Circulatory System	I00-I99	527	10.99%
5.	Diseases of Blood and Blood forming Organs	D50-D89	250	5.21%
6.	Diseases of the Nervous System	G00-G99	209	4.36%
7.	Diseases of the Skin & Subcutaneous tissue	L00-L99	130	2.71%
8.	Diseases of the Musculoskeletal System & Connective tissue	M00-M99	162	3.38%
9.	Injury, Poisoning and certain other consequences of external causes.	S00-T98	132	2.75%
10.	Neoplasm	C00-D48	140	2.92%
11.	Pregnancy, Child birth and the Puerperium	O00-O99	361	7.53%
12.	Congenital malformation, Deformities & chromosomal abnormality	Q00-Q99	89	1.85%
13.	Diseases of Ear& Mastoid region	H60-H95	283	5.90%
14.	Diseases of the Genitourinary System	N00-N99	211	4.40%
15.	Diseases of the Eye and adnexa	H00-H59	258	5.38%
16.	Symptom not Classified	R00-R99	182	3.79%
17.	The Mental and Behavioral disorders	F01-F99	196	4.09%
		Total	4791	100%

The prevalence patterns of major drug groups observed in this study for the treatment of the above morbidities are shown in **Table No. 4.**

Table 4: showing the prevalence pattern of prescribing Major Drug Groups

No.	Drug Groups	No. of Prescription	% (n=4180)
1	Anti-infective drugs/Antibiotic/Antimicrobials	1208	28.899%
2	Gastrointestinal system drugs.	526	12.583%
3	Respiratory system agents.	380	9.090%
4	Cardiovascular system drugs.	415	9.928%
5	Musculoskeletal system agents.	180	4.306%
6	Central nervous system drugs.	205	4.904%
7	Minerals and vitamins.	488	11.674%
8	Ear, nose and throat preparations.	210	5.023%
9	Skin preparations.	90	2.153%
10	Endocrine system agents.	91	2.177%
11	Eye preparations.	206	4.928%
12	Anticancer drugs.	181	4.330%
	Total Number of Prescriptions-	4180	100%

The most prescribed category of drugs was anti-infective/antibiotic/antimicrobials, followed by drugs of the gastrointestinal system, minerals& vitamins cardiovascular system drugs, drugs of the respiratory system, ear, nose and throat preparation, eye preparation, drugs of the central nervous system, anti cancer drugs in decreasing frequency order. In this study it was observed that only 17.77% of total prescriptions contained single

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drugs as mono-therapy and rest of the prescriptions contained poly-therapy with maximum portion of the prescriptions (30.09%) contained four drugs. Frequency of drug administrations per prescription is shown in **Table no.5.**

Table 5: showing the frequency drug administration per prescription

No. of drugs per prescription	No. of prescriptions	% (n=4180)
0	**89**	**2.129%**
1	**718**	**17.177%**
2	**811**	**19.401%**
3	**1012**	**24.210%**
4	**1258**	**30.095%**
Above 4	**292**	**6.985%**
Total number of prescription -	**4180**	**100%**

Table 6: Showing the numbers of antibiotics prescribed per encounter/ patient

Parameter	No. of patients.(Total n=4180)	%
Antibiotic prescriptions.	**1208**	**28.899%**
Single antibiotic.	**201**	**4.808%**
Two antibiotics.	**389**	**9.306%**
>Two antibiotics	**370**	**8.851%**
Antimicrobial FDCs.	**248**	**5.933%**

