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## Assessment of Injectables in a Tertiary Care Teaching Hospital



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### ABSTRACT

WHO defines a safe injection as one that does no harm to the recipient, and does not expose the health worker to avoidable risk, and does not result in waste that puts other people at risk. Injection is the most common medical procedures in the health sector. **Objective:** To assess the injection practice in a tertiary care teaching hospital. **Methodology:** A prospective, observational study was conducted at CSI Holds worth Memorial Hospital for a period of 6 months. Study approved by institutional ethics committee. The data was collected in a well designed data collection form. **Results:** A Total of 183 patients were enrolled in the study. Among them, majority (31.6%, n=58) of injectables were used in age group of middle aged (16-35 years) followed by geriatric(27.3%, n=50) of injectables in age group of (>55 years), followed by children (19.6%, n=36) of injectables in age group of (<12 years), followed by older adults (18.5%, n=34) of injectables in age group of (16-35 years) and adolescent (2.7%, n=5) of injectables in age group of (12-16 years) were found. Majority [63.3%, n=116] of the patients using injectables were female, and [36.6%, n=67] of patients using are male. Drugs used in injectables were identified and among all the drugs Pantoprazole (n=138) were highly used. **Conclusion:** Injectables are the most used treatment in hospital admitted patients. In this study, we summarized the findings of comparative studies of different injection routes, dose, frequency, drug classes and subclasses in gender wise and age group wise, which will enrich the knowledge of patient preference-oriented medication administration. Patients are complex so we may suggest further study on personalized therapy should improve the quality of treatment. The result indicates knowledge about safe injections was sufficient.

## INTRODUCTION

Injections play an important role in medical treatment at hospital and other medical institutions, especially those where many patients with serious health conditions are treated<sup>1</sup>. In terms of preventive medicine, vaccination has a significant impact on reducing the incidence and mortality of infectious diseases, which can be prevented by children's vaccination<sup>2</sup>. Despite such positive outcomes, injection can also cause risk of abscess at the site of injection, nerve paralysis, allergic reaction, and anaphylaxis, and in particular, the risks of transmission of bloodborne viruses to patients, healthcare workers (HCWs) and the community<sup>3,4</sup>.

Injection therapy was first introduced to the developing world population with the mass campaigns against yaws and kala-azar in the 1920s, and became widespread after the Second World War following the introduction of penicillin<sup>5</sup>. Anthropologists have described the flourishing business of untrained "injection doctors" in several developing countries<sup>6, 7, 8, 9</sup>. WHO defines a safe injection as one that does no harm to the recipient, and does not expose the health worker to avoidable risk, and does not result in waste that puts other people at risk<sup>10</sup>.

Injection is the most common medical procedure in the health sector. Annually up to 16 billion injections are prescribed in LMICs. In some settings, over 70% of injections are unnecessary or can be given in other formulations like oral medications<sup>11</sup>. Injection is an invasive procedure which can lead to some side effects including bleeding, inflammation, atrophy, nerve injury, and in some cases hypersensitivity reactions such as anaphylactic shock<sup>12</sup>.

The problem of unsafe injection is complex and multi-factorial<sup>13</sup>. Many injections are given unnecessarily because patients value them superior (more efficacious and fast acting) in comparison to oral medications, and health care practitioners over prescribe them<sup>14</sup>. In other hand patients are open to alternative medications, even though prescriber provide injections.

Prescribers overestimate patient's preference for injection and have false preconception about their effectiveness<sup>15</sup>.

Unsafe injection practices have an inherent risk of spreading three preventable primary Blood Borne Viral (BBV) pathogens; Human Immunodeficiency Virus (HIV), Hepatitis B virus

(HBV) and hepatitis virus (HCV) <sup>16, 17</sup>. Preference of injections to oral medications and widespread misuse of injections in many developing countries has long been of great concern to health professionals and the World Health Organization, but so far little systematic research has been conducted in to this world-wide practice. Available information suggests that the use injections in developing countries is common and often unnecessary<sup>18, 19</sup>.

The aim of the study was to assess the injectables and injection practices in CSI Holds worth memorial Mission Hospital.

