Injection Practices at Primary Healthcare Units in Bangladesh: Experience at Six Upazilla Health Complexes

M. C. Shill[1], Fahad B. M.[2], Sarmistha Sarker[3], Shrabanti Dev[4], K. Rufaka H. [5], Asish K. D[6]

1. B. Pharm, Coordinator - In-Patient Pharmacy Department, Square Hospitals Ltd., Dhaka, Bangladesh.

2. B. Pharm, Hospital Pharmacist, United Hospital Ltd., Dhaka, Bangladesh.

3. M.S.S., National University, Dhaka, Bangladesh.

4. M.S., Pharmacy Discipline, Khulna University, Khulna, Bangladesh.

5. B.Pharm, Department of Pharmacy, North South University, Dhaka, Bangladesh

6. PhD, Associate Professor, Pharmacy Discipline, Khulna University, Khulna, Bangladesh

RESEARCH

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Corresponding Author:
Fahad Bin Moain
E-7, Zakir Hossain Road, Mohammadpur,
Dhaka-1207, Bangladesh
fahad.moain@gmail.com

Abstract

Background
Indiscriminate usage of injections and lack of safe practices during injection administration have been reported worldwide. Unnecessary and unsafe injection usage not only increases the financial burden but are also responsible for spreading blood borne diseases including HIV, HBV and HCV. To attain a better understanding of the situation of injection usage in Bangladesh, a study was conducted at six Upazilla Health Complexes (UHCs), which are primary healthcare units in Bangladesh.

Method
The study involved the retrospective collection of treatment sheets of 1048 in-patients at six UHCs from January 2009 to June 2009. The data was then analyzed using statistical tests.

Results
Among the patients investigated, 60.11% of the patients received injections and among them the male population received more injection than the female population (males vs. females = 62.50% vs. 55.85%). Patients below 12 years of age received the highest proportion of injections and highest usage of injections was observed in the month of March. The average number of injection(s) prescribed to a patient was 2.44 incurring a prescription cost of 280.22 Taka (USD 3.92 approx.). Injections were mostly prescribed in patients who were diagnosed with physical assault and acute watery diarrhea where intravenous fluids and antibiotics were most widely prescribed. Non-compliance to recapping of used injections was very common which accounted for 22.22% needle stick injuries.

Conclusion
The data suggest that indiscriminate and unsafe injection practices were occurring in all UHCs. Such practices resulted in financial losses as well as compromising safety for healthcare providers and patients.

Key Words
Injection practice, Blood borne disease, Upazilla Health Complex, Needle stick injury, Prescription

Background
The administration of injections is a very common healthcare procedure. In developing and transitional countries around 16 thousand million injections are administered each year[1] where most of the injections (more than 90%) are given for therapeutic purposes while only 5 to 10% are given for preventive measures. However, the majority of the injections used for therapeutic purposes in developing and transitional countries are considered unnecessary[2]. Another factor to be taken into consideration is that safe injection administration practices usually do not harm the recipient; however, unsafe injection administration practices cause patients to be exposed to various risks which have caused them major disabilities and even death in many cases. [2,3]

Unsafe injection administration practices have caused more than 80,000 deaths a year due to HIV infection alone, and have caused another 10 million deaths due to infections

involving hepatitis viruses. Collectively such unsafe injection administrations practices are causing 1.3 million premature deaths per year worldwide, incurring an average treatment cost of USD 535 million per year due to such infections, while the injections itself bear a hidden cost of USD 0.125 per injection in the developing countries[4]. Studies have confirmed that there were 1,495 reported HIV cases in Bangladesh until November 2008 and it was estimated that another 7,500 persons were living with HIV, which is three times the number of HIV cases reported since 2003; and among them 11.1% have been associated with IV drug abuse[5-7].

Poor and unsafe injection administration techniques cause infections involving hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) [8]. In Egypt, Pakistan and many other countries it has been confirmed that unsafe injection administration techniques alone are an important vector for the introduction of HCV to a huge number of patients.[9-11], while in South Asia such inappropriate practices accounted for up to 9% of newly acquired HIV infections[12]. The reasons for such unsafe injection administration techniques and practices are very complex and include structural, economical and socio-cultural factors[13]. Moreover, knowledge regarding safe practices of injection administration is often very suboptimal among injection prescribers, providers and consumers[14, 15].

The objective of our study was to investigate the pattern of injection usage in several primary health care units in Bangladesh. The findings could be a good indicator of unsafe injection usage and could be used to address the upcoming threats of HIV, HBV, and HCV infections in Bangladesh.

Method

Permissions were taken from all the Upazilla Health and Family Planning Officers (UH&FPO) Resident Medical Officers (RMO) in charge of the hospitals and wards respectively.

Study centers

The study was conducted at six Upazilla Health Complexes (UHCs) in Dhaka (Capital of Bangladesh). The UHCs were located right at the outskirts of Dhaka city at Dhamrai, Dohaar, Keranigonj, Savar, Shaturia and Singair.

Data Collection

Retrospective medication and treatment records of 30 patients on an average per month were collected randomly from January 2009 to June 2009 at each of the UHCs, except Dohaar UHC, where the records were collected from January 2009 to May 2009. Thus from each UHC medication records from 180 in-patients were collected with the exception of Dohaar UHC where medication records of 150 patients were collected. Interviews with the doctors and nurses at each of the UHCs (with the questionnaire prepared by the research team) and open discussion sessions were also performed, with the aim to assess their perception on injection based medications for disease management. Interviews were conducted on two doctors and four nurses at each UHC. Open discussion sessions included two or more doctors from each UHC.

Data analysis process:

Data were analyzed using Microsoft® Excel 2002 software and GraphPad Software (http://www.graphpad.com/quickcalcs/ttest1.cfm).]