Table 7: Showing the distributions of Common categories of Drugs with ATC code

Drug Group	Subgroup	ATC code	Number	%
Quinolones (J01M).	**Fluoroquinolones.**	**J01MA.**	**1445**	**7.785%**
Penicillins (J01C).	**Extended spectrum penicillins** **Combination of penicillins**	**J01CA** **J01CR.**	**270** **531**	**1.454%** **2.861%**
Other β-lactams (J01D).	**1st Generation** **3rd Generation**	**J01DB** **J01DD.**	**1011** **427**	**5.447%** **2.300%**
Sulfonamide with Trimethoprim (J01E).	**Combination of Sulfonamide with Trimethoprim.**	**J01EE.**	**274**	**1.476%**
Macrolides (J01F).	**Macrolide.**	**J01FA.**	**589**	**3.173%**
Combination of antibiotics (J01R.	**Combination of antibiotics.**	**J01RA.**	**1081**	**5.824%**
Other antibiotics (J01X).	**Glycopeptide antibacterials** **Imidazole derivatives.**	**J01XA** **J01XD.**	**02** **49**	**0.01%** **0.264%**
Agents against amoebiasis and other protozoal diseases (P01A)	**Nitroimidazole derivatives** **Other agents against**	**P01AB** **P01AX.**	**231** **43**	**1.244%** **0.231%**
Antiinflammatory&anti rheumatic products(M01A)	**Coxibs** **Propionic acid derivatives** **Oxicams**	**M01AH** **M01AE** **M01AC**	**789** **338** **382**	**4.251%** **1.821%** **2.058%**
Analgesics(N02B)	**Combinations of ibuprofen and paracetamol.**	**N02BE51**	**1178**	**6.347%**
Drugs for acid related disorder(A02)	**H2-receptor antagonists** **Antacid** **Proton pump inhibitors**	**A02BA** **A02A** **A02BC**	**790** **364** **1189**	**4.256%** **1.961%** **6.406%**
Beta blocking agents(C07A)	**Beta blocking agents, selective**	**C07AB**	**742**	**3.998%**
Calcium channel blockers(C08C)	**Dihydropyridine derivatives**	**C08CA**	**782**	**4.213%**
ACE inhibitors(C09)	**ACE inhibitors and diuretics**	**C09BA**	**991**	**5.339%**
Angiotensin II antagonists(C09D)	**Angiotensin II antagonists and diuretics**	**C09DA**	**886**	**4.773%**
Vitamins(A11A)	**Multivitamins and iron**	**A11AA01**	**1012**	**5.452%**
Cough&Cold preparation(R05)	**Mucolytics** **Expectorants**	**R05CB** **R05CA**	**645** **793**	**3.475%** **4.272%**
Antihistamines for systemic use(R06A)	**Combinations of antihistamines**	**R06AK**	**887**	**4.779%**
OTHERS			**838**	**4.515%**
		Total Prescribed Drugs	**18559**	**100%**

In the study period among the total 4180 prescriptions, 1208 prescriptions contained antibacterial agents. Out of that, majority contained two antibacterial agents and only 201 prescriptions contained single one. And 5.933% of the total prescriptions contained antibacterial fixed dose combination (FDCs). Number of antibacterial agents prescribed per encounter is shown in the **Table no.6**. Anti-protozoal agents and antimicrobials primarily used to treat tuberculosis or malaria are excluded[24].

Among the antibacterial agents the most common category was fluoroquinolones, followed by combination of antibiotics, 1st generation cephalosporin, combination of penicillin, 3rd generation cephalosporin, macrolides in descending order. Distributions of common category of drugs with ATC Code are shown in the **Table No.7.**

Among the analgesic-anti-inflammatory drugs most common category was combination of ibuprofen & paracetamol. Out of the gastro-intestinal drugs proton-pump inhibitors were the most common. Among the drugs of the cardiovascular system the most common category was ACE- inhibitors with diuretics. During the analysis of Errors of the Mechanics of Prescription Order Writing, it is observed that in 91.33% of prescription weight is not written, while in-appropriate drugs prescribed in 52.99% of prescription. In-appropriate instruction to the pharmacist and also to the patients was written in 30.09% and in 56.10% of total prescription respectively. Follow-up advice not mentioned in maximum no. of prescription (97.87%). Details results of analysis of error of the Mechanics of Prescription Order Writing are shown in the Table No.8.

Table 8: showing analysis of Errors of the Mechanics of Prescription Order Writing

Parameters	Errors in particular item	Numbers of prescription	% out of total 4180 prescriptions
Superscription	Name not written	125	2.990%
	Sex not mentioned	85	2.033%
	Age not written	91	2.177%
	Weight not written	3818	91.339%
	Symbol-Rx not written	529	12.655%
Inscription	In appropriateness	2215	52.990%
	Using of confusion term	542	12.966%
	Abbreviation of medicine	3989	95.430%
Subscription	Error in the Instruction to the pharmacist	1258	30.095%
Signa	Error in the instruction to the patient	2345	56.100%
	Follow up advice not mentioned	4091	97.870%
	Use of Latin abbreviation	3998	95.645%
Signature	Doctors Signature absent	268	6.411%
	Date not mentioned	152	3.636%

Analysis of WHO core prescribing indicators[24]:

(1) Average number of drugs per encounter (C): First number of encounters were counted for which data were collected, even if no drugs were given (A=4180). Then total numbers of drugs prescribed were added during these encounters (B=18559). Result was expressed by dividing the total numbers of drugs by the number of encounters.

