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Original Research Article

Rational and irrational use of intra-venous infusions: a cross-sectional study among patients of a tertiary care hospital

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ABSTRACT

Background: Intravenous infusions (IV) are a rapid mean of administering drugs. Hospitals are commonplace for their use, but at the same time they have many serious potential complications. This study aims to know the justified use of intravenous infusion among patients of a tertiary care hospital and awareness about its use.
Methods: It was a cross-sectional study in which 249 subjects were conveniently studied. Nil per oral, severity of dehydration, vomiting, and diarrhoea was used as confirmatory criteria for using IV Infusions. Questionnaire with verbal consent was used to collect the data. Descriptive statistical analysis was applied to analyse the data and presented as means, frequencies and percentages in the form of tables and figure.
Results: Total n249 (100%) subjects, n68 (27.3%) males and n181 (72.7%) females with average age was 24.05±14.21 years participated. Among n116 (46.6%) irrational users, females n76 (30.5%) were more then males n40 (16.1) with significant difference, p= 0.018. However, no significant difference was found among other variables (age groups, profession, education, awareness and rational or irrational use of IV infusion). Majority n249, n204 (81.9%) were not aware of the IV infusion medication error and doctors were most common unjustified prescribers of IV infusion, n105 (90.5%).
Conclusions: The study concluded with the more prevalent irrational IV infusion use in our setup. Doctors appeared the dominant prescriber of irrational IV infusion. This statement is astonishing and must not be overlooked. Female gender, adult age, under-grade patients and students are more exposed to irrational IV infusion.

Keywords: Awareness, Doctors, Intravenous infusions, Rational

INTRODUCTION

In a rational system of medicine, medicines reach the inpatient in hospitals following different steps, i.e. prescribing, transcribing, dispensing, administration, and monitoring. Through this system, the basic objective of the health care provider is to achieve optimal therapeutic benefits.[1] Rational use of medicine, as quoting by the World Health Organization (WHO) "Patient receives proper medication according to their clinical needs, in doses that meet their own individual requirements for an adequate period of time and at the lowest cost to them and their community." Its use is considered irrational if it does not fulfill any of its criteria defined by the WHO.[2]

Medication errors are incident results in patient harm through medicines either by themselves or when the medicines are in the physician's regulation.[3] Intravenous (IV) infusions error occurs mostly in emergency departments and medical or surgical wards where there is no regular cardiovascular monitoring and where the prescription of IV infusion is usually left in the hands of the most junior medical staff that generally lack relative skills and experiences. In hospitals, every 1 in 5 people receiving IV medication, facing serious illnesses or morbidity due to their mis-administration.[4] Reporting medication errors are very important to refine the administration of IV infusion system and to make the right use of medicine certain.[3,5] There are many methods of reporting IV medication errors, i.e. direct observation, chart review, incident reporting and so forth. Among all of them, a direct observational method is the most accurate. Whenever intravenous fluids are prescribed, they must be given musing patients clinical needs like in other medicines i.e. indication, dose, monitoring, and volume, to prevent the patient from complications like hypo or hypernatremia, fluid overload, organ damage or failure. hyperchloremic metabolic acidosis, coagulation abnormalities etc.[6,7] IV infusions are a non-oral way of giving fluids and medication directly into the bloodstream.[7] Their delivery becomes important in cases like adding fluid volume in case of electrolyte imbalance, maintaining life support in casualty or in the intensive care unit (ICU) and for easy access to medication. Ninety percent of patients in the hospital got IV infusions at any stage during their admission.[5] Albeit it is very common, but also reported as a forceful factor of morbidity and mortality associated with nosocomial infections.[8-10] It is shocking to hear that 100,000 patients in the United State develop bloodborne diseases due to the irrational use of IV infusions.[11] The nonoperative complications either from drug treatment, therapeutic misadventure or diagnostic errors are most common. 61% of life-threatening complications are the results of IV infusions errors.[12] Transmission of Hepatitis B, C virus, human immunodeficiency virus, abscess, septicemia, malaria, and viral hemorrhagic fever are important outcomes of unjustified use of IV infusions.[13]

Administration of medicine is the most vulnerable stage prior to the error, and in the case of IV infusions, can lead to a life-threatening stage.[6] As IV infused medicines inject directly into the blood their reaction occurs within a few seconds. In some cases, patients tasted the fate of death due to mis-administration of IV medicine.[14] Admitting that IV infusions are cornerstones in critical condition, but they must be used with great care, piercing of skin through needles makes the vein pregnable to so many micro-organisms colonizing as the flora of the skin. They may walk along the IV line seed into the blood and can cause localized or generalized infections.[8,9,15] A national trauma bank concluded that pre-hospital IV infusions increase the risk of mortality, i.e. 49.3% of 776734 patients received pre-hospital IV infusions out of which 24.13% patients were more likely to die.[16] The incidence of serious IV infusion errors in the USA and UK is 60% and 56%, respectively, and in Germany, 23% of them occur during administration of drugs.[17] Of the 19% injuries reported by the Harvard Medical Practice Study, 9.5% is the result of medication errors.[18] China surpasses other countries for using IV infusions i.e. 10.4 billion bottles/years. It means there is 8 bottles/capita for 1.3 billion Chinese people. Rare IV infusions errors are reported in China, but if the error rate of only 9% is applied, then the annual rate will be 900 million errors/year in Chinese hospitals. As reported by Qian ding IV infusion errors in a large teaching hospital in China is 12.8%.[19] IV infusions are the preventable cause of morbidity and mortality, and most important it is the most common way of treatment in our society and worldwide too. During handling the patient ineptitude and laxness can put the patient to lethal state. This study aims to know the justified use of intra venous infusion among patients of a tertiary care hospital and awareness regarding the hazards of such use, to create awareness among medical practitioner about this serious issue. Empirical research is needed to investigate the current breadth of practice, the risks associated with the prescription of the unjustified use of IV infusions and the effectiveness of various interventions in mitigating these issues.

METHODS

It was a cross-sectional study conducted at Sheikh Khalifa Bin Zaid (SKBZ), Muzaffarabad, Azad Kashmir from 1st September 2016 to 10th January 2017. Convenient sampling technique was used to collect data from 249 patients of different departments (emergency ER, outpatient departments OPD's and wards). All subjects, irrespective of gender and age visiting SKBZ Muzaffarabad and treated with IV infusions were included in this study. Mentally handicapped and those not willing to become a participant of our study were excluded from the study.

A self-administered pre-tested questionnaire was used for data collection and verbal consent was taken from each participant. The study was approved by the Research Committee of Azad Jammu& Kashmir Medical College (AJKMC), Muzaffarabad. The questionnaire included demographic data and questions according to the aims and objectives of the study. The use of IV infusions was considered rational: If the subject couldn't take anything by mouth, preoperative, perioperative and postoperative cases, all cases in the ER, OPD's and wards, with intractable vomiting, severe diarrhoