

MASTER OF PUBLIC HEALTH
Johns Hopkins Bloomberg School of Public Health & IIHMR University

PRACTICUM REPORT

By
Dr Satbir Kaur
Cohort-7
2019-21

Under the Guidance of
Dr Nutan Prabha Jain
(Professor)
IIHMR University

Dr Krishna Rao
(Associate Professor)
Department of International Health
Johns Hopkins Bloomberg School of Public Health

TO WHOMSOEVER MAY CONCERN

This is to certify that ***Dr Satbir Kaur***, student of Master of Public Health program offered by Indian Institute Health Management Research University, Jaipur in cooperation with Johns Hopkins Bloomberg School of Public Health, Baltimore has undergone practicum training at Department of International Health, Johns Hopkins Bloomberg School of Public Health from ***9 December 2020 to 18 February 2021***. The Candidate has successfully carried out the study designated to her during practicum training and her approach to the study has been sincere, scientific, and analytical.

The Practicum Training is in fulfillment of the course requirements.

I wish her success in all his future endeavors.

Sd-

Dr Nutan Prabha Jain

Practicum Advisor

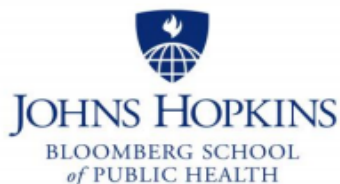
CERTIFICATE BY SCHOLAR

This is to certify that the practicum project named “*Assessment of quality of care by prescribing patterns of primary care provider in rural Bihar*” submitted by me, *Dr Satbir Kaur* with Enrollment No. IIHMR-U/07/2019-2021/0042 under the supervision of *Dr Nutan Prabha Jain and Dr Krishna Rao* for award of *Master of Public Health* carried out during the period *from 9 December 2020 till 18 February 2021* represents my original work and has not formed the basis for the award of any diploma, degree, fellowship, associateship, titles in this or any other institute or other similar institution of higher education.

Dr Satbir Kaur

MPH Cohort 7 (2019-21)

Certificate from the organization



Date -2 March 2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Dr Satbir Kaur, pursuing Master's of Public Health from Indian Institute of Health Management Research (2019-2021) in collaboration with Johns Hopkins Bloomberg school of Public Health USA, has undergone Practicum training under the supervision of Dr Krishna Rao in project "Assessment of primary health care in Bihar". The duration of the practicum training was from 9 December 2020 to 18 February which amounts to more than 160 hrs as per requirement.

Dr Satbir Kaur successfully carried out assigned work to her through online mode. Participated in biweekly and weekly meeting of the project team. Her contribution towards the project as clinician and as future public health professional was valuable.

We wish her prosperous academic and professional life ahead.

Dr Krishna Rao

Associate Professor

Department of International Health

Johns Hopkins Bloomberg School of Public Health

Abstract

Background: -

During the second year of MPH, the students are supposed to work for their practicum training under the guidance of faculty member(s). The document provides the details of work done by the student for her practicum. The project “**Assessment of primary healthcare in Bihar**” was conducted by distinguished researchers, professors, and scholars from department of International health, Johns Hopkins Bloomberg School of Public Health, USA together with Oxford Policy Management, New Delhi, India. The aim of the study was to strengthen the quality of care provided by the primary care providers both in public and private in rural Bihar. The study was conducted to understand why there is low utilization of primary care facilities for curative care services in Bihar because little is known about the quality of care provided by private and public (qualified and unqualified) providers in Bihar, or the types of primary care providers patients seek out first. The practicum included a part of the whole study and focused on the quality of care provided by the different providers private, public, informal, and formal. Following are the three objectives according for which practicum work was completed.

Objectives: -

The objectives of the study were:

- To evaluate the patient observation prescriptions by comparing with WHO core indicators to check for irrational prescribing patterns.
- To assess the clinical quality of care among the private and public primary care providers by comparing prescribing patterns among them.
- To estimate the extra cost incurred due to unnecessary drug prescribed by comparing it market price.

Methodology: -

Methods adopted for the practicum work involves- Rating of the different prescription according to the prescription rating protocol, then comparison of the study data with WHO core indicators. Data analysis was done using chi square statistic with p-value <0.001, which was used to assess the prescribing patterns of the different provider with the rating protocol. Extra cost of unnecessary drugs was estimated by comparing the price of these drugs with the market price. Around 377 prescriptions

were collected from private and public primary care providers. The collected data was analysed on SPSS version 21. Informed and written consent was taken, and confidentiality was assured.

Results: -

The results show an average of 2.31 drugs per prescription. Drugs prescribed by branded name was 53% and generic name was 47% which less than brand name. Drugs prescribed from the NLEM was 72% which was lower than the recommend value of 100%. Share of analgesics and antibiotic were highest among other drug types with 27% and 24% respectively. Percentage of prescriptions having homeopathic drugs were 12%. It was observed that there was a significant association between prescription ratings and type of training and providers the signifying that with no formal training and providers from private sector has affected the clinical quality of care by their prescribing practices. Average extra cost incurred by the unnecessary drugs was Rs 76/- and percentage of antibiotics was highest among these drugs.

Conclusion: -

The average number of drugs per prescriptions was slightly high indicating polypharmacy. Brand name prescribing dominates as doctors are reluctant to use generic names because being doubtful of the efficacy of these drugs. Significant association between provider with no formal medical education and prescription rating was seen which could have serious health implications as these providers prescribed multiple and unnecessary drugs. Inappropriate practice of medicine in form combination therapy was noted. Financial burden to the population is clearly advent because different provider prescribes unnecessary drugs which compiles the patient to pay extra for those drugs which are not required for their treatment. Average additional cost of Rs 76 per prescription was perceived as high for the poor and vulnerable population of rural Bihar.

Key words:-

WHO core indictors, Quality of care, Primary health care, Public Provider, Private providers, Analgesics, Antibiotics.

Acknowledgement

I would like to thank my practicum advisor Dr Nutan Prabha Jain, who supported and guided me throughout my research process. Her contribution to my work is invaluable and I am very grateful for it. Sincere gratefulness to Dr Marie Diener West and MPH office at JHSPH and Dr Seema Mehta and MPH office at IIHMR for immense encouragement and assistance during journey of MPH program

I would express my deep and sincere gratitude to my practicum preceptor Dr Krishna Rao, Associate professor, Department of International health, Johns Hopkins Bloomberg School of Public health, and also principal investigator of the project “Assessment of primary healthcare in Bihar”, for giving me the opportunity to work in this prestigious project. I am also very grateful to the other members of JHU team- Michael Peters, Caitlin Noonan, Hunied Kaustar without their help the research work would not be possible. Their valuable feedbacks and suggestions are worth praising.

Last but at the least I would like to extend my appreciation to my family, friends and also to those who could not be mention here but has well played their role to inspire me through my academic journey.