## **METHODS**

### **Study Design and Setting**

This was a prospective, observational and interventional study, the patients who were satisfying the inclusion criteria were enrolled in to the study after obtaining their written consent. This study was conducted for a period of 6 month from November 2018 to April 2019 in hospitalized patients of CSI Holdsworth Memorial (Mission) Hospital, Mysore.

The study was approved by Institutional Ethics Committee of Farooqia College of Pharmacy, Mysore and written consent was taken from patients.

A specially designed data collection form was devised for the study. The data collection form had provision for collecting key information like demographic details (name, age and gender), clinical data like (reason for admission, past medical history, diagnosis, comorbidities), treatment chart (name of the drug, dose, frequency, route, duration of administration).

Treatment chart and all the prescriptions were reviewed to identify the injections prescribed. The data collection and assessment form designed for use in this study was computerized using Microsoft access 2016 and Microsoft excel 2016 for easy storage, accessibility, retrieval and analysis of data and excel have been used to generate graphs, tables etc.

## **RESULTS AND DISCUSSION**

The present study was focused on assessing injectables used in general medicine, ICU, OBG, surgery, pediatrics wards during the study period.

Majority (31.6%, n=58) of injectables were used in age group of middle aged (16-35 years) followed by geriatric (27.3%, n=50) of injectables in age group of (>55 years), followed by children (19.6%, n=36) of injectables in age group of (<12 years), followed by older adults (18.5%, n=34) of injectables in age group of (16-35 years) and adolescent (2.7%, n=5) of injectables in age group of (12-16 years) were found. Majority [63.3%, n=116] of the patients using injectables were female, and [36.6%, n=67] of patients using are male. Details of age groups for all patients using injectables are given in Table 1 below.