Formula: **Average number of drugs prescribed:** [C = B/A] = 18559/4180= **4.439= 4.4**

(2) Percentage of drugs prescribed by generic name (E): Result was calculated by dividing the total number of generic drugs prescribed (D=3897) by the total number of drugs prescribed (B), and multiplied by 100 to make a percentage (E).

Formula: **% Prescribed as generic:** [E = (D/B) × 100%] = 3897/18559×100= **20.997%**

(3) Percentage of encounters with an antibiotic prescribed (G): It was calculated by dividing the total number of patients who received one or more antibiotics (F=1208) by the total number of encounters (A) and multiplied by 100 to make a percentage.

Formula: **% Antibiotics prescribed:** [G = (F/A) × 100%] = 1208/4180×100 = **28.899%**

(4) Percentage of encounters with an injection prescribed (I): It was calculated by dividing the total number of patients who received one or more injections (H=1212) by the total number of encounters (A) and multiplied by 100 to make a percentage.

Formula: **% Injections prescribed:** [I = (H/A) × 100%] = 1212/4180 × 100 = **28.995%**

(5) Percentage of drugs prescribed from essential drugs list or formulary (K): Result was calculated by dividing the total number of Essential Drugs prescribed (J=11319) by the total number of drugs prescribed (B) and multiplied by 100 to make a percentage (K).

Formula: **% Drugs prescribed from Essential Drugs List:** [K = (J/B) × 100%]= 11319/18559×100= **60.989%**

Illegibility of Prescription(Y) was analyzed by counting the total number of illegible prescription (Z=961) having

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very poor hand writing, divided by the total number of prescription (A), and multiplied by 100 to make a percentage [Y =Z/A]= 961/4180×100=**22.990%** .

DISCUSSION

The evaluation of costs is known as financial audit while the assessment of quality of medical care is called medical audit[25].It is the critical assessment of medical and healthcare related system with a view to bring about necessary improvement in the same. Prescription audit is a part of Medical audit and is seen as one approach to improving the quality of patient care[26]. Prescription audit is the process of reviewing the delivery of medical care to identify deficiencies so that they may be remedied[27].Benefits to patient care and service delivery have been commonly identified in different audit studies in different parts of the world[28].Several studies have also reported that clinicians have felt they had benefited from audit through improvements in communication between professional groups and increased professional satisfaction and knowledge[29-32].Changes in prescribing behavior were attributed to the fact that doctors were able to control the audit process using their own values and attitudes and that being able to compare one's own practice with that of immediate colleagues and outside authorities provided a powerful impetus to changing behavior. In addition, audit was seen to promote communication between partners and as a stimulus to learn from colleagues' behavior[33].The outcome of the prescription auditing is to improve the patients' care and rationalization of medicine prescription. Irrational or non-rational use is the use of medicines in a way that is not compliant with rational use. Worldwide more than 50% of all medicines are prescribed, dispensed, or sold inappropriately, while 50% of patients fail to take them correctly[11]. Moreover, about one-third of the world's population lacks access to essential medicines[15]. Common types of irrational medicine use are:(1) the use of too many medicines per patient (poly-pharmacy); (2) inappropriate use of antimicrobials, often in inadequate dosage, for non-bacterial infections; (3)over-use of injections when oral formulations would be more appropriate; (4) failure to prescribe in accordance with clinical guidelines; inappropriate self-medication, often of prescription only medicines[13].

Lack of access to medicines and inappropriate doses result in serious morbidity and mortality, particularly for childhood infections and chronic diseases, such as hypertension, diabetes, epilepsy and mental disorders. Inappropriate use and over-use of medicines waste resources – often out-of-pocket payments by patients – and result in significant patient harm in terms of poor patient outcomes and adverse drug reactions. Furthermore, over-use of antimicrobials is leading to increased antimicrobial resistance and non-sterile injections to the transmission of hepatitis, HIV/AIDS and other blood-borne diseases. Irrational over-use of medicines can stimulate inappropriate patient demand, and lead to reduced access and attendance rates due to medicine stock-outs and loss of patient confidence in the health system[15].

To address irrational use of medicines, prescribing, dispensing and patient use should be regularly monitored in terms of: (i) the types of irrational use, so that strategies can be targeted towards changing specific problems; (ii) the amount of irrational use, so that the size of the problem is known and the impact of the strategies can be monitored; (iii) the reasons why medicines are used irrationally, so that appropriate, effective and feasible strategies can be chosen. Doctors often have very rational reasons for using medicines irrationally. Causes of irrational use include lack of knowledge, skills or independent information, unrestricted availability of medicines, overwork of health personnel, inappropriate promotion of medicines and profit motives from selling medicines. There are several well-established methods to measure the type and degree of irrational use. Analysis of Errors of the Mechanics of Prescription Order Writing and WHO core prescribing indicators are such tool assessing the irrational use of medicine[15]. & indicators explore the quality of patient care and of health-care facilities as they relate to medicines use. The data collected can then be used to design appropriate interventions and to measure the impact of those interventions on medicine use.