Results

Our findings suggest that the male population 62.50% (95% CI: 58.26 to 66.56) had received more injections than the female population 55.85% (95% CI: 51.56 to 60.06) in all the six UHCs. It was also found out from the study that the highest injection usage of 78.38% (95% CI 62.56 to 88.86) was observed in patients whose age was 1 year or lesser. Injection usage rate was lower among patients with ages between 5 to 11 years 66.67% (95% CI: 52.01 to 78.70), while lowest usage was observed in patients aged above 65 years 43.64% (95% CI: 31.37 to 56.74). The injection usage rate was also very low in patients aged between 50 and 65 years 49.69 % (95% CI: 42.01 to 57.37). Further details are in Table – 1.

The average injection usage rate as per our study, considering all the UHCs, was 60.11% (95% CI: 57.12 to 63.04), with each patient receiving an average of 2.44 (*p* value 0.0021) injections. Seasonal variations also had an impact on the injection usage. In the month of March the highest injection usage was observed 64.16%, (95% CI: 56.77 to 70.93) while lowest injection usages occurred in April 53.11% (95%CI: 45.77 to 60.32). However, the number of injections received by each patient individually was highest in January 2.73 (*p* value 0.0141) and lowest in May 2.24 (p value 0.0026). The study also revealed that 35.24% (95% CI: 31.61 to 39.05) of the patients received one injection whereas 28.57% (95% CI: 25.18 to 32.22) of them received two injections. Most interestingly 5.87% (95% CI: 4.27 to 8.01) received 6 or more injections. These facts are described in greater details in Table – 2.

In our study, it was calculated that “the cost of medication in each prescription on an average” was 280.22 Taka (Bangladesh National Currency where 1 Taka = 0.014 USD approx.) for patients who had injections prescribed to them, while “the cost of injection based medications in those prescriptions” itself were 226.21 Taka, which is 80.73% of the total cost of those prescriptions. Interestingly, it was observed that “the cost of medication in each prescription on average” for patients who had not been prescribed injections was only 79.08 Taka, which is three times lesser than that of patients who had been prescribed injections. These results are descriptively cited in Table – 4. and Fig-1

Injections had been most widely prescribed in patients suffering physical assaults 23.97% (95% CI: 20.80 to 27.46) followed by those patients who were diagnosed with acute watery diarrhea and respiratory tract infection where the

prescription rates for injections were 17.30% (95% CI: 14.54 to 20.46) and 11.43% (95% CI: 9.16 to 14.16) respectively. Details have been discussed in Table – 5 and Fig – 2. The most frequently used category of injections were IV Fluids which constituted 26.75% (95% CI: 24.60 to 29.02) of total usage of injections. Antibiotics, NSAIDs and antiulcerants followed the trail and their percentage usage was 22.66% (95% CI: 20.64 to 24.82), 13.44% (95% CI: 11.83 to 15.24) and 11.43% (95% CI: 9.93 to 13.12) respectively. Details are summarized in Table – 6 and Fig -3.

Interviews with the doctors and the nurses to assess their level of awareness with respect to safe injection usage and administration techniques and practices revealed that 58.33% (95% CI: 42.18 to 72.88) of them did not wipe the site of injection with rectified spirit before administering injections to patients. All of them 100% (95% CI: 88.53 to 100.00) reported that they had used new syringes and needles for reconstituting of the medication for injection. It was also observed that 72.22% (95% CI: 55.86 to 84.30) of the health providers recapped the needles of an injection after usage and 22.22% of them (95% CI: 11.47 to 38.33) reported needle stick injury (NSI) in the last 6 months. Further detailed figures regarding the matter are presented in Table – 7.

Our study also identified the underlying factors that had influenced the healthcare providers (Physicians) to prescribe injection(s). 91.67% (95% CI: 62.47 to >99.99) of the physicians claimed that they had prescribed injections because they had considered the patients' disease state to be very serious. 58.33 % (95% CI: 31.89 to 80.74) of the physicians believed that medications administered by parenteral routes were more efficacious than administered by oral or rectal routes. 66.67% (95% CI: 38.80 to 86.45) of them claimed that the medical assistants themselves prescribed injections for the patients in the absence of the physicians. Some physicians admitted that they had prescribed injections to boost their professional image as a healthcare provider. The interviewed physicians also explained that the reasons behind such high injection prescribing rates were also due to the fact that in many cases the patients themselves had demanded for injections, and sometimes injections were prescribed as an effort to strengthen litigation cases & compensation for physically assaulted patients. Please see Table – 8 for more details.

Discussion

Bangladesh is considered to be a developing country with more than 75% of the total (142 million) population living in rural areas, where, the basic needs of living particularly health and education remain largely unmet; basic healthcare is accessible to lesser than 40% of the population [16, 17]. The per capita total expenditure on health in Bangladesh is only USD 2.84 compared to USD 30-40 per capita, which is the minimum that is required for essential health interventions in low income countries [18]. Rational usage of injections is not closely monitored in Bangladesh as in other developing regions of the world and this phenomenon has led to spread of the deadly HIV and hepatitis viruses at an alarming rate.

Our study showed that the male population was prescribed more injections than the female population, which was in contradiction to a study conducted in Cambodia, which revealed that women were more likely to be prescribed injections than men and the respective usage rates were 42% vs. 28%[19]. A closer look into the injection usages at various age groups demonstrated that in the age groups "below 1 year" and "5 to 11 years", the highest percentage of injections was used whereas in age groups of 50 years and above the least amount of injections was used. These findings are worth comparing to a Pakistani study where it was reported that 79% of injection receivers were below 5 years old and 60–76% of the usages occurred in older age groups[20]. Another study conducted in China reported that children, aged below 10 years of age, and the elderly patients, who were 60 years or older, had higher injection usage rates compared with the young adults[21]. High injection usage prevalence in age groups below 12 years may be due to greater prevalence of respiratory tract infection and acute watery diarrhea. Our study also reported that 60.11% of the total patients under investigation at the UHCs were prescribed injections, which was lower than injection usage rates of 68% in a Pakistan study[20].