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List of Abbreviations

ATC.....	Anatomical therapeutic Chemical
AYUSH.....	Ayurvedic Yoga and Naturopathy Unani, Siddha and Homeopathy
BDS	Bachelor in Dental Sciences
CAPI	Computer Assisted Personal Interview
CARE	Cooperative for Assistance and Relief Everywhere
CHC	Community health Centre
Covid-19	Corona Virus Disease 2019
IRB	Institutional Review Board
JHU	Johns Hopkins University
MBBS	Bachelor of Medicine, Bachelor of Surgery
NLEM	National List of Essential Medicine
OBC	Other Backward Class
OPM.....	Oxford Policy Management
PHC.....	Primary Health Care
SC.....	Scheduled Caste
SDGs	Sustainable development Goals
ST	Scheduled Tribe
UHC	Universal Health Coverage
WHO	World health Organization

Chapter 1: Introduction

Background

During the second year of MPH, the students are supposed to work for their practicum training under the guidance of faculty member(s). The document provides the details of work done by the student for her practicum. The project “**Assessment of primary healthcare in Bihar**”. was conducted by distinguished researchers, professors, and scholars from Department of International health, Johns Hopkins Bloomberg school of public health, USA, CARE India, and Oxford Policy Management India, and was funded by the Bill and Melinda Gates Foundation under the Bihar Technical Support Program.

The aim of the study was to strengthen the quality of care provided by the primary care providers both in public and private in rural Bihar. The study was conducted to understand why there is low utilization of primary care facilities for curative care services in Bihar because little is known about the quality of care provided by private and public (qualified and unqualified) providers in Bihar, or the types of primary care providers patients seek out first. The study would add new knowledge about the relative importance of factors that influence patient primary care seeking behaviour. Understanding the significance of these factors, it will help to inform and direct health policy towards the most effective strategies and interventions to improve primary care coverage in Bihar.

1.1 Study area:

A total of 16 districts of rural Bihar, namely Bhojpur, Buxar, Kaimur, Nalanda, Patna, Rotas, East Champaran, West Champaran, Muzaffarpur, Sheohar, Sitamarhi, Madhubani, Siwan, Vaishali and Gopalganj were included in the study (Figure 1).



Figure 1: Study districts of Bihar

1.2 Study Population:

There was one main population group in the study: clinicians at private and public primary care facilities. Patients seeking consultations at private and public primary care facilities.

1.3 Sample size:

The study has covered the public and private health providers from both type of facilities. From each facility, at least five patient observations were made (Table 1).

Table 1: Sample size of the study

Group	Number	Remarks
Public primary care facilities (PHC and CHC)	57	
Private primary care facilities	57+	More than one private provider in a public facility catchment area
Health workers in public facilities	57	One per facility
Health workers in private facilities	57+	More than one private provider in a public facility catchment area
Patient observations at public facilities	171	Five per facility
Patient observations at private facilities	171+	Five per facility, private provider in a public facility catchment area
Households	8,709	Selected from catchment area of public facility

1.4 Methods and Tools of Data collection:

Patient observations prescriptions were recorded (up to five per sampled primary care provider) for provider-patient consultations using standardized checklists. These checklists contain items related to specific quality actions taken by the clinician including taking patient history, patient examinations, tests recommended, provisional diagnosis and medicines prescribed. In addition, the presenting symptoms of the patient and the time taken per consultation was recorded. Local enumerators were recruited and trained for the survey. They record data into electronic data (Tablets) using Computer

Assisted Personal Interviewing instruments. OPM field staff was primarily responsible for updating the data into Tablets using CAPI.

1.5 Data Management:

Data for this study was gathered in two phases. Five cross-sectional surveys to collect relevant information were conducted:

- Household survey
- Primary care provider survey
- Patient observation survey
- Private primary care facility survey
- Village infrastructure survey.

The first phase started in August 2019 which involved the household survey conducted by OPM and lasted for the period of four months. After the completion of data collection, the OPM team undertook data cleaning for a month and provide the data to the JHU team by December 2019.

In the second phase, which began in January 2020, public and private primary care facilities were selected and surveyed. This includes the provider survey, the observation of patient consultation, and the private facility survey. The second phase of survey was interrupted by the Covid-19 pandemic after March 2020 no survey was done. The survey was resumed in February 2021.

1.6 Measures of Quality:

A full-time supervisor for each field team was dedicated for, mentoring and assistance, who was in contact with the survey manager daily. A senior JHU staff was deployed for the initial weeks on the field to ensure, earlier identification of mistakes, timely correction and immediate feedback which improves the quality of data. Spot checks were be carried out by the field monitors at all stages of the fieldwork process. Throughout the period of data entry, enumerators and supervisors were available for any query on the individual questionnaires. The back-check results were used to give feedback to the investigators.

Primary consistency checks on the data were built directly into the CAPI instruments and serve to provide instant interview feedback to the enumerator and as an automated way for supervisors to

consistently cross-check interviews. They check for incorrect routing, missing and improbable or impossible answers, and combinations of answers that are contradictory or can be ruled out by logic, and flag potential outliers. Interviewers use primary checks during the interview to work out correct answers together with the respondent. Secondary consistency checks on the data were done on STATA do-files and are run daily by the central data management unit across all interviews collected to date.

1.7 Measures of ethics:

Informed and written consent was be taken from the following respondents: adult member of household, facility in-charges. Respondents were informed in the beginning of the interview that they have been selected to participate in the study by a method of random selection and they can refuse to answer any question and withdraw at any point of time if they are not comfortable. The identifiers of the respondents were kept confidential and not shared with anyone outside of the study team. The project was a collaboration between Johns Hopkins University, CARE India, and Oxford Policy Management India and was funded by the Bill and Melinda Gates Foundation under the Bihar Technical Support Program . The study was approved for human subjects research by the Johns Hopkins University Institutional Review Board, while it was approved by the Sigma Institutional Review Board – a local IRB in India.

Practicum on Assessment of quality of care by prescribing patterns of primary care provider in rural Bihar

For patient observation prescriptions the student worked as the first rater. The patient observation prescriptions were rated according to the prescribed protocol. There was second rater as well. Decision over contradictory ratings was taken jointly by both the raters. Total number of patient observation prescriptions was 377 and all of them were rated by student.

The specific objectives of the practicum are as follows: -

- To assess the patient observation prescriptions by comparing with WHO core indicators to check for irrational prescribing patterns.
- To assess the clinical quality of care among the private and public primary care providers by comparing prescribing patterns among them.
- To estimate the extra cost incurred due to unnecessary drug prescribed by comparing it with market price.

Besides, patient observation ratings, the student was responsible for rating (as third rater) Clinical Vignettes, for resolving the conflict between the two raters (if any) and provide final rating (inter-rater reliability). Total number of clinical vignettes was 673 out of which 165 were rated by student to resolve the conflict between the previous two raters.

