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A study to assess the extent of intramuscular injections among inpatients and outpatients in a tertiary care hospital in Jammu and Kashmir

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Abstract
Problem: The study was conducted to assess the extent of intramuscular injections among inpatients and outpatients in a tertiary care hospital in Jammu and Kashmir. The objectives of the study were to find out the monthly load of injections prescribed in the inpatient and outpatient department of the tertiary care hospital, and to estimate the percentage of intramuscular injections administered to the inpatients and outpatients of the hospital.
Materials and Methods: The approach used for the study was a quantitative approach, a record based cross sectional retrospective study conducted at a tertiary care centre in Jammu & Kashmir. The hospital is a 780 bedded referral centre with bed occupancy of about 550-600/day and caters directly to about 40000 population of defense personnel, ex-service men, and their dependants. The treatment book of all the in-patient and out-patient facility of the hospital were analysed for six months to find out the type and rate of injections administered. The obtained data was analysed using frequency and percentages.
Major findings: The average monthly admission of in-patient department was found to be about 1400-1450, and the average monthly OPD attendance was about 1500. On analysis of the data, it was seen that the total number of parenteral injections given in the hospital was 9740 per month, of which about 55% injections given in the outpatient department and 24% of the injections given in the inpatient department were intramuscular injection. About 88% of injections were administered in the inpatient wards and only 12% were given in the outpatient departments. Almost 96% of inpatient and 98% of outpatient injections composed of intravenous, intramuscular and subcutaneous route of administration. About 17% of IPD patients and 4% of OPD patients received injections daily, and the frequency of injection was calculated to be 0.08 per person per year. One in every 16 outpatient received an injection. The average duration of hospital stay was calculated to be 3 days with a bed occupancy rate of 74%.
Conclusion: The study found that almost 55% of the outpatient and 24% of the inpatient injection prescriptions are intramuscular in nature. More than 96% of injections in both inpatient and outpatient departments are intravenous, intramuscular and subcutaneous injections which are exclusively administered by the nurse. These needle procedures being very common in the health care setting, need to be as safe and as pain free as possible so as to improve patient satisfaction and compliance to health care services.

Keywords: Injections, intramuscular injection, needle procedures, tertiary care hospital

Introduction
Medicines significantly contribute to human health and well being and play a critical role in both prevention and treatment of diseases. Medicines are administered in a variety of settings like hospitals, clinics, nursing homes, assisted living facilities, schools, hospices, camps, and during in-home care facilities. Pepin states that patients prefer injections because they believe that they provide quick relief from the symptoms or work better than oral medicines [1].

Injections are among the most frequently used medical procedures in a hospital. One of the most common and safe route of administration of medicine is the intramuscular route, as the muscles are easily accessible, ensures rapid and uniform absorption of the drug because of the rich blood supply of the muscles, improved bioavailability, and better systemic effect of the drug compared to oral and other parenteral routes. It has a long duration of action, and can be given safely whenever oral medication is poorly tolerated, or patient is uncooperative.

Injecting into the muscles has thought to have started as early as 500 AD. By the late 1800's, the technique of the procedure began to be scientifically described and developed by the physicians. The first documented intramuscular administration of a vaccine was in the year 1923 for diphtheria, and by 1970's guidelines were formed to ensure safe administration of intramuscular injections. In the early days the procedure was almost exclusively performed by the physicians, and after the introduction of antibiotics in the middle of 20th century, by about 1960, nurses started performing intramuscular injection [2].

As per the World Health Organization statistics, every year there are 16 billion injections administered globally of which 3-6 billion are contributed by India. The WHO also estimates that about 60% of the population in India does not have regular access to essential medicines, and among those who have access, the private health sector provides majority (80%) of the outpatient health care [3]. The WHO gives a conservative estimate of average number of injections from 0.9–8.5 per person per year, with a median of 1.5 injections per person per year [4].

Of the current WHO estimate of the 16 billion injections, only 10% are given for vaccination, blood transfusion and injectable contraceptives; the rest 90% of the injections are administered as intramuscular, intradermal, or subcutaneous injection for various therapeutic purposes; and suggests that many of these injections are either unnecessary or could be replaced by oral medication [4]. As per WHO data, India's contribution to the global burden of HIV infection was 5%, HBV infection was 32%, and HCV infection was 40% per year [5].

Studies point that India contributes to 25-30% of the global injection load. Arora conducted a WHO sponsored study to examine injection practices in India and found that 3-6 billion injections are administered annually; and more than half of these are prescribed for minor ailments like fever, cough, and diarrhea. He also noticed that one in every 3rd patient visiting an outpatient facility is prescribed with an injection [6].

Another survey conducted by Greenhalgh in India on 2400 patients about prescribing and dispensing of drugs by the public and private medical sectors and by private pharmacies found that 96% of all injections given by private doctors were of antibiotics, vitamins, and analgesics. The study also identified that one third of all patients (66.6%) attending a private and government facility was given unsafe injection [7].