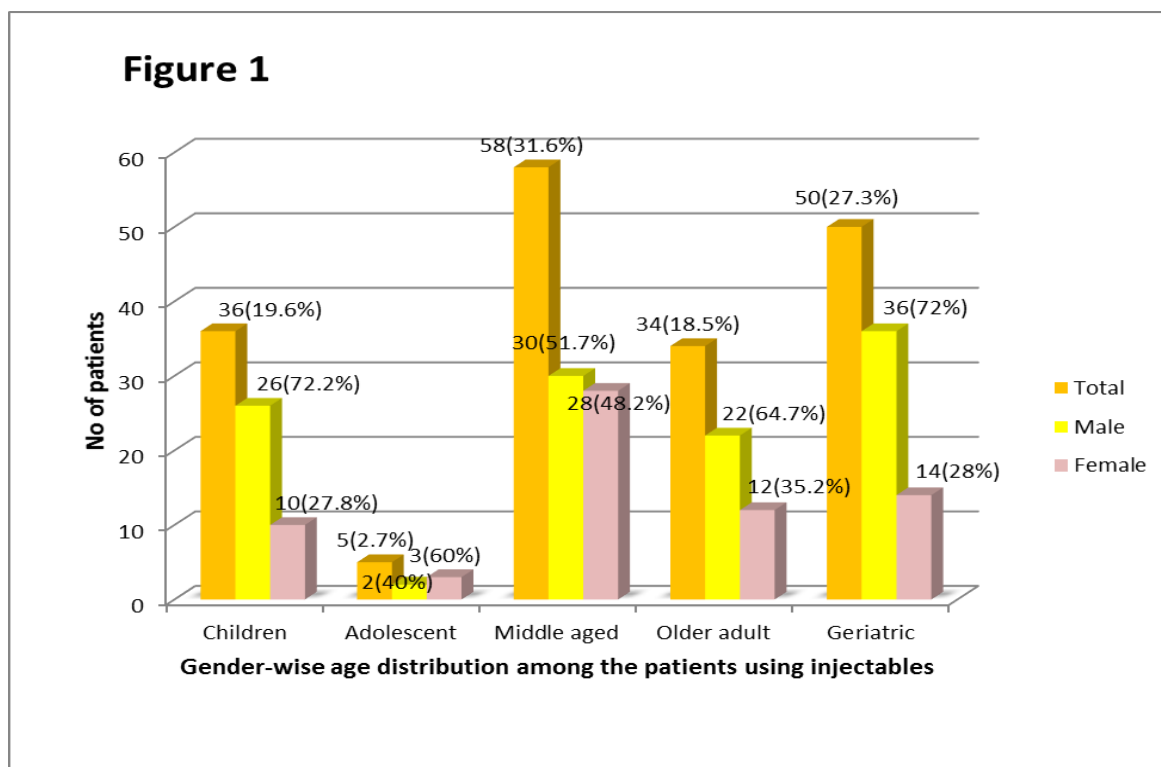
**Table No. 1: Patients Demographics**

Patients Demographics	Number of patients	Percentage
<b>Age</b>		
• Children (<12yrs)	36	19.6%
• Adolescent (12-16yrs)	5	2.7%
• Middle aged (16-35yrs)	58	31.6%
• Older adult (36-55yrs)	34	18.5%
• Geriatric (>55yrs)	50	27.3%
<b>Sex</b>		
• Male	116	63.3%
• Female	67	36.6%

**Gender wise age distribution among patients using injectables:**

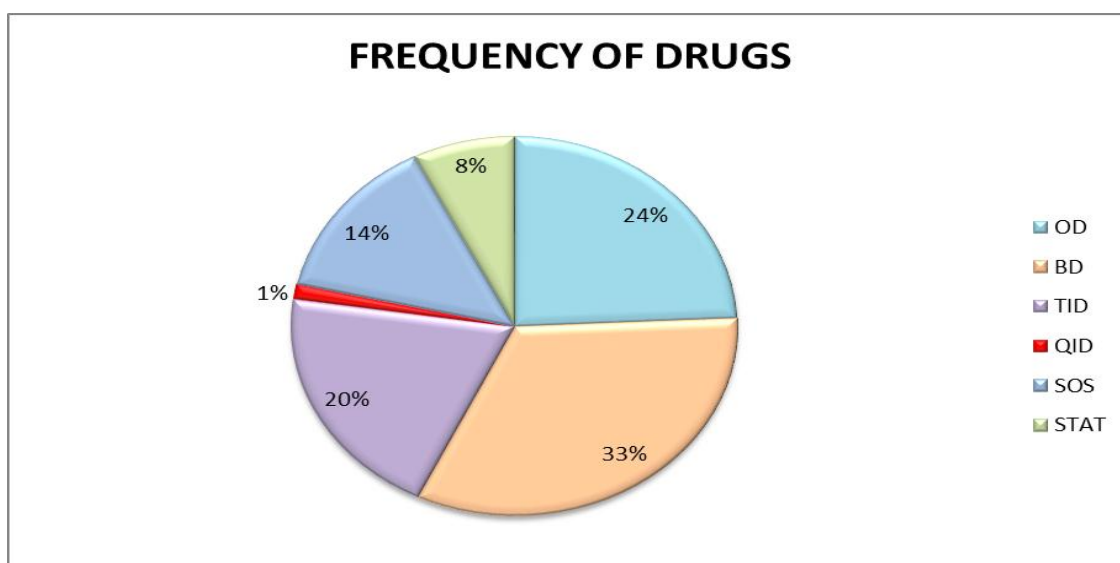
The bar graph (Figure 1) shows the gender wise age distribution among the patients using injectables in four respective age groups i.e. neonates (0-1month), infants (1month-2years), children (2-12years), and adolescents (12-16years) vs. number of patients.

In neonates (n=5) among which 4 were found in males and 1 in females, in infants (n=40), 21 were found in males and 19 in females, children (n=65) 44 were found in males and 21 in females, adolescents (n=4) 4 were found in males and none in females. Majority of ME were seen in children under age 2-12years followed by infants, neonates and adolescents.



**Frequency of drugs:**

All the injectables were categorized in to different frequencies as OD (once daily), BD (twice daily), TID (three times a day), QID (4 times a day), SOS (If necessary), STAT (immediately). Highest number of injectables administered in BD (33%,n=230) followed by OD (24%,n=170), TID (20%,n=141), SOS (14%,n=98), STAT (8%,n=52) and QID (1%,n=9).