In our study it was deduced that the average numbers of injections prescribed per patient were 2.44 which was slightly lower than Indian studies that reported that the average number of injections prescribed per person were 2.46, 2.4, 5.1 and 3 during the years 2001, 2003, 2004, and 2005 respectively[14, 22, 15, 23]. According to our study the proportion of patients who had received one injection based medication was 35.24%, while those for patients who had been prescribed two Injectables were 28.57%, and only 5.87% of the investigated patients had been prescribed more than 6 injections. These figures are much lower than those reported in the Cambodian study where 40% of the patients in the study were prescribed one or more than one injection(s) while 18% of them were prescribed five or more Injectables [19].

Total cost of medications in prescriptions, where injections had been prescribed, was 280.22 Taka (3.92 USD); the respective figures in case of prescription that did not contain injection based medications were only 79.08 Taka (1.107 USD). These findings in our study is worth comparing with the Pakistani study which reported that the overall cost of the prescription was Rs. 95 (USD1.5) when an injection was prescribed and was Rs. 44 (USD 0.7) in the absence of injections[20]. In Pakistan 90% injections used were for generalized fever[20], but our study revealed that only 9.84% of the injections used were for general weakness and fever. However our study revealed that Respiratory Tract Infection were responsible for 11.43% of the injections being prescribed.

The major factors that have prompted high injection usage

in Bangladesh are patients' demand, belief that injections are superior to other routes, marketing efforts by the drug manufacturing companies and efforts to boost up the professional image of the healthcare providers (both doctors and medical assistant). The most common diagnosis for which injections were prescribed was 'physical assault'. The reasons for such high prescription rates of injections in assault cases may be due to the complex socio-cultural and socio-economic factors e.g. injections were prescribed according to the seriousness of disease (that is the health care providers believed that injectable medications were the solution to get prompt action if the patients' condition was very serious), or injections were prescribed to strengthen litigations to compensate legally for physically assaulted patients. However, large quantity of intravenous fluid usage with no usage of ORS (Oral Re-hydration Solute) in the patients diagnosed with 'acute watery diarrhoea' in our study, surely pointed out irrational practices against the WHO guideline[24]. In Cambodia, the main reasons stated for prescribing injections were severity of the illness (44%) and perceived patient preferences for injectable medications (40%) [19]. Our study demonstrated that 91.67% of the injections were based upon solely due to seriousness of the disease while 50% of the usage was due to the patients' demand. This phenomenon has also been previously reported in other studies e.g. Kermode[25] cited in his findings that health service providers are influenced by popular socio-cultural perceptions about injections and professional beliefs that injections are better than oral medications. They assumed that patients wanted injections, and if an injection was not provided during consultation, the patients would seek healthcare elsewhere, which meant a loss of status and income on the physicians part.[25] These can be compared with our study where 58.33% of the physicians believed that injection medications were more efficacious than oral dosage forms and another 25% of the physicians mentioned that they prescribed injections to boost their professional image. Our study also showed that 66.67% of the injection prescriptions were generated by medical assistants which are in coherence with other studies that showed that around 26% of professional medical posts in rural areas remain vacant and there is high rate of absenteeism (about 40%) and that treatments in the rural areas are mainly (about 45%) provided by unqualified health personnel including medical assistants, mid-wives, village doctors, community health workers rather than by qualified medical graduates (only 10- 20%)[26].

Our study revealed that 72.22% of the healthcare providers had recapped the injection needles after use and 22.22% of them reported needle stick injuries (NSI) during the 6 months period of our study which is higher than South Indian study that showed 17% recapping and 19% NSI [25]. However compared to the Cambodian study[19], where 58% of the respondents confirmed that they practiced proper recapping practices of injections while 53% of them reported NSI, our study had much lower NSI. Nonetheless compared to our study NSI are much lower (2.2%) in the developed parts of the world[28]. The only positive finding in our study was that all the healthcare providers (100%) reported that they were using new syringes and new needles each time while injecting medications which is better than reports from other studies of 93% in India [27] and 97% in China [29]. In our study another vital factor came into the focus where it was revealed that more than 50% of the healthcare providers did not wipe the injection site with rectified spirit or any other antiseptics before injecting the medication. This practice is very important as sterilizing injection sites prior to injecting significantly lowers risks associated with viral or bacterial infections after injection.[30] To add to that it was also revealed that more than thirty five percent of them did not wash their hands with antiseptics lotions or soaps, which further increases risk of infection. All these reports collectively indicate that unsafe injection usage practices are highly prevalent at the UHCs, which are in agreement with the study performed by Simonsen et al. which reported that 50% of injections were considered as unsafe in 14 of 19 countries[8].

Conclusion

The present study demonstrated that unnecessary and unsafe injection practices are still prevalent in Bangladesh. Such practices add more pressure to the financial burdens on the government and the general population, moreover it threatens public health safety of the whole nation as they could be potential sources to originate and spread blood borne diseases. Thus immediate governmental intervention should be taken to rationalize injection usages and train healthcare professionals about safe usage practices for injections.

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We, the authors declare that we have no conflict of interest