Sudesh G studied prescription of injectable drugs and intravenous fluids to in-patients in a 700 bedded teaching hospital in Nepal for about six months. The study conducted on 1131 patients showed that 938 (82.9%) patients received at least one injection during their hospital stay. The median duration of hospital stay was 5 days. About 8203 medicines were prescribed (mean value 8.75/prescription), and intravenous fluids and intradermal drugs accounted for more than half (52.8%) of the total drugs [8].

According to a 2010 study conducted between 2000-2010 in developing countries and transitional economies, the average number of injection per person per year has decreased from 4.88 to 3.40 [9].

The WHO global estimates for average number of injections is 0.9–8.5 per person per year [4]. For the Indian estimates, the WHO figures are 2.9 per person per year [6], and some other studies calculated this rate as 2.4 per person per year [10]. In Nepal, a study conducted by Sudesh found that 82.94% of in-hospital patients received injections, and estimated that the mean prescription rate of medication was 8.75 per prescription [8].

Review of Literature

The World Health Organisation as per their studies estimated that in the year 2011, there were about 16 billion injections administered globally annually, with a conservative estimate of the average number of injection ranging from 0.9-8.5 per person per year. Of these, 90% are administered as intramuscular, interadermal or subcutaneous injections [4]. A WHO sponsored study conducted in India estimates the rate of injection to be 2.4 per person per year [6] and states that 60% of (499-649 million) the population in India does not have regular access to essential medicines [3]. Among those who have access, the private sector provides majority (80%) of the out-patient health care in India [3].

In accordance with this WHO initiative, NK Arora conducted a WHO sponsored study to assess injection practices in India, in which he estimated that India contributes to about 25-30% of the global injection load and one in every third patient visiting an out-patient facility is prescribed with an injection. This accounts to about 3 billion injections administered every year in India; of which 1.89 billion were unsafe, and about 75% were unnecessary. He conducted nationwide population based cluster survey (24021 subjects in 1200 clusters) at household level; along with observations, interview of the prescribers (2402 prescribers), and exit interview of the patients (12012 patients) at health facility level in the clusters; carried out using probability proportionate to size (PPS) technique. The results showed that the frequency of injections was 2.9 per person per year (95% CI, 2.8-3.2), and among the total injections administered, about 62.9% (95% CI: 60.7-65) were found unsafe. Majority of the injections (82.5%) were prescribed for curative purposes and were mostly given for mild ailments like fever, cough and diarrhea. He suggested that the micro-level leadership should be primarily responsible for reducing overuse of injections and the responsibility for making injection safer [6].

Rajasekharan conducted a study to assess injection practices in Tamil Nadu using the rapid assessment and response guide of the Safe Injections Global Network of the World Health Organisation. The convenience sampling included 39 prescribers, 62 providers, and 175 patients who were interviewed and found that the per-capita injection rate was 2.4 per year. The ratio of therapeutic injection to vaccination was estimated to be 6.5:1 [10].

Studies conducted in Bangladesh also showed a high rate of injection in the primary health care (PHC) hospitals. The study found that the median duration of the hospital stay of inpatients was 5 days and 82.94% of patients received at least one injection during their hospital stay. More than 3 quarters of the total prescribed medications (n=3354 out of 4320 prescriptions) were injections (77.7%), and the majority (78.4%) of prescribed injections were antibiotics followed by intravenous fluids, analgesics and vitamins [11].

Sudesh carried out a similar study in Western Nepal on prescription of injectable drugs and intravenous fluids to inpatients in a teaching hospital. The study conducted on 1131 patients showed that 78% of patients received at least one injection during their hospitalisation. The median duration of hospital stay was 5 days. The mean prescription

rate of medicines was 8.75 per prescription, and among the prescription, injectable drugs and intravenous fluids accounted for 52.8% of the total drugs [8].

Materials and Methods

The study was based on quantitative approach, a record based cross sectional retrospective study conducted at a tertiary care centre in Jammu & Kashmir. The hospital is a 780 bedded referral centre with bed occupancy of about 550-600/day and caters directly to about 40000 population of defense personnel, ex-service men, and their dependants. The average monthly admission of in-patient department is about 1400-1450, and the average monthly OPD attendance is about 1500. The treatment book of all the in-patient and out-patient facility of the hospital were analysed to find out the type and total number of injections administered. The obtained data was analysed using frequency and percentages. All the outpatient departments, vaccination room, the common injection room, procedure room, and MI room were considered as OPDs. All the hospital wards, blood transfusion department, Emergency room, Operation Theatre, and minor OT were considered as in-patient departments. The treatment book of all the wards and emergency room, injection register of the OT, procedure book of all the OPDs, injection register of the injection room, and the vaccination room were examined, and data for the past 6months from Aug 2022 to Jan 2023 were collected. The data was tabulated and expressed in frequency and percentages.