The student could gain the following learnings and skills:

Analytics/Assessment Skills

- Analyzing clinical vignettes to assess medical officers ability to manage health conditions (i.e., Diarrhea and Pneumonia in children, Hypertension, and Angina in adults) as a provider of primary health care
- Assessing inter-rater reliability on each clinical vignette rating in case of conflict between the two raters.

- Analyzing patient observation prescriptions to assess quality of care provided (i.e., 50 % prescriptions have only symptoms on it and 50% have diagnosis) by private and public primary care providers
- Evaluating prescribing patterns of providers and its effects on physical health of the patients and financial burden on them.
- Classifying clinical vignettes into (appropriate, inappropriate, and harmful) and patient observation prescriptions into (appropriate, inappropriate not harmful and inappropriate and harmful) according to the prescribed “Prescription Rating Protocol”.
- Assessing the data on the drugs from patient observation prescriptions with misspells and error according to WHO ATC drug classification.

Public health science skills

- Applying public health knowledge for critical analysis of the prescriptions or clinical vignettes where the two raters are in conflict and resolve ethical dilemma.
- Collecting relevant information to support the program and analyzing various aspects of the study to produce recommendations and improvements.

Chapter 2: Review of Literature

For reviewing the literature, search strategy used the following key words.

Key words used-

- Prescribing patterns, Private and Public provider, Informal and Formal provider, Quality of care, Primary health Care, Appropriate, Inappropriate, Unnecessary drugs, Core Indicators, Analgesics, Antibiotics, Allopathic, Homeopathic.

Modifying Keywords included-

- *Phrase Searching* -it involves placing with and without quotations marks (“ ”) around two or more word.
 - E.g.- “Quality of care” and Quality of care
- *Truncation*- It involved replacing of word ending with a symbol like asterisk (*), a question mark (?)
 - E.g.- If the truncation symbol is *, then the truncated word, indicator, the search result contained indicators

Combining keywords-

- Keywords are combined using: AND, OR and NOT.

Information sources-

- Specific fields- Author, Title, Subject, Abstract, Abstract and Keywords, Publication Name.
- Search engines- PubMed, and Google scholar.

Inclusion criteria-

- Literature searched was in English.
- Time reference of publication was taken from 2010 to 2021.
- Ten documents were reviewed from PubMed .
- Twelve documents were reviewed from Google scholar.
- One state government factsheet was reviewed.

Exclusion criteria-

- Articles- Newspapers, conference papers and grey literature

One of the remarkable aspects of India's health sector is the array of quality services which are available. The problem of low quality in health care not only prevails India but research from developed and developing countries also have proven extensive issues with providers who doesn't work enough towards the efforts to ensure that patients receive quality care, with high levels of medical errors.(1–5) Quality of care problems nowadays are made in the context of personal health services for the people, but several challenges relating to the population still persist. The health systems must be aware of modifications in the organization, and delivery of care which affects groups of population, particularly vulnerable people who are at risk of poor care. These considerations call for employing quality methods to all kinds of providers in private as well as public sectors and to the extent achievable under all financing procedures. Clinical quality of care depends on the interaction between health-care providers and patients and the ways in which inputs from the health system are transformed into health outcomes. The care provided should be effective, evidence-based and neither underused nor overused.(3)

According to Donabedian's model – measure of quality care which has three categories structure, process, outcome, this study concentrates on measuring the process. Process will denote what is actually done in offering and delivery of care, which includes providers actions in making a diagnosis and treatment.(6) Considering WHO core drug indicators for the study, because main purpose of these indicators to assess potential issues in drug use and to concentrate on following efforts to correct the issues. The selected indicators fall broadly into two categories – *Describing the current treatment practices and Comparing the performance of different prescribers*. Out of different core indicators selection of prescribing indicators was done on the basis of measurement of performance of providers which is important aspect associated with the correct use of drugs. Based on the practices observed in a sample of clinical encounter at an outpatient facility for the treatment of acute or chronic illness.

Primary healthcare has been identified as a main element of efficient and effective health system since twentieth century. High performing PHC systems are vital for achievement of SDGs and UHC.(7) However, gaps in knowledge and practices regarding working of PHC systems in LMICs still prevails. Enduring the organizational capacities requires to deliver high-quality services in ways that promote sustainable and equitable improvements in health outcomes of the population. Multiple studies have also pointed to substantial gaps in PHC performance including major constraints in access to quality care.(8,9)

In Bihar only 58% of children with diarrhoea received oral rehydration and 25% received zinc treatment.(10) The public sector, works through a huge network of PHC centres and community health workers, offers low-cost curative and preventive health services. Private providers, both formal and informal, also provide basic curative health services to communities. The majority 76% of curative care visits are done to the private providers; only a small proportion 22% attend to the public sector.(11)

The current study focuses on the practices of primary care provider- public and private, facility type, formal and informal, training type, by considering the prescribing patterns and assessing the impact on physical health and financial burden for which patient observation was considered. The data set consist of different variables like age, sex, prescriptions with or without diagnosis, drugs name by generic or branded, dosage, mode of administration, frequency, and duration.

The Table 2 provides the studies which were reviewed by the student in the context of type of providers, and practices which they follow, and the implications they have on physical health of the population.

Author/Year	Title	Method/Sample	Study findings	Recommendations
Yip <i>et al.</i> (2021)	Odisha Health System Assessment Study Report-2019-Clinical effectiveness of provider-Clinical vignettes- (Prescription Patterns among Providers)	Cross-Sectional/110 prescriptions.	The average no of drugs was 2.9. 50.8% was prescribed an antihypertensive, and 30% cases was given combinations of antibiotics, antacids, non-steroidal anti-inflammatory drugs. 55.4 % providers prescribed at least one drug that is recommended for angina, 43.2% prescribed these in combination with like antacids and analgesics. Mean no of drugs prescribes by public providers 11.9% and private provider 9.4%.	The low competence of primary care providers in general was observed. Public sector providers need policy efforts towards improving access to primary care which has to be re-analyzed. Improvement in access with quality is required
Hussain <i>et al.</i> (2021)	Assessment of Drug Prescribing Pattern Using World Health Organization Indicators in a Tertiary Care Teaching Hospital.	Cross-Sectional/1000 Prescriptions	The average no of drugs per prescription was 2.91. The percentage of generic name, NLEM and FDCs was 10%, 22.5%, and 49.2%, respectively. The total percentage of encounters with antibiotics, Injection, was 19.7%, 2.2%, respectively	There is requirement for quality improvement in the standards of prescribing patterns in following aspects-polypharmacy, over prescription of FDCs.
Teja <i>et al.</i> (2019)	Audit of prescriptions from the department of general medicine based on the WHO core prescribing indicators at Sapthagiri hospital, Bangalore.	Cross-Sectional/256 prescriptions	The average no of drugs per prescription was 2.23 . 23% of the prescriptions had at least one drug prescribed by generic name, 25% of prescriptions contained an antibiotic and 31% of prescriptions had an Injection. The percentage of drugs prescribed from NLEM was only 57%	Routine prescription audit with reporting might increase awareness among doctors to follow the suggested guidelines and minimize prescription errors.
Mishra Shradha <i>et al.</i> (2020)	Quality of Prescription Writing Practices in a Tertiary Care Teaching Hospital of Bihar: A Cross-Sectional Study	Cross-Sectional/ 1132 prescriptions	The average no of drugs prescribed per prescription was 3. Drugs prescribed by generic name was only 10% of prescriptions. Route, frequency, and duration of administration of drug were mentioned in 79.3%, 86.7%, and 69.6% of prescriptions, respectively.	The doctors need more training to improve the quality of prescription writing with regular monitoring by the hospital authority.