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Figures and Tables

Usage pattern of injections at various UHCs analyzed by gender							
	Dhamrai	Dohaar	Keranigonj	Savar	Shaturia	Singair	Total
% of male receive injection (95% CI intervals**)	75 (64.15 to 83.44)	70.37 (59.65 to 79.25)	32.14 (23.10 to 42.75)	69.07 (59.27 to 77.42)	66.67 (57.04 to 75.08)	61.25 (50.28 to 71.19)	62.50 (58.26 to 66.56)
% of female receive injection (95% CI intervals**)	71.56 (62.44 to 79.21)	51.56 (39.58 to 63.37)	38.00 (29.09 to 47.80)	41.24 (31.95 to 51.19)	69.14 (58.37 to 78.17)	65.71 (54.01 to 75.78)	55.85 (51.56 to 60.06)
% Difference between male and female(95% CI intervals**)	3 (0 to 17)	19* (3 to 35)	- 6 (- 20 to 0)	28* (14 to 41)	- 2.5 (- 16 to 0)	- 4.5 (- 20 to 0)	7* (1 to 13)
p value (Unpaired t-test)	0.6065	0.0204	0.4105	0.0001	0.7244	0.5744	0.0292
% of cases where injections were prescribed in different age group (95%CI intervals*)							
Age (Year)	Dhamrai	Dohaar	Keranigonj	Savar	Shaturia	Singair	Total
<1	91.67 (62.5 to 99.9)	100.00 (15.81 to 100.00)	42.86 (15.75 to 75.02)	83..33 (41.78 to 98.86)	83.33 (41.78 to 98.86)	75.00 (28.91 to 96.59)	78.38 (62.56 to 88.86)
1 to 4	100 (38.25 to 100)	0 (0 to 83.25)	44.44 (18.84 to 73.37)	75.00 (50.03 to 90.29)	20.00 (2.03 to 64.04)	25.00 (3.41 to 71.09)	55.26 (39.70 to 69.86)
5 to 11	100 (65.54 to 100)	100.00 (38.25 to 100.00)	25.00 (6.31 to 59.91)	100.00 (59.56 to 100.00)	46.15 (23.19 to 70.87)	60.00 (22.91 to 88.40)	66.67 (52.01 to 78.70)
12 to 19	80.00 (54.05 to 93.72)	54.55 (34.65 to 73.09)	56.25 (33.15 to 76.93)	55.00 (34.19 to 74.19)	50.00 (9.45 to 90.55)	71.43 (49.79 to 86.44)	62.50 (52.50 to 71.54)
20 to 34	70.51 (59.58 to 79.52)	61.76 (49.86 to 72.41)	43.48 (32.43 to 55.22)	56.67 (44.10 to 68.43)	72.73 (59.68 to 82.81)	71.70 (58.35 to 82.12)	62.40 (57.45 to 67.11)
35 to 49	76.67 (58.80 to 88.48)	71.43 (52.76 to 84.93)	36.67 (21.81 to 54.55)	42.00 (29.36 to 55.78)	75.56 (61.18 to 85.92)	62.16 (46.06 to 75.98)	60.00 (53.41 to 66.25)
50 to 65	59.26 (40.69 to 75.52)	60.00 (40.70 to 76.64)	13.79 (4.88 to 31.18)	50.00 (31.43 to 68.57)	65.71 (49.08 to 79.24)	47.37 (27.33 to 68.30)	49.69 (42.01 to 57.37)
>65	57.14 (24.98 to 84.25)	50.00 (67.76 to 93.24)	25.00 (9.71 to 49.97)	50.00 (23.66 to 76.34)	50.00 (20.17 to 79.83)	50.00 (18.76 to 81.24)	43.64 (31.37 to 56.74)
*95% confidence interval calculated by Modified-Wald Method							

Table: 1 - Usage pattern of injections analyzed according to gender and various age groups

No. of injection (s) per patient	Number of cases of injection usage as per UHCs						Total cases	% (Total)	*CI (95%)
	Dhamrai	Dohaar	Keranigonj	Savar	Shaturia	Singair			
1	40	31	34	33	56	28	222	35.24	31.61 to 39.05
2	47	25	22	33	32	21	180	28.57	25.18 to 32.22
3	15	21	5	17	10	23	91	14.44	11.91 to 17.41
4	10	11	3	19	8	10	61	9.68	7.60 to 12.25
5	10	5	1	8	8	7	39	6.19	4.54 to 8.37
6 and above	13	2	0	6	10	6	37	5.87	4.27 to 8.01

*95% confidence interval calculated by Modified-Wald Method

Table – 2: Single and multiple injection usage pattern in six UHCs.

Injection use pattern by Geography								
Name of UHC	No. of patient(s) (prescription)	No. of patient(s) received injection	% of patient(s) received injection	CI (95%)	Total quantity of injections	Average no. of injection per person (prescription)	p value (Unpaired t- test)	95% difference CI
Dhamrai	185	135	72.97	66.14 to 78.87	359	2.66	0.0051	13.999 to 60.668
Dohaar	152	95	62.50	54.58 to 69.81	217	2.28	0.0027	11.221 to 37.579
Keranigonj	184	65	35.33	28.62 to 42.26	110	1.69	0.1306	-2.65 to 17.65
Savar	194	116	59.79	52.77 to 66.44	309	2.66	0.0001	21.44 to 42.89
Shaturia	183	124	67.76	60.67 to 74.12	295	2.38	0.0003	16.921 to 40.079
Singar	150	95	63.33	55.37 to 70.63	250	2.63	0.0022	11.78 to 39.89
Total	1048	630	**60.11**	**57.12 to 63.04**	1540	**2.44**	**0.0021**	**69.304 to 234.029**
Monthly injection use pattern								
Month	No. of patient(s) (prescription)	Patient(s) received injection	% of patient(s) received injection	CI (95%)	Total quantity of injections	Average no. of injection per person (prescription)	p value (Unpaired t- test)	95% difference CI
January	180	103	57.22	49.92 to 64.23	281	2.73	0.0141	7.394 to 51.939
February	176	112	63.64	56.30 to 70.39	262	2.34	0.0335	2.392 to 47.608
March	173	111	64.16	56.77 to 70.93	268	2.41	0.0131	6.790 to 45.544
April	177	94	53.11	45.77 to 60.32	231	2.46	0.0001	14.75 to 30.92
May	184	110	59.78	52.56 to 66.60	246	2.24	0.0026	9.99 to 35.35
June	158	100	63.29	55.54 to 70.41	252	2.52	0.0505	-0.08 to 60.88
Total	1048	630	**60.11**	**57.12 to 63.04**	1540	**2.44**	**0.0001**	**134.392 to 168.942**