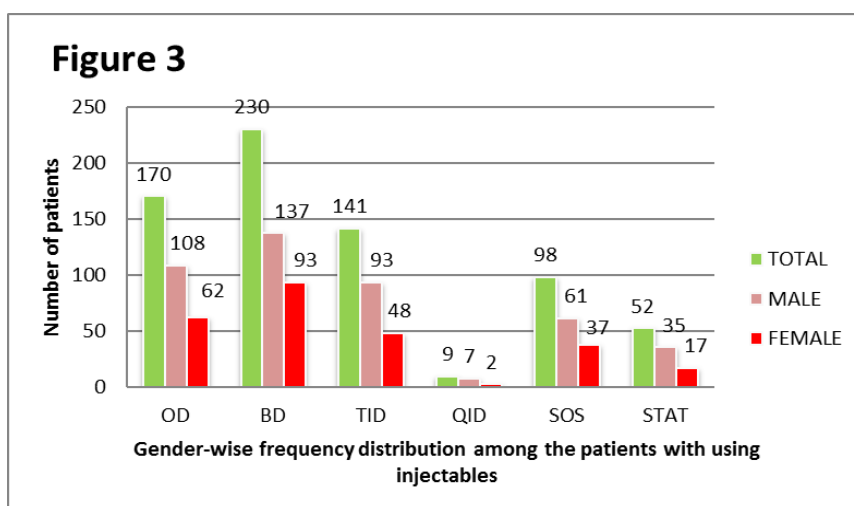
**Figure No. 2**

**Gender-wise frequency of injectables:**

The bar graph (figure 2) shows the frequency distribution among the patient using injectables in five respective frequency groups i.e. OD (once daily), BD (twice daily), TID (three times a day), QID (4 times a day), SOS (If necessary), STAT (immediately) vs. number of patients.

In OD (n=170) among 108 were found in males and 62 in females, in BD (n=230) 137 were found in males and 93 in females, TID (n=141) 93 were found in males and 48 in females, QID (n=9) 7 were found in males and 2 in females, SOS (n=98) 61 were found in male and 37 in females, STAT (n=52) 35 were found in males and 17 in females.

Majority of using injectables were seen in BD (twice daily) followed by OD (once daily), TID (three times a day), SOS (If necessary), STAT (immediately), and QID (4 times a day).



**Details of Route of administration:**

Route of administration were categorized in to different levels as IV (intravenous), IM (intramuscular), SC (subcutaneous). Highest number of ROAs was found as IV (92.2%, n=563), followed by SC (5.2%, n=32), and the least found IM (2.4%, n=15).