Table 2: Selected recent studies details based on review of literature

Chapter 3: Methodology

This section discuss methodology for patient observation prescriptions component of the study only. The data was analysed by the student based on the three objectives of the practicum.

The direct observation method was used to collect the data because the analysis is usually done in its natural setting, thus offering a deeper knowledge of the matter. The limitation of this method could be observer error or bias that can alter the reliability. However, the study has used inter rater reliability technique using two raters who rated each observation and gave final judgment on reliability of the study data using the prescription rating protocol (Annex I).

As the assessment is directed towards the prescribing patterns of the providers a comparative analysis on the of the existing data was done with the prescribing indicators. For analysing the prescribing patterns WHO core indicators (Table 3) were used for allopathic prescriptions.

Table 3:WHO core Indictors for prescribing pattens

1) Average no of drugs per encounter (for this research encounter was consider as on prescription)	Estimated by dividing the total number of drugs by total no of prescriptions.
2) Percentage of drugs prescribed by generic name	Estimated by dividing the no of drugs prescribed by generic name by total no of drugs prescribed. multiplied by 100.
3) Percentage of encounters with an antibiotic prescribed	Estimated by dividing the no of prescriptions during which an antibiotic or an Injection was prescribed, by total no of prescriptions, multiplied by 100.
4) Percentage of encounters with an Injection prescribed	Estimated by dividing the no of prescriptions during which an antibiotic or an Injection was prescribed, by total no of prescriptions, multiplied by 100.
5) Percentage of drugs prescribed from essential drug list	Estimated by dividing the no of drugs prescribed from essential drug list (National List of Essential Medicine by GOI was considered for the reference calculation of this indicator) by total no of drugs prescribed, multiplied by 100.

These indictors revels whether there is rational or irrational prescribing of drugs. Irrational prescribing means the pattens that fails to correspond to the decent standards of treatment, which manifest as over-prescribing, multiple prescribing (polypharmacy), or incorrect prescribing.

Sample size

A total of 377 prescriptions were considered from the patient observation survey (direct method) which contain allopathic as well as homeopathic drugs. First, they were categorized into the prescription rating protocol by the two raters separately and conflicts raising were resolved by discussion between two raters.

Data Analysis

For the assessing quality of care for different provider in context of the prescribing patterns was done by using Chi Square statistic using p-value as <0.001 and finding the association between type and training of provider to the prescription rating. Calculating chi square by below formula: -

$$\chi^2 = \frac{\sum(O - E)^2}{E}$$

Where,

χ^2 = chi square statistic

O = Observed value

E = Expected value

After finding the value of χ^2 it was checked by predetermined alpha value of significance (0.001), and assuming degrees of freedom to be 1 in chi square distribution table.

The prescriptions were then analysed for unnecessary drug use to calculate undesirable or extra cost incurred to the patients due to these drugs. and also calculating average number of these drugs per prescriptions with classifying different types of drugs

Chapter 4: Results

Total of 377 prescriptions were obtained from the project team. First the profile of the providers is discussed to understand the background of the prescriptions. Later patients' profile is discussed.

Providers' Profile

Of 377 providers, 66% belong to the private sector. Of these 247 private providers, about 64% were from the private clinic where both formal and informal providers are available. The government providers constitute almost one-third of the total providers, and of these a majority were from the primary health center level. At PHC level, AYUSH providers are also available. (Table 4).

Table 4: Distribution of Patient Observation Prescription by type of health facilities(n=377)

Type of Facility	Frequency	Percent
Private Providers (both formal and informal)	n=247	66
Private clinic	240	64
Private hospital	7	2
Government Providers	n=130	34
PHC	110	29
CHC	20	5

According to the provider types, proportion of prescriptions provided by the informal providers (no formal medical education) was more than the formal providers. By the training type (education), proportion of informal provider was higher followed by MBBS and AYUSH. Residence for most of the provider was the village where the health facility was located 58% followed by another village 22% and there was provider who use to come from nearby town 17% and there was only 3% of providers coming from cities. A majority of the providers were men. The caste of the providers signifies the background from which they are coming with OBC accounting for the largest share 47%, followed by general, SC, ST, and others, 33%, 10%, 9% and 1%. (Table 5)

Table 5: Distribution of health providers by their age, caste, and training (n=377)

Providers details	Frequency	Percent
Age of Providers (Years)		
<20	5	1
20-40	151	40
41-60	165	44
61-80	56	15
Average age with range (min-max)	45.6 (19-80) year	
Sex of the Providers		
Male	341	90.
Female	36	10
Caste		
SC	37	10
ST	32	9
OBC	177	47
General	126	33
Others	5	1
Providers' Training		
MBBS	86	23
AYUSH	78	21
Informal Provider	180	48
Other Allopathic Medicine	33	9

Patients' profile

About one-fourth of the patients were up to 10 years of age. Adolescents were about 20% followed by youths in the age group of 21-30 years. About 12% were the elderly persons (Table 6). Both male and female patients were covered.

Table 6: Distribution of patient by their age and sex (n=377)

Patients details	Frequency	Percent
Age (Years)		
< 1	23	6
1-10	74	20
11-20	58	15
21-30	53	14
31-40	52	14
41-50	36	10
51-60	35	9
61-70	37	10

> 70	9	2
Average age with range (min-max)	29.7(0-85) years	
Sex		
Male	186	49
Female	191	51

About the Prescriptions

Of 377 prescriptions, 22 (6%) were not found complete and therefore, 355 prescriptions were categorised. The prescriptions contain information on patient's gender, age, symptoms which are classified as main and secondary symptoms. It was further grouped as prescriptions has having diagnosis (42%) and not having diagnosis (56%). According to the prescription rating protocol: prescriptions were divided into four categories (i) appropriate, (ii) inappropriate not harmful, (iii) inappropriate, and harmful, and (iv) homeopathic. A total of 38% prescriptions were found to be appropriate. Almost one-third prescriptions were found inappropriate and harmful (Fig 2).