Table: 3 – Geographic and Monthly injection usage pattern

	Total Patients		Patients receiving injection				Patients not receiving injection		Difference Analysis		
Location	**Number of patients**	**Per Prescription cost**	**Number of patients**	**Per prescription cost**	**Per Prescription cost of injection (only)**	**% cost of injection**	**Number of patients**	**Per prescription cost**	**Difference* (CI, 95%)**	**% difference**	**P** value**
Dhamrai	185	227.28	135	282.07	220.65	78.22	50	79.34	203.62 (145.77 to 261.47)	73.98	0.0001
Dohaar	152	228.44	95	312.60	257.34	82.32	57	88.16	220.88 (173.36 to 268.40)	71.56	0.0001
Keranigonj	184	110.54	65	175.87	112.88	64.19	119	74.86	84.93 (28.93 to 140.92)	52.77	0.007
Savaar	194	203.64	116	294.40	245.93	83.54	78	68.68	226.29 (167.61 to 284.97)	76.75	0.0001
Shaturia	183	223.06	124	289.80	238.22	82.20	59	82.80	211.03 (154.42 to 267.65)	72.81	0.0001
Singar	150	214.38	95	286.79	240.77	83.95	55	89.30	194.24 (123.95 to 264.53)	68.57	0.0001
All Locations	**1048**	**199.99**	**630**	**280.22**	**226.21**	**80.73**	**418**	**79.08**	**189.29 (163.05 to 215.52)**	**70.72**	**0.0001**

*Statistically significant difference calculated by Paired t - test, **p value calculated by paired t - test

Table - 4: Cost analysis of injection usage at different UHCs

Injection usage in different situations at different UHCs (95% CI*)							
Diagnosis	Dhamrai	Dohaar	Keranigonj	Savar	Shaturia	Singair	Total
Physical Assault	9.63 (5.6 to 15.90)	63.16 (53.11 to 72.18)	1.54 (0.01 to 9.00)	16.38 (10.66 to 24.25)	25.81 (18.88 to 34.19)	27.37 (19.37 to 37.12)	23.97 (20.80 to 27.46)
Acute Watery Diarrhoea	24.44 (17.93 to 32.37)	9.47 (4.87 to 17.23)	35.38 (24.85 to 47.55)	12.93 (7.88 to 20.35)	14.52 (9.30 to 21.87)	11.58 (6.43 to 19.72)	17.30 (14.54 to 20.46)
Respiratory tract infection	17.04 (11.57 to 24.33)	4.21 (1.31 to 1.67)	6.15 (1.98 to 15.22)	14.66 (9.26 to 22.32)	11.29 (6.73 to 18.18)	10.53 (5.64 to 18.48)	11.43 (9.16 to 14.16)
Acute Abdomen with PUD**	14.81 (9.72 to 21.85)	0 (0 to 4.66)	12.31 (6.11 to 22.71)	13.79 (8.57 to 21.34)	13.71 (8.64 to 20.96)	9.47 (4.87 to 17.23)	11.11 (8.88 to 13.82)
General weakness and fever	9.63 (5.6 to 15.90)	2.11 (0.12 to 7.81)	6.15 (1.98 to 15.22)	11.21 (6.54 to 18.36)	13.71 (8.64 to 20.96)	13.68 (8.04 to 22.15)	9.84 (7.74 to 12.43)
Full term pregnancy with labour pain	10.37 (6.17 to 16.77)	2.11 (0.12 to 7.81)	27.69 (18.23 to 39.65)	5.17 (2.16 to 11.06)	1.61 (0.08 to 6.06)	3.16 (0.69 to 9.27)	7.14 (5.36 to 9.44)
Road Traffic Accident	2.22 (0.47 to 6.62)	10.53 (5.64 to 18.48)	1.54 (0.01 to 9.00)	7.76 (3.96 to 14.27)	4.03 (1.49 to 9.34)	7.37 (3.38 to 14.67)	5.56 (4.0 to 7.65)
Organo Phosphate Poisoning	0.74 (<0.01 to 4.49)	0 (0 to 4.66)	0 (0 to 6.68)	10.34 (5.88 to 17.35)	4.84 (2.02 to 10.37)	5.26 (1.97 to 12.03)	3.81 (2.55 to 5.63)
Others	11.11 (6.75 to 17.63)	8.42 (4.11 to 15.96)	9.23 (3.97 to 19.04)	7.76 (3.96 to 14.27)	10.48 (6.11 to 17.24)	11.58 (6.43 to 19.72)	9.84 (7.74 to 12.43)

*95% confidence interval calculated by Modified-Wald Method
**PUD = Peptic Ulcer Disease

Table – 5: Injection usage in different situations at different UHCs

Therapeutic categories of injections prescribed at different UHCs (95% CI*)							
Category of drugs	Dhamrai	Dohaar	Keranigonj	Savar	Shaturia	Singair	Total
IV fluid	29.25 (24.78 to 34.16)	27.65 (22.11 to 33.96)	37.27 (28.80 to 46.60)	25.89 (21.31 to 31.06)	30.51 (25.53 to 35.99)	14.40 (10.55 to 19.32)	26.75 (24.60 to 29.02)
Antibiotic	23.68 (19.56 to 28.35)	21.66 (16.68 to 27.63)	17.27 (11.26 to 25.49)	28.48 (23.73 to 33.76)	14.24 (10.68 to 18.71)	27.20 (22.05 to 33.04)	22.66 (20.64 to 24.82)
NSAID	6.96 (4.72 to 10.12)	29.49 (23.81 to 35.89)	4.55 (1.69 to 10.47)	7.12 (4.70 to 10.59)	18.98 (14.90 to 23.86)	14.00 (10.21 to 18.88)	13.44 (11.83 to 15.24)
Antiulcerant	10.03 (7.30 to 13.60)	12.44 (8.65 to 17.54)	5.45 (2.28 to 11.63)	12.62 (9.34 to 16.82)	11.53 (8.33 to 15.71)	13.60 (9.86 to 18.44)	11.43 (9.93 to 13.12)
Benzodiazepine	6.13 (4.04 to 9.15)	5.99 (3.45 to 10.07)	3.64 (1.12 to 9.28)	4.85 (2.90 to 7.92)	9.49 (6.61 to 13.42)	8.40 (5.50 to 12.56)	6.69 (5.54 to 8.05)
Antispasmodic	7.52 (5.18 to 10.76)	0.46 (0.01 to 2.83)	5.45 (2.28 to 11.63)	8.41 (5.77 to 12.08)	5.76 (3.57 to 9.09)	8.40 (5.50 to 12.56)	6.36 (5.24 to 7.70)
Corticosteroid	4.46 (2.71 to 7.17)	1.38 (0.28 to 4.17)	0.91 (0.01 to 5.47)	5.18 (3.15 to 8.30)	3.73 (2.02 to 6.63)	6.0 (3.60 to 9.73)	4.03 (3.15 to 5.13)
Antiemetic	6.41 (4.27 to 9.47)	0 (0 to 2.09)	10.91 (6.21 to 18.25)	0.65 (0.02 to 2.49)	1.69 (0.61 to 4.02)	3.20 (1.52 to 6.29)	3.25 (2.46 to 4.26)
Diuretic	0.84 (0.17 to 2.55)	0.46 (0.01 to 2.83)	0.91 (0.01 to 5.47)	2.27 (1.01 to 4.70)	3.39 (1.77 to 6.21)	1.60 (0.48 to 4.19)	1.69 (1.14 to 2.47)
Labour inducer	1.39 (0.50 to 3.31)	0 (0 to 2.09)	12.73 (7.61 to 20.36)	0.65 (0.02 to 2.49)	0 (0 to 1.55)	0.4 (0.01 to 2.46)	1.43 (0.93 to 2.17)
Tetanus Toxoid	0.84 (0.17 to 2.55)	0 (0 to 2.09)	0 (0 to 4.05)	1.94 (0.79 to 4.27)	0.34 (0.01 to 2.09)	1.20 (0.24 to 3.63)	0.84 (0.48 to 1.45)
Others	2.51 (1.25 to 4.77)	0.46 (0.01 to 2.83)	0.91 (0.01 to 5.47)	1.94 (0.79 to 4.27)	0.34 (0.01 to 2.09)	1.60 (0.48 to 4.19)	1.43 (0.93 to 2.17)