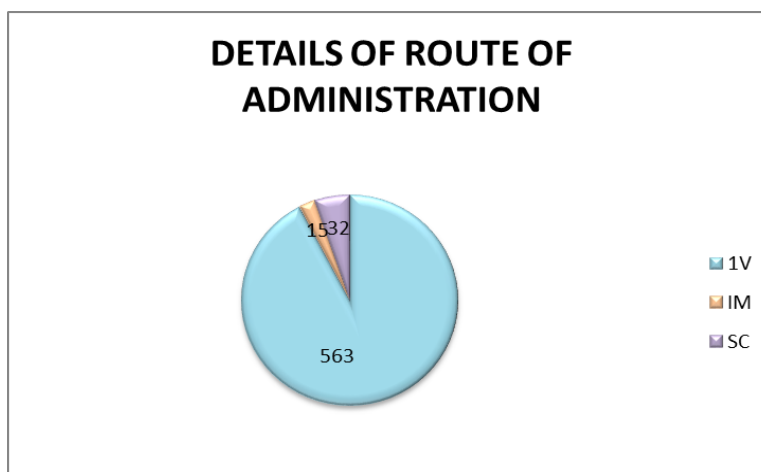
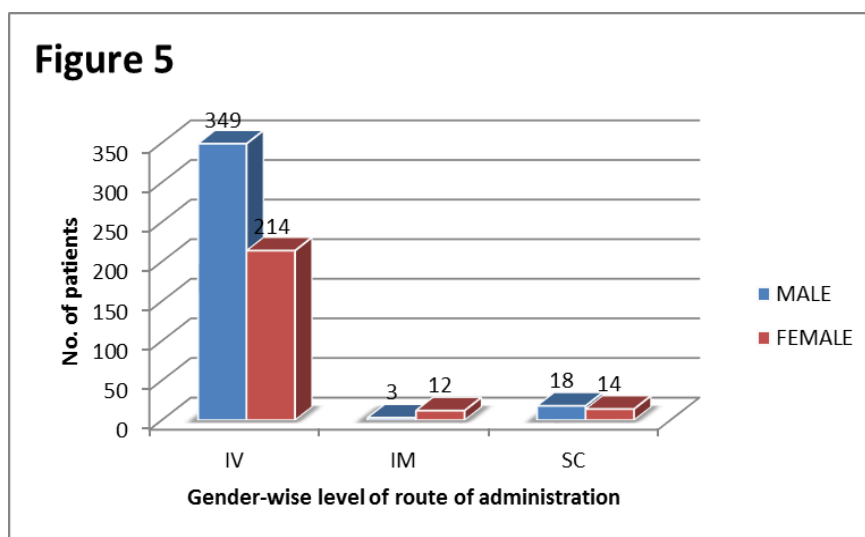


Figure No. 4

**Details of Route of administration in gender:**

The bar graph (figure 3) shows the gender wise level of route of administration among the patient using injectables in three respective ROA groups i.e. IV (intravenous), IM (intramuscular), SC (subcutaneous).

In IV (n=563) among 349 were found in males and 214 in females, in IM (n=15) 3 were found in males and in 12 females, SC (n=32) 18 were found in males and 14 in females. Majority of using injectables were seen in IV followed by SC, IM.