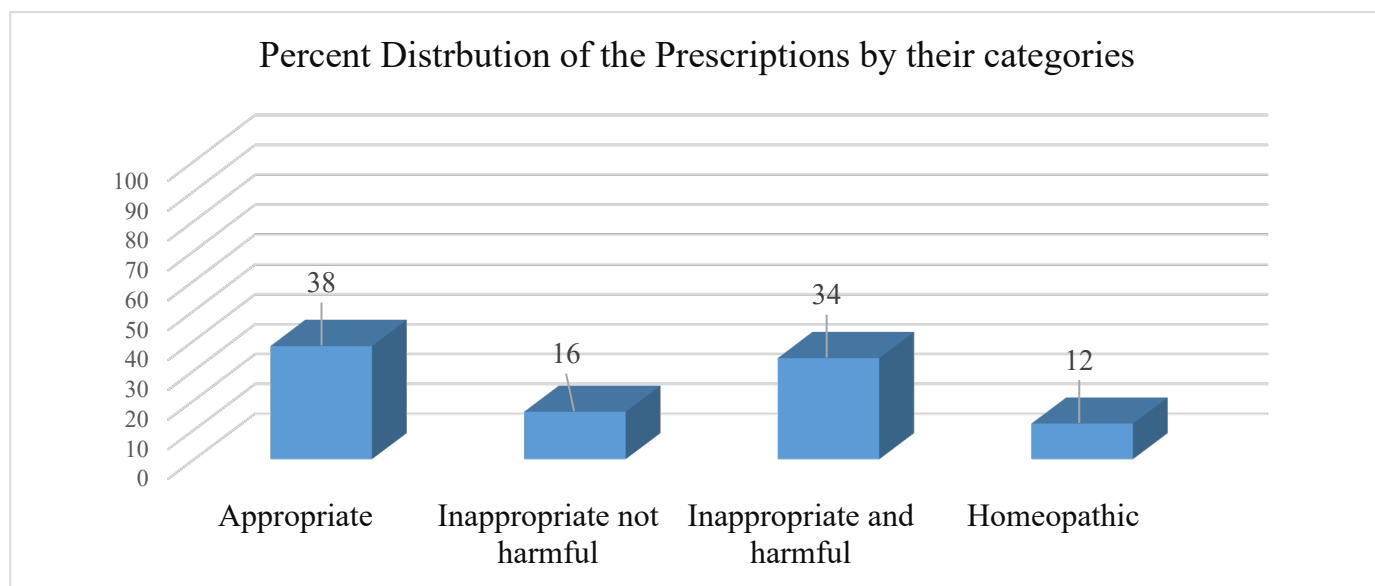


Figure 2: Precent Distribution of prescriptions by categories

Fever was the most common ailment diagnosed by the provider followed by cough/cold, diarrhoea and gastritis. The symptoms were divided into main and secondary. The main symptoms in the

prescriptions included pain (28%), fever (25%), other (11%), cough (9%), injury (9%), high blood pressure (7%), chest ENT (5%), skin related (4%), pregnancy (2%), and chest pain (1%). About one-fourth cases 26% analgesic drug was used followed by antibiotics (24 %) antinuclear/antacid (9%) and homeopathic (8%).

Irrational prescribing patterns

The results show (Table 7) that an average of 2.3 drugs per prescription were prescribed. Drugs prescribed by generic name were lesser 47% than branded name drugs 53%. Percentage of drugs prescribed from the NLEM was 72% which is low from the recommend value of 100%. Share of prescriptions having homeopathic drugs among 355 prescriptions was around 12%. Percentage of combination drugs containing both allopathic and homeopathic drugs was around 9%.

Table 7:WHO core indicators compared with studied value

Indicators	Standard values	Study values
1. Average number of drugs per encounter	1.6-1.8	2.3
2. Percentage of encounters with an antibiotic prescribed	20.0-26.8	53
3. Percentage of encounters with an Injection prescribed	13.4-24.1	16
4. Percentage of drugs prescribed by generic name.	100.0	47
5. Percentage of drugs prescribed from the essential drug list/formulary	100.0	72

Clinical quality of care

The association between the types of prescriptions and type of training (education) is presented in Table 8. It was observed from the results that among those who had completed MBBS training, 42% of them provided appropriate prescriptions. However, a substantiate proportion of them 35% found to provide inappropriate and harmful prescriptions. Among those who were trained in AYUSH, 40% of them gave appropriate prescriptions. However, among those who had informal training, 42% were found to give inappropriate and harmful prescriptions. Among those with other allopathic training, 44% of them prescribed appropriate medicines while a sizable proportion of them had also prescribed inappropriate and harmful medicines. It was also noted that proportion of homeopathic drug provided by the informal

provider was 12% Thus, it can be inferred that training plays an important role in helping the practitioners provide appropriate medicines. Further, the chi-squared statistic for the analysis was found to be 48.842 with $p < 0.001$ which indicates that the two groups, prescription rating and type of training, are associated with each other.

Table 8: Association between Prescription rating and Provider training type(education)(n=355)

Provider training type	Prescription rating				Total
	Appropriate	Inappropriate and not harmful	Inappropriate and harmful	Homeopathic	
MBBS	33 (42%)	18 (23%)	28 (35%)	0	79
AYUSH	30 (40%)	14 (18%)	10 (13%)	22 (29%)	76
Informal Provider	58 (35%)	19 (11%)	71 (42%)	20 (12%)	168
Other Allopathic Medicine	14 (44%)	6 (19%)	11 (34%)	1 (3%)	32
Total	135 (38%)	57 (16%)	120 (34%)	43 (12%)	355
Chi-Square value - 48.842, P-value = 0.000					

The association between type of care provider and the prescription rating can be studied from Table 9. It can be observed from the results that 42% of the formal healthcare and 37% of the informal providers prescribed appropriate medicines, respectively. However, around 35% of the formal providers and 33% of the informal providers provided inappropriate prescriptions. Thus, it can be inferred that prescription of inappropriate medicines was also quite common among the formal providers. Further the chi-square static for the analysis revealed that the two groups, type of providers and prescription rating, are associated with each other (chi-square=15.628; $p < 0.001$)

Table 9: Association between Prescription rating and Provider type(n=355)

Provider training type	Prescription rating				Total
	Appropriate	Inappropriate and not harmful	Inappropriate and harmful	Homeopathic	
Formal Provider	33 (42%)	18 (23%)	28 (35%)	0	79
Informal Provider	102 (37%)	39 (14%)	92 (33%)	43 (16%)	276
Total	135 (38%)	57 (16%)	120 (34%)	43 (12%)	355
Chi-Square value - 15.628, P-value = 0.001					

The association between public and private provider type and prescription rating is presented in Table 10. It can be observed from the results that 51% of public and 31% private providers gave appropriate prescriptions were as 25 % of public and 38% of private providers gave inappropriate and harmful prescriptions. The Chi-square statistic was found to be 37.844 with $p < 0.001$ which implies that the two groups, type of provider and prescription rating, are associated with each other.