*95% confidence interval calculated by Modified-Wald Method

IV Fluids (includes Normal Saline, 5% Dextrose, 5% Dextrose+0.9% Sodium Chloride, Hartmann Solution, Cholera Saline, 5% Amino Acid); **Antibiotics** (includes Amoxicillin, Ampicillin, Procaine Penicillin, Cloxacillin, Flucloxacillin, Ciprofloxacin, Levofloxacin, Ceftriaxone, Cefradine, Cefuroxime, Cefotaxime, Gentamycin, Metronidazole); **NSAIDs** (includes Diclofenac Sodium, Ketorolac); **Antiulcerants** (Ranitidine, Omeprazole, Pentoprazole); **Benzodiazepine** (includes Diazepam); **Antispasmodics** (includes Tiemonium methylsulphate, Hyscine butyl bromide, Atropine sulphate); **Corticosteroids** (Hydrocortisone, Dexamethasone, Prednisolone); **Antiemetics** (includes Procholrperazine, Metoclopramide, Ondansetron, Domperidone); **Diuretics** (includes Frusemide); **Labour inducer** (includes Oxytocin) and **Others** (includes ORS, Vitamin, Iron, Aminophylline, Procyclidine, Cough preparation)

Table – 6: Distribution of different category of injection drugs at UHCs

% of respond among 36 healthcare providers who were interviewed: 2 doctors and 4 nurses from each UHC							
Question	Dhamrai	Dohaar	Keranigonj	Savar	Shaturia	Singair	Total
Do the health providers wash their hands with antiseptic soap? (%)	50.00 (95% CI: 18.76 to 81.24)	16.67 (95% CI: 1.14 to 58.22)	16.67 (95% CI: 1.14 to 58.22)	50.00 (95% CI: 18.76 to 81.24)	33.33 (95% CI: 9.25 to 70.43)	50.00 (95% CI: 18.76 to 81.24)	36.11 (95% CI: 22.42 to 52.48)
Do they wipe the injection place with rectified spirit before injection? (%)	66.67 (95% CI: 29.57 to 90.75)	33.33 (95% CI: 9.25 to 70.43)	66.67 (95% CI: 29.57 to 90.75)	83.33 (95% CI: 41.78 to 98.86)	33.33 (95% CI: 9.25 to 70.43)	66.67 (95% CI: 29.57 to 90.75)	58.33 (95% CI: 42.18 to 72.88)
Do they prepare the injection on a clean table or tray? (%)	33.33 (95% CI: 9.25 to 70.43)	0.00 (95% CI: 0.00 to 44.28)	16.67 (95% CI: 1.14 to 58.22)	16.67 (95% CI: 1.14 to 58.22)	0.00 (95% CI: 0.00 to 44.28)	0.00 (95% CI: 0.00 to 44.28)	11.11 (95% CI: 3.82 to 25.91)
Do they use new syringe and new needle each time of injection also for reconstitution of medicine? (%)	100.00 (95% CI: 55.72 to 100.00)	100.00 (95% CI: 55.72 to 100.00)	100.00 (95% CI: 55.72 to 100.00)	100.00 (95% CI: 55.72 to 100.00)	100.00 (95% CI: 55.72 to 100.00)	100.00 (95% CI: 55.72 to 100.00)	100.00 (95% CI: 88.53 to 100.00)
Do they recap the needle after use of injection?	66.67 (95% CI: 29.57 to 90.75)	83.33 (95% CI: 41.78 to 98.86)	83.33 (95% CI: 41.78 to 98.86)	50.00 (95% CI: 18.76 to 81.24)	83.33 (95% CI: 41.78 to 98.86)	66.67 (95% CI: 29.57 to 90.75)	72.22 (95% CI 55.86 to 84.30)
Do they report needle stick injury in the last 6 months? (%)	16.67 (95% CI: 1.14 to 58.22)	33.33 (95% CI: 9.25 to 70.43)	33.33 (95% CI: 9.25 to 70.43)	0.00 (95% CI: 0.00 to 44.28)	16.67 (95% CI: 1.14 to 58.22)	33.33 (95% CI: 9.25 to 70.43)	22.22 (95% CI: 11.47 to 38.33)
Are they trained in injection safety practices? (%)	66.67 (95% CI: 29.57 to 90.75)	33.33 (95% CI: 9.25 to 70.43)	66.67 (95% CI: 29.57 to 90.75)	83.33 (95% CI: 41.78 to 98.86)	33.33 (95% CI: 9.25 to 70.43)	66.67 (95% CI: 29.57 to 90.75)	58.33 (95% CI: 42.18 to 72.88)
Have they completed primary hepatitis B immunization (3 doses)? (%)	16.67 (95% CI: 1.14 to 58.22)	0.00 (95% CI: 0.00 to 44.28)	16.67 (95% CI: 1.14 to 58.22)	33.33 (95% CI: 9.25 to 70.43)	16.67 (95% CI: 1.14 to 58.22)	0.00 (95% CI: 0.00 to 44.28)	13.89 (95% CI:5.61to 29.13)
*95% confidence interval calculated by Modified-Wald Method							