In this study out of the total 4180 prescriptions, 11% contain two diagnosis and 8% contain three diagnoses while 19.40%, 24.21% & 30.09% of the total prescriptions contain 2, 3 &4drugs respectively indicating a definitive practice of poly-pharmacy. This may increase chances of adverse drug reactions and interactions.

From our study, 91.339%% of the prescriptions did not show the weight of the patients. Consequently, determination of dose accuracy was not possible. Follow-up visit not mentioned in 97.87% of total prescriptions and 56.1% of the prescription contain error in the instruction to the patient. All these anomalies encountered in the collected data indicate that there is a huge scope for improvements in the prescriptions patterns in our institution. Prevalence of morbidity & prescription data may help the health administers to take interventions to check and scope of further study to see any impact. Because the essence of the audit process is that it should be a continual cycle of improvement. It encourages the health care provider to rectify.

In this study total number of drugs from 4180 prescription was 18559 and **average number** of prescribed drugs was 4.4. In different studies in different countries this average number ranges from 1.3 to 2.2. And according to Yemen study[34], ideally it should be 1.4. In previous study in India[35] it was 3. So in our institution there is a trend of poly-pharmacy indicating irrational prescription. The figure for percentage of drugs prescribed by **generic names** is discouraging Percentage of 20.99%, as in other Indian studies[35] it was 59%. Levels as high as 82% to 94% offers ideal rationalization of prescription & improve wastage of scarce health resources[34]. Because of rising cost of healthcare has favored the dispensing of so-called "generic" drugs. Also generic prescribing reduces the chances of dispensing errors which may be due to misinterpretation of like sounding brand names of drugs. Percentage of

encounters with an **antibiotic** prescribed was 28.89%. In different countries this is[36] between29% to 43% and according to Yemen study[34] suggested a theoretical need of 22.7% which is fur less than our study, indicating inappropriate antibiotic prescription. But earlier studies in India it was 43%. What is striking about injectables is the considerable variation between countries from 0.2% to 48%. In India[35] cumulative result was 17%. For Yemen[34] the ideal figure is 17.2%.But in this study percentage of encounters with an **injection** prescribed was 28.995%, indicating again inappropriate prescription of injection. Percentage of drugs prescribed from **essential drugs** list or formulary was 60.989%, where as in Nepal this figure is 86%[37].

This study reveals that the auditing of prescription in terms of rationality, it remains poor. WHO recently has taken twelve core interventions to promote more rational use of medicines[15].

- A mandated multi-disciplinary national body to coordinate medicine use policies
- Clinical guidelines i.e. Standard Treatment Guidelines
- Essential medicines list based on treatments of choice
- Drugs and therapeutics committees in hospitals
- Problem-based pharmacotherapy training in undergraduate curricula
- Continuing in-service medical education as a licensure requirement
- Supervision, audit and feedback
- Independent information on medicines
- Public education about medicines
- Avoidance of perverse financial incentives
- Appropriate and enforced regulation
- Sufficient government expenditure to ensure availability of medicines and staff.

The doctors should know that the drugs provided by the Hospital are of good quality. They could be obtained at a lower cost even from the hospital fair price shop because of procurement practices like (1) buying directly from the manufacturer, (2) centralized procurement practices (3) and buying at the generic name instead of brands name. This important because some doctors believe that these drugs are of poor & inferior quality. So they prescribe well-known brands. Doctors should be made aware of the advantages of prescribing drugs using generic names, such as (1) cost effectiveness (2) and minimizing medication error due to branded brand names. Lastly more stringent measures like those initiated by the Government of Orissa[38] such as, recovery of the cost of drugs if the prescription is found unjustified, could be considered by the State Government.

CONCLUSION

The information gathered from this study should be a pointer to the trends in prescribing patterns. The present study could serve as a frame work upon which further studies in prescription audit can be launched to investigate the scope for educational intervention and improvement in prescribing patterns. Prescription audit is an important tool to improve the quality patients' care. Data created on the morbidity pattern coupled with present practice of prescription will help in the generation of action plan also in order to improve the quality of care, and recommendations for changing the present prescribing practices. Comparing the current usage of drugs with the standard treatment guidelines will enhance the effectiveness of treatment and render it most cost effective.

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