Table 10: Association between Prescription rating and Provider type(sector)(n=355)

Provider training type	Prescription rating				Total
	Appropriate	Inappropriate and not harmful	Inappropriate and harmful	Homeopathic	
Private Provider	72 (31%)	29 (13%)	89 (38%)	42 (18%)	232
Public Provider	63 (51%)	28 (23%)	31 (25%)	1 (1%)	276
Total	135 (38%)	57 (16%)	120 (34%)	43 (12%)	355
Chi-Square value - 37.844, P-value = 0.000					

Estimating the extra/ additional cost incurred

For this analysis two types of prescriptions were considered – inappropriate and not harmful and inappropriate and harmful, total number of these prescription were 176 out of which 136 contain unnecessary drugs. Total number of drugs in these prescriptions were found to be 473 of which 175 drugs (37%) were unnecessary. From each of the prescriptions maximum number of drug selected was up to four, some had three and most of them having one or two drugs.

Table 11:Percent Distribution of Prescriptions by number of unnecessary drugs(n=136)

Unnecessary drug per prescription	Frequency	Percent
1 drug	102	74
2 drug	32	24
3 drug	1	1
4 drug	1	1
Average number of drugs per prescription	2.5 number of drugs	

Different types of unnecessary drugs like antibiotics, steroid, vitamins, anthelmintic, analgesic, antihistamine, antiemetic, antiulcer/antacids, digestive enzyme, and hormones were found in the prescriptions. (Figure 3). The results show (65%) of antibiotics were found to be unnecessarily prescribed followed by steroid (12%), and vitamins and anthelmintic (7%). This The results show high use of antibiotics in most of primary health care facilities under the study.

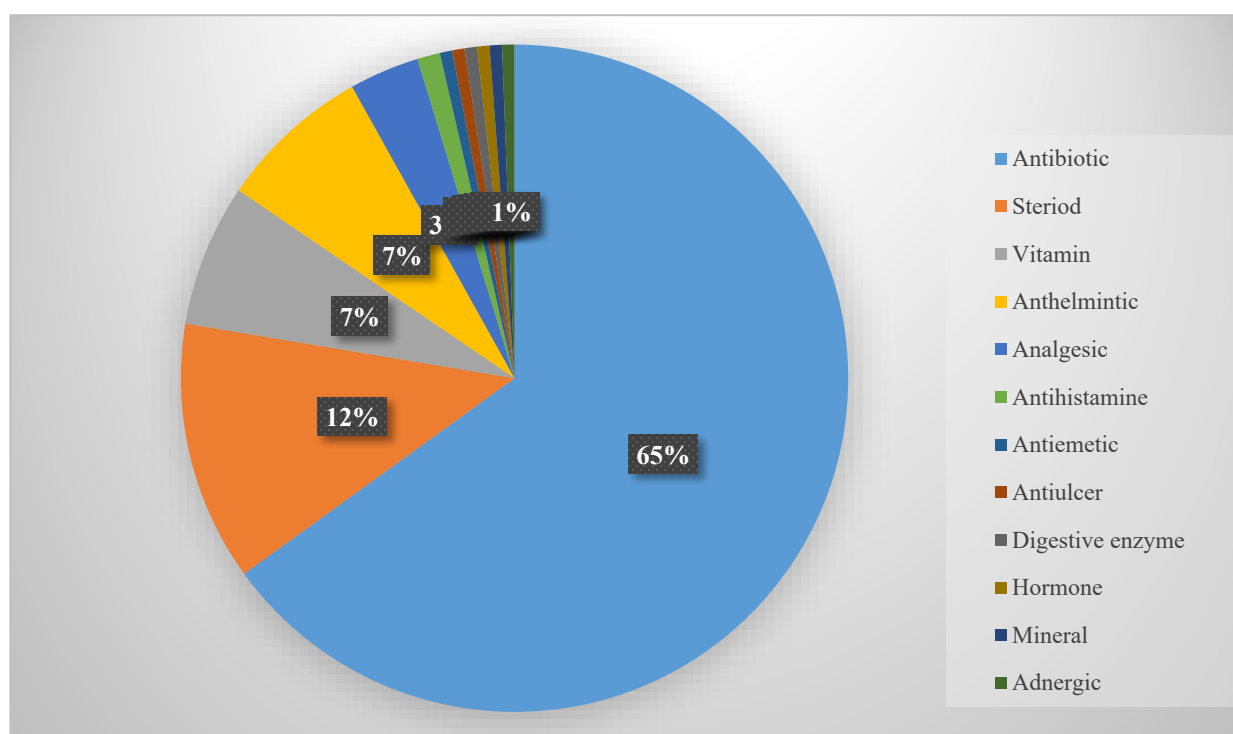


Figure 3:Percent distribution for types of unnecessary drugs

The total cost of these drugs amounts to be Rs 13,338 (Annex II). Therefore, average extra cost incurred by the unnecessary drugs was Rs 76/-

Chapter 5: Discussion

Given that inaccurate prescriptions can lead to ineffectual and dangerous treatment, which may instigate exacerbation of the existing conditions or harm patients moreover, increase additional burden in terms of money to the patients. In the current study there are greater number of females with considerable proportion of children who attended the primary healthcare facility with minor ailments like fever, cough, cold and diarrhea. Out of the 377 prescriptions the proportion of homeopathic prescriptions was around 12% out of which large number of prescriptions were containing combination drugs (allopathic and homeopathic drugs) which signifies serious drug interactions with each other and are harmful to the patients. As it observed from the study data that these combinations were mostly with antibiotic or analgesics which can affect organs like kidney and liver to a greater extent. It was evaluated from the study data that use of anthelmintic drug was quite often in Bihar because of prevalence of worms and other helminthic infections is high due to which at least one anthelmintic drug is provided for any kind of stomach ailment like gastritis or diarrhea in every prescription.

Private sector in Bihar plays an important role in offering healthcare in rural areas. It also represents several bottlenecks related to public sector, which includes lack of human resources, logistics, unstable delivery system and many more. Through there is large out of pocket expenditure is related to this sector still major portion of the population prefer private sector. The contribution of private sector healthcare in medical training and in the provision of medical services in rural areas cannot be undermined. Among the study participants, a majority of them were informal healthcare providers 77%, while 23% of them were formal healthcare providers. The government of India established the Ministry of AYUSH to develop education, research, and propagation of indigenous alternative medicine systems in India. Among participants, one-fifth of them were trained in AYUSH and 23% were trained in MBBS. There was also observed that small proportion of providers 9% were classified as other allopathic medicine includes BDS. Since the aim of the study is to assess the quality of healthcare provided by practitioners in rural areas, the inclusion of a majority of informal providers in the study sample ensures that the data collected offer rich insights into the need for improving the prescription practices of healthcare providers and also signifies lack of specialist doctors in rural areas.