Table – 7: Indicators for safe use of injection(s) and response of doctors and nurses

Factors that influence vigorous injections use	Doctors View (%)
Seriousness of the disease	91.67 (95% CI: 62.47 to >99.99)
Physical assault for litigation & compensation.	41.67 (95% CI: 19.26 to 68.11)
Patients' demand.	50 (95% CI: 25.38 to 74.62)
Doctor's effort to boost professional image.	25 (95% CI: 8.27 to 53.85)
Injection is more efficacious than oral dosage form.	58.33 (95% CI: 31.89 to 80.74)
Prescription by medical assistants in absence of the doctors.	66.67 (95% CI: 38.80 to 86.45)
Persuasion by Medical Representative of Pharmaceutical Company	16.67 (95% CI: 3.50 to 46.00)
Pressure on doctors to use the medicine stock before expiry date.	8.33 (95% CI: 0.01 to 37.53)
*95% confidence interval calculated by Modified-Wald Method	

Table – 8: Factors that influence vigorous injections use by doctors, nurses and others

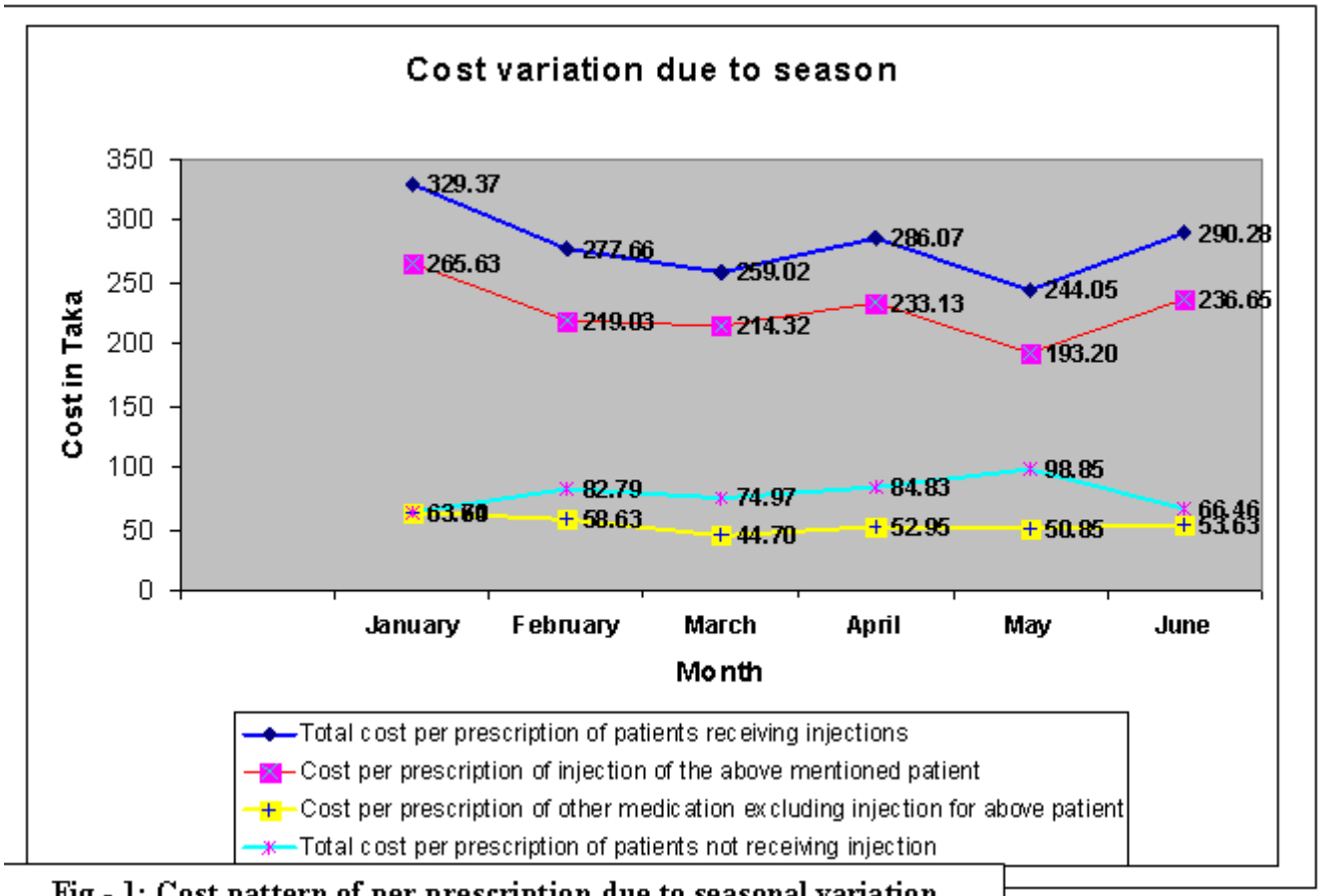

Fig - 1: Cost pattern of per prescription due to seasonal variation.