Results

The information obtained from the records were tabulated and presented in table 1 as frequency distribution of injections and table 2 as statistics regarding injections, and are given below:

Table 1: Frequency distribution of injections given in the hospital in a month n=9740

Type of injection	IPD		OPD	
	Freq	%	Freq	%
Subcutaneous injection	1315	15	250	22
Intramuscular injection	2110	24	610	55
Intravenous injection	4945	57	240	21
Spinal injection	250	03	-	-
Other types of injection	12	0.14	8	0.7
Total	8632	100%	1108	100%
Grand Total	8632+1108=9740/ month			

The table 1 shows the various types of injections and the number of injections given in the in-patient department and out-patient department of the hospital. The total number of injections given in the hospital in a month was 9740. More than half of the injections (57%) given in IPD were intravenous injections (n=4945). About 55% of injections given in OPD (n=610) and only a quarter of injections given in IPD (24%, n=2110) were intramuscular injections. Subcutaneous, intramuscular and intravenous injections, altogether constituted about 96% of IPD and 98% of OPD injection prescriptions. Among the total number of injections given in the hospital (including IPD and OPD), only 28% of injections were given through intramuscular route. The average number of injections given in a day in the hospital was 325 per day with 288 in the IPD and 37 in the OPD. About 88% of injections were administered in the hospital wards and only 12% injections were given in the out-patient department of the hospital.

Table 2: Statistics related to injections

Parameter	IPD		OPD		Total
	Freq	%	Freq	%	
Number of patients getting injections (per day)	95	17%	24	4%	119
Number of injections given in hospital (per day)	288	88%	37	12%	325
Rate of injection as per the catering population	0.08 per person per year				
Average Length Of Stay (ALOS)	3 days				
Bed Occupancy Rate (BOR)	74%				

The hospital is a 780 bedded tertiary care centre, catering to about 40000 population directly, with daily bed state of about 550-600 per day, and average monthly admission of about 1400-1450 per month. From table 2, it can be seen that about 119 patients receive injections daily, of which, about 17% patients (n=95) are from the in-patient department and 4% patients (n=24) are from the out-patient department. The total number of injections in a day was about 325, with 88% (n=288) injections given in the inpatient department and 12% (n=37) injections given in the outpatient department. The average daily OPD attendance is about 500 per day and hence, one in every 16 OPD patients receives an injection. The frequency of injection of the hospital was calculated to be 0.08 per person per year. The average duration of hospital stay (ALOS) in the inpatient department was calculated to be 3 days with a bed occupancy rate (BOR) of 74%.

Discussion

The WHO estimates that 90% of all the injections given in the OPD facility in India were intravenous, intramuscular or subcutaneous in nature. Much like the WHO estimates, almost 97% of the injections given in the inpatient and outpatient department were intravenous, intramuscular, and subcutaneous injections.

This study found the rate of injection as 0.8 per person per year which is in line with lower level of the range estimated by the WHO for the developing world, which is estimated to be a conservative rate of 0.9 to 8.5 injections per person per year; but contradicts the data estimated by Arora in his multisite study in India in which he estimated the frequency of injection to be 2.9 per person per year. It also contradicts Hutin's findings in which he estimated the frequency of injection to be 1.7 to 11.3 per person per year. The findings of this study are also not in line with findings of Rajasekharan in which he found frequency of injection to be 2.4 per person per year.

This study found the average length of hospital stay (ALOS) for the inpatients as 3 days which is comparable to the findings of the study by Chouhan where he found the ALOS

of private hospitals to be 2.5 days. This finding is also similar to studies by Thapa *et al*., in which he found similar duration of 2.7 days of ALOS in a rural hospital in West Bengal. However, it contradicts findings of Chauhan who recorded 5.8 days for a tertiary care hospital in a multi-site study in India in the year 2007. It also contradicts findings of Kiren *et al*., who noticed 9 days ALOS in a tertiary care hospital, and also by Qureshi, who found 6.9 days od average length of hospital stay in a tertiary care hospital.

The bed occupancy rate (BOR) found in this study was 74% which is well within the recommendations for a tertiary care hospital. This finding is almost in line with the study by Vaz in which he found the BOR to be 72.13% for a tertiary care hospital for the year 1999, and also by Chouhan who found 70% bed occupancy rate for a tertiary care facility. Whereas, it contrasts the findings by Kiren *et al*., where he found BOR of 50–60%, and also by Qureshi, where he found BOR of 87%.

Conclusion & recommendation

This record based cross sectional retrospective study conducted in a tertiary care hospital in Jammu & Kashmir found that almost 55% of the outpatient and 24% of the inpatient injection prescriptions were intramuscular in nature. More than 96% of injections in both inpatient and outpatient departments are intravenous, intramuscular and subcutaneous injections, which are exclusively administered by the nurse. These needle procedures being very common in the health care setting, need to be as safe and as pain free as possible so as to improve patient satisfaction and compliance to health care services.

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