**Categorization of drug dose:**

All the doses of injectables classified into 8 categories i.e, category A (0.1 mg-40 mg), category B (100 mg-1000mg), category C (1gm-10 gm), category D (1 amp-5 amp), category

E (0.1 ml- 100ml), category F (0.4 u-5000 u), category G (0.2 cc-30 cc) and category H (500 ml-1000 ml). In all injectables all most doses are in category A.

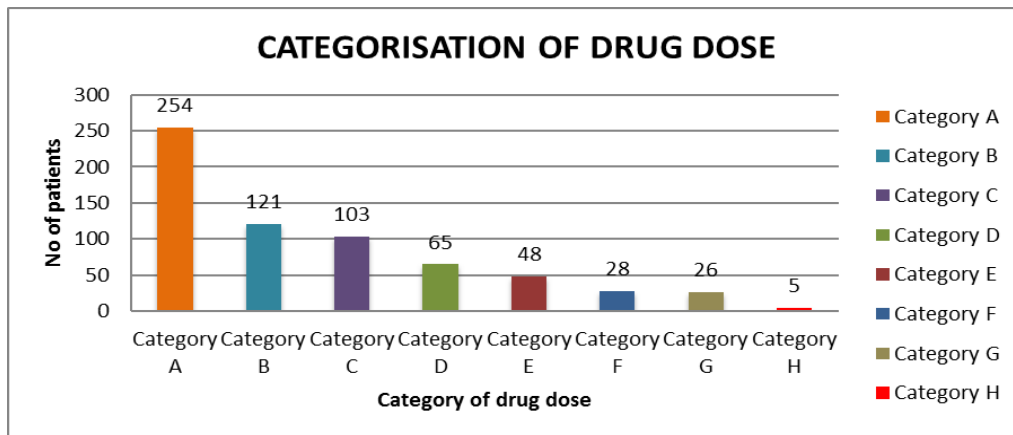
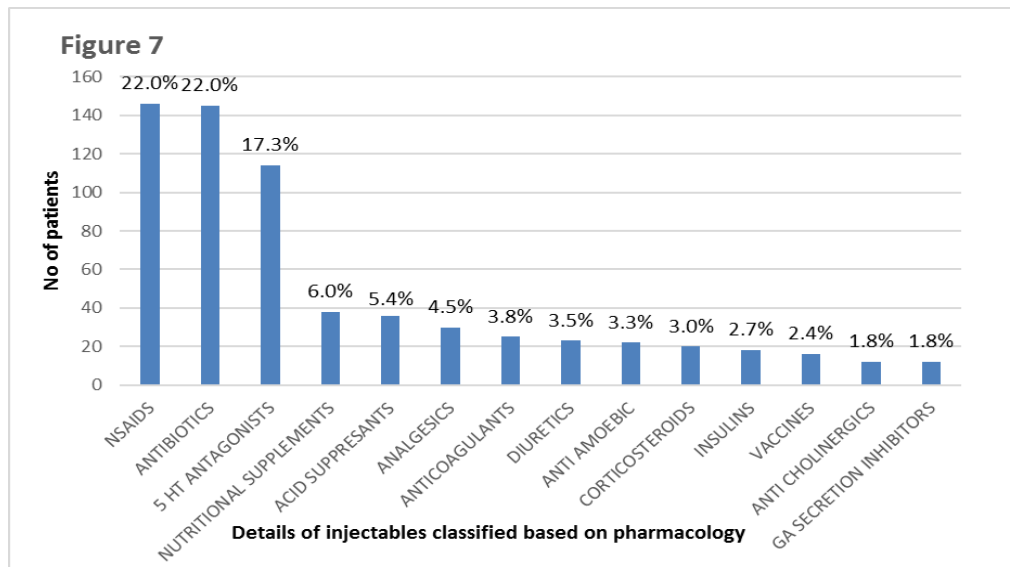