The condition of the studied data, according to the WHO prescribing indicator were not up to the mark and reveals polypharmacy more than 2 drugs per prescriptions, a smaller number of prescriptions generic

name, lack of knowledge about NLEM, over prescription of combination drugs as well as antibiotics which can have several side effects with harmful drug interaction with other drugs. It also reveals multiple drug therapy for geriatric population with co-morbidities were also provided. The finding was very much similar as the study by (Hussain,*et al.*) conducted in Lucknow, Uttar Pradesh, and study by (Yip, *et al.*) conducted in Odisha which reveals that though the location of two studies are different still irrational prescribing patterns are prevalent in many parts of countries.

There are several studies revealing association between the prescribing practices with education and type of provider. There is a significant association between the healthcare providers with informal training provide inappropriate prescriptions. On the other hand, practitioners with AYUSH training prescribed appropriate and homeopathic medicines. MBBS providers provided substantial proportion of appropriate prescriptions which reveals, that their proportion is less and there is need of more trained professional in area to provide adequate and effective treatment. A significant proportion of the population belonging to different groups were also found to provide inappropriate and not harmful medicines which can be considered largely a response to the lack of trained public and private sector healthcare practitioners.

Lastly, large amount financial burden is faced by the population due to the unnecessary drugs provided mainly by providers from the private sector and not fully trained to give appropriate medical treatment to the poor, and undeveloped population of rural area. The ratio of private spending on health care relative to public is high in India and considering that one-third of the population is below the poverty line, the burden of out-of-pocket payments is catastrophic on those already below the poverty line. As an Empowered Action Group state, Bihar qualifies for extra central grants to support its weak health outcomes and service delivery.

Chapter 7: Conclusion and Recommendations

According to the of Donabedian's model of quality-of-care, the study reveals defects in the process (prescribing patterns) with addition of financial burden on the populations. Quality care can only be provided to the patients when all the three dimensions of structure, process and outcome align with each other.

Overall, it can be concluded that the providers average age is approx. 45 years signifying experience and good relationship with the community, mainly dominated by male population which represents unequal gender distribution while allocating service station, and female also are not opting to work in rural areas due to various social liabilities. The providers generally reside in the same locality where the health facility is situated as it more convenient and easier to reach the facility. Majority of the providers comes from the background of OBC and general caste which implies that there is need for recruitment of more providers from SC and ST communities.

The average number of drugs per prescriptions was slightly high indicating polypharmacy. Brand name prescribing dominates as doctors are reluctant to use generic names, being doubtful of the efficacy. Significant association between provider with no formal medical education and prescription rating was seen which could have serious health implications as these providers prescribed multiple and unnecessary drugs. Inappropriate practice of medicine in form combination therapy was also noted. Financial burden to the population is clearly evident because different provider prescribes unnecessary drugs which compels the patient to pay extra for those drugs which are not required for their treatment. Average extra cost incurred by the unnecessary drugs was Rs 76/- was perceived as high for the poor and vulnerable population of rural Bihar.

Improving the quality of care at the provider level involves emphasis on prescribing matters, which includes enhancing public-sector involvement, developing institutional function, and advocating

treatment with the formal providers. Preferably, state government and local health facilities should do a control check for the informal providers who are main source of inappropriate treatment with recruitment of more medical graduates in rural area by application of more stringent laws. Conducting patient satisfaction while existing the facility and household surveys for checking the quality enhancement efforts and for increasing accountability in health care delivery. It can be used as evidence in making policy decisions especially in context with informal providers. It is vital for governments, implementing agencies and researchers to collaborate more on the evidence-based approach to improve the quality of care for better health outcomes.

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I. Annexure

Prescription Rating Protocol	
Clinical vignettes	Patient observations
Appropriate: Correct type of medication was prescribed as indicated, with appropriate dosage, frequency, and duration.	Prescriptions with diagnosis
	Appropriate: Correct type of medication was prescribed as indicated, with appropriate dosage, frequency, and duration with prescriptions.
Inappropriate: Prescription was missing one or more key medications as indicated by the primary diagnosis.	Inappropriate not harmful: Prescription was missing one or more key medications as indicated by the primary diagnosis but does not cause direct harm to patients, breastfed infants, or fetus based on the type of medication and/ or dosage.
Harmful: If one or more medication in the prescription may directly cause harm in patients, breastfed infants, or fetus based on the type of medication and/ or dosage.	Inappropriate and Harmful: If one or more medication in the prescription may directly cause harm in patients, breastfed infants, or fetus based on the type of medication and/ or dosage with missing one or more key medications as indicated by the primary diagnosis.
	Prescriptions without diagnosis
	Appropriate: Correct type of medication was prescribed as indicated, with appropriate dosage, frequency, and duration with prescriptions having main or secondary symptom.
	Inappropriate not harmful: Prescription was missing one or more key medications as indicated by the main or secondary symptoms but does not cause direct harm in patients, breastfed infants, or fetus based on the type of medication and/ or dosage.
	Inappropriate and Harmful: If one or more medication in the prescription may directly cause harm in patients, breastfed infants, or fetus based on the type of medication and/ or dosage with missing one or more key medications as indicated by the main or secondary symptoms.

II. Annexure

S.No	Unnecessary Drug	Price (INR)
1	Tablet Norflex 400mg	88
2	Tablet Vitamin A TO Z	141
3	Tablet Azithromycin 500mg	119
4	Tablet Ceftriaxone 200	154
5	Capsule Amoxicillin 500mg	105
6	Tablet Brekke 500mg	117
7	Injection Magnas 1.5mg	206
8	Tablet Betamethasone 0.5mg	18
9	Injection Ceftriaxone 1gm	60
10	Injection Dexona 1ml	28
11	Capsule Amoxicillin 500mg	105
12	Capsule Amoxicillin+Clavcinic Acid 625mg	201
13	Tablet Brufen 400mg	35
14	Capsule Amoxicillin 500mg	105
15	Tablet Betamethasone 0.5mg	18
16	Tablet Levofloxacin 650 mg	93
17	Tablet Albendazole 200mg	11
18	Tablet DEC 100mg	40
19	Tablet Walacort 0.5mg	18
20	Tablet Dexona 4mg	41
21	Tablet Azithromycin 500mg	119
22	Capsule Amoxicillin 500mg	105
23	Tablet Ciprofloxacin 500mg	40
24	Injection Monocef 1 gm	78
25	Injection Dexona 1ml	28
26	Tablet Montair FX 120mg	171
27	Syrup Mealvit 30 ml	168
28	Tablet Albendazole 200mg	11
29	Tablet Betamethasone 0.5mg	18
30	Tablet Cefpodime 200 mg	215
31	Tablet Norflex 400mg	88
32	Tablet Coside 12A	24
33	Syrup Zyme 300ml	104
34	Tablet Levofloxacin 650 mg	93
35	Tablet Monocef 200mg	154