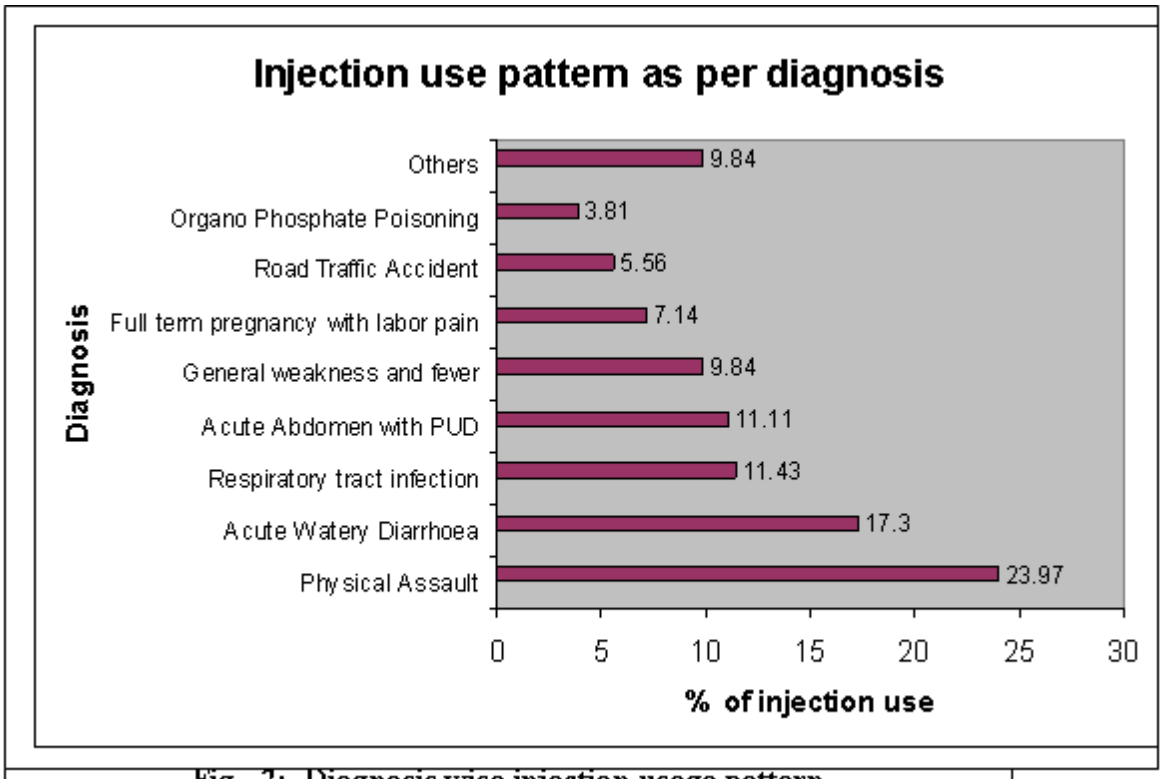

Fig - 2: Diagnosis wise injection usage pattern

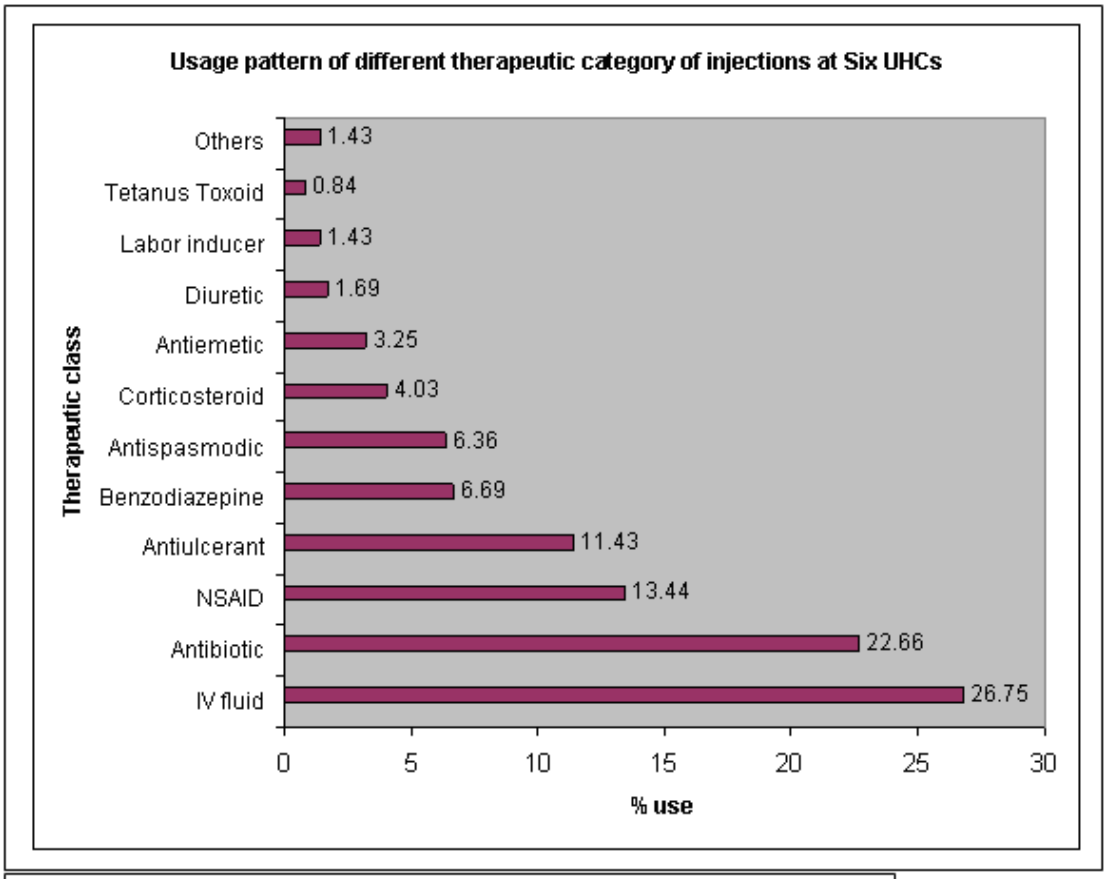

Fig – 3, Usage pattern of injection in different therapeutic classes