Figure No. 6

**Details of injectables classified based on pharmacology:**

All injectables were categorized in to different drug classes. Highest number of injectables was found in NSAID (n=146) , followed by Antibiotics (n=145) ,and 5 HT Antagonists (n=114), Nutritional supplements (n=38), Acid suppressants (n=36), Analgesic (n=30), Anticoagulants (n=25), Diuretics (n=23), Anti amoebic (n=22), Corticosteroids (n=20), Insulins (n=18), Vaccines (n=16), Anti cholinergics (n=12) and GA Secretion inhibitors (n=12).

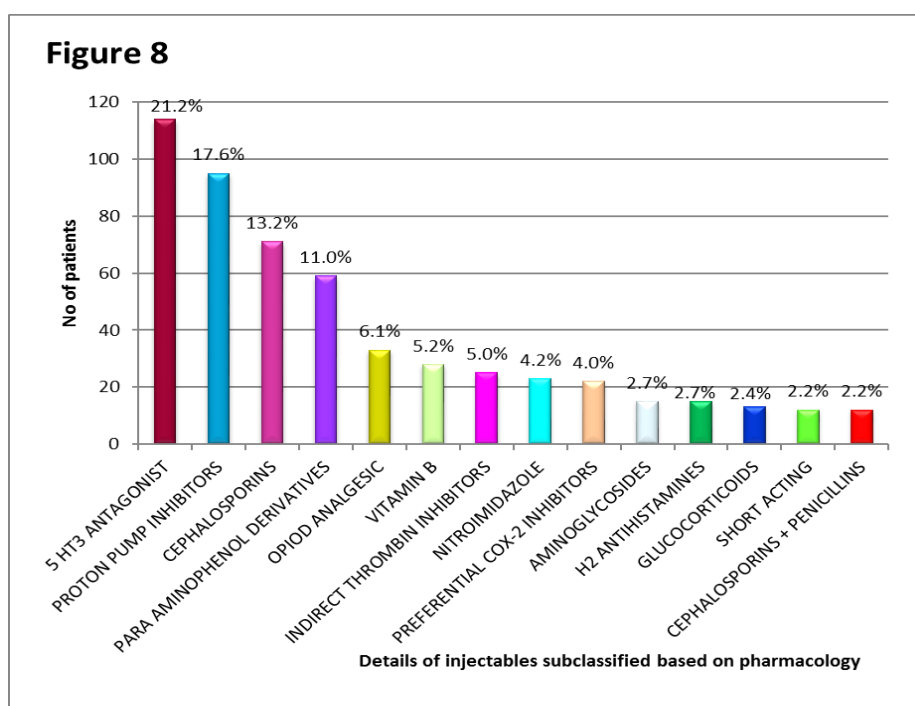




**Details of injectables subclassified based on pharmacology:**

All the injectables were sub classified among drug class, Majority was 5 HT3 Antagonist (n=114), followed by Proton pump inhibitors (n=95), Cephalosporins (n=71), and Para aminophenol derivatives (n=59), Opiod analgesic (n=33), Vitamin B (n=28), Indirect thrombin inhibitors (n=25), Nitroimidazole (n=23), Preferential COX-2 inhibitors (n=22), Aminoglycosides (n=15), H2 Antihistamines (n=15), Glucocorticoids (n=13), Short acting (n=12), and Cephalosporins + Penicillins (n=12).

Details of different type of injectables depicted in figure 8.



**Drugs frequently used in injectables:**

Drugs used in injectables were identified and among all the drugs Pantoprazole (n=138) were highly used and followed by, Ondansetron (n=105), Ceftriaxone (n=61), Acetaminophen (n=59), Optineuron (n=32). List of drugs commonly used in injectables are shown in Table: 2.

Table No. 2: Drugs commonly used in injectables:

GENERIC NAME	NUMBER OF DRUGS USED
PANTOPRAZOLE	138
ONDANSETRON	105
CEFTRIAZONE	61
ACETAMINOPHEN	59
OPTINEURON	32
METRONIDAZOLE	24
RANITIDINE	24
TRAMADOL	23
DICLOFENAC	23
HEPARIN	19
INSULIN	16
CEFOPERAZONE + SULBACTAM	12
AMIKACIN	11
FUROSEMIDE	10
DEXAMETHASONE	10
PIPERACILLIN	8
MAGNESIUM SULPHATE	8
PROMETHAZINE	7
AMOXYCILLIN + CLAVULANIC ACID	6
HYDROCORTISONE	6
CEFUROXIME	5
ENOXAPARIN	5
HYOSCINE BUTYL BROMIDE	4
MEROPENEM	4
CEFOTAXIME	4
VANCOMYCIN	3
LINEZOLID	3
GENTAMYCIN	3
CALCIUM GLUCONATE	2

<b>TETANUS TOXOID</b>	2
<b>LIDOCAINE</b>	2
<b>CEFTRIAZONE + SALBACTAM</b>	2
<b>CIPROFLOXACIN</b>	2
<b>CLINDAMYCIN</b>	2
<b>PENTAZOCINE+PROMETHAZINE</b>	2
<b>DIAZEPAM</b>	2
<b>PENTAZOCINE+DIAZEPAM</b>	2
<b>ATROPINE</b>	2
<b>VITAMIN K</b>	2
<b>MULTIVITAMIN</b>	2
<b>OXYTOCIN</b>	1
<b>INSULIN ISOPHANE</b>	1
<b>AZITHROMYCIN</b>	1
<b>ERYTHROPOETIN</b>	1
<b>NUROKIND</b>	1
<b>VALPROIC ACID</b>	1
<b>OMEPRazole</b>	1
<b>TRANEXAMIC ACID</b>	1
<b>VITAMIN C</b>	1
<b>METHYL PREDNISOLONE</b>	1
<b>ATORVASTATIN</b>	1
<b>PENTAZOCINE</b>	1
<b>METOCLOPRAMIDE</b>	1

## CONCLUSION

Injectables are the most used treatment in hospital admitted patients. In this study, we summarized the findings of comparative studies of different injection routes, dose, frequency, drug classes and subclasses in gender wise and age group wise, which will enrich the knowledge of safe, efficacious, economic, and patient preference-oriented medication administration.

Patients are complex because of biological, medical, socioeconomic and cultural factors we may suggest further study on personalized therapy should improve the quality of treatment. The result indicates knowledge about safe injections was sufficient.

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