36	Tablet Albendazole 200mg	11
37	Syrup Amoxicillin 125mg	24
38	Tablet Estrogen 0.65mg	205
39	Tablet Norflex 400mg	88
40	Capsule Amoxicillin 500mg	105
41	Tablet Ofloxacin 200mg	67
42	Tablet Azithromycin 500mg	119
43	Tablet Nexioia 90mg	85
44	Injection victcofol 1mg	59
45	Tablet Levofloxacin 650 mg	93
46	Capsule Amoxicillin+Clavcinic Acid 625mg	201
47	Syrup Swich 50mg	177
48	Capsule Amoxicillin+Clavcinic Acid 625mg	201
49	Syrup Ceftriaxone 50mg	83
50	Capsule Amoxicillin+Clavcinic Acid 625mg	201
51	Tablet levofloxacin 500mg	90
52	Tablet cefixime 200 mg	107
53	Syrup Amoxicillin 125mg	24
54	Cap Becosule	36
55	Injection Amikacin 500mg	84
56	Injection Dexona 1ml	28
57	Capsule Amoxicillin 500mg	105
58	Tablet Pantop 40mg	130
59	Tablet Albendazole 200mg	11
60	Tablet levofloxacin 500mg	90
61	Capsule Amoxicillin+Clavcinic Acid 625mg	201
62	Capsule Amoxicillin 500mg	105
63	Syrup Omnacortil 5mg	56
64	Tablet Monocef-SB 500 mg	157
65	Tablet Oncef-O 200mg	135
66	Capsule Amoxicillin 250mg	38
67	Tablet Vitamin A TO Z	141
68	Injection Odicef 500mg	45
69	Syrup Zymofar 200ml	90
70	Tablet Norflex 400mg	88
71	Syrup Cefixime 125mg	22
72	Tablet Metronidazole 400mg	21
73	Syrup Metrogyl 200mg	30
74	Injection Amikacin 500mg	19
75	Tablet Bandy plus 6mg	25
76	Tablet Dilona plus 500mg	25

77	Tablet DEC 100mg	40
78	Syrup Cefixime 125mg	22
79	Tablet B Complex	105
80	Tablet Calcium 500 mg	99
81	Tablet Cefixime 200 mg	107
82	Tablet Cefixime 200 mg	107
83	Tablet Domperidone 10mg	25
84	Injection Ceftriaxone 1gm	60
85	Injection Amikacin 500mg	84
86	Tablet Norflex 400mg	88
87	Tablet Ciprofloxacin 500mg	40
88	Tablet Dexamethasone 4mg	82
89	Syrup Olife- M 5ml	55
90	Injection Ampicillin 500mg	14
91	Tablet Dexona 5mg	10
92	Tablet Ofloxacin 200mg	67
93	Tablet Dilona plus 500mg	25
94	Injection Ceftriaxone 1gm	60
95	Injection Dexona 1ml	28
96	Tablet Betnesol 1mg	16
97	Tablet Alde 5mg	50
98	Tablet Diclofenac 50 mg	16
99	Syrup Albendazole 5ml	23
100	Capsule Amoxicillin 500mg	105
101	Tablet Ciprofloxacin 500mg	40
102	Tablet Megacef 325mg	109
103	Tablet Azithromycin 500mg	119
104	Tablet Monocef 200mg	154
105	Injection Metrogyl 200mg	19
106	Injection Ceftriaxone 1 gm	24
107	Injection Ciprofloxacin 500mg	50
108	Syrup Azithromycin 200mg	46
109	Syrup Levofloxacin 50mg	85
110	Capsule Amoxicillin+Clavcinic Acid 625mg	201
111	Capsule Amoxicillin+Clavcinic Acid 625mg	201
112	Injection Amikacin 250mg	37
113	Syrup Metron 200mg	30
114	Injection Dexona 1ml	28
115	Injection Ceftriaxone 1 gm	24
116	Injection Dexona 1ml	28
117	Injection Gentamycin 40mg	28

118	Tablet Ornidazole 500mg	39
119	Injection Ceftriaxone 1 gm	24
120	Tablet Betnesol 0.5mg	16
121	Tablet Megapan 500mg	30
122	Tablet Resteclin 500mg	37
123	Tablet Azithromycin 500mg	119
124	Injection Gentamycin 40mg	28
125	Tablet cefixime 200 mg	107
126	Injection Stimen 4mg	15
127	Tablet Brekke 500mg	117
128	Tablet Cefixime 200 mg	107
129	Capsule Amoxicillin 200mg	78
130	Capsule Ampicillin 500m	65
131	Tablet Dexona 5mg	10
132	Tablet B Complex	105
133	Tablet levofloxacin 650mg	98
134	Tablet Ultracet 200mg	105
135	Syrup Azithromycin 200mg	46
136	Syrup Metrogyl 200mg	30
137	Tablet Cefixime 200 mg	107
138	Tablet Metronidazole 400mg	21
139	Syrup Olife- M 5ml	55
140	Tablet Azithromycin 500mg	119
141	Injection Dexona 1ml	28
142	Tablet Cefixime 200 mg	107
143	Injection Dexona 75mg	57
144	Injection Amikacin 100mg	20
145	Tablet Bandy plus 6mg	25
146	Tablet Lone-O	169
147	Tablet DEC 100mg	40
148	Cap Becosule	36
149	Syrup Albendazole 200 mg	15
150	Syrup Cefixime 125mg	22
151	Tablet levofloxacin 500mg	90
152	Tablet DEC 100mg	40
153	Tablet Ofloxacin-oz 200mg	112
154	Syrup Monocef 100mg	83
155	Tablet Cefixime 200 mg	107
156	Injection Ceftriaxone 250mg	38
157	Syrup Odicef o 100mg	43
158	Tablet cefixime 50mg	31

159	Syrup Cefixime 125mg	22
160	Syrup Aricef 50mg	44
161	Injection Linco 300ml	375
162	Tablet Azithromycin 500mg	119
163	Capsule Amoxicillin 500mg	105
164	Injection Ceftriaxone 250 mg	61
165	Capsule Amoxicillin 250mg	84
166	Capsule Amoxicillin 250mg	84
167	Tablet Doximax 400mg	32
168	Tablet Dexona 75mg	57
169	Injection Ciprofloxacin 500mg	50
170	Capsule Amoxicillin+Clavcinic Acid 625mg	201
171	Tablet B Complex	105
172	Syrup Cefixime 125mg	22
173	Injection Ceftriaxone 250mg	38
174	Injection Dopamine 40mg	78
175	Tablet Levocetirizine 5mg	28

III. Annexure

Definitions	
Public provider	These health worker work in government funded health facility, generally attended by low socio-economic population.
Private Provider	These health worker work in a health facility funded by any individual or group, generally attended by high socio-economic population.
Informal Provider	These health worker, does not have any formal medical education
Formal Provider	These health worker, have formal medical education like allopathy or Ayush
Other Allopathic Medicine	These health worker have higher allopathic medical degree like masters of surgery, diploma of obstetrics and gynaecology or masters in dental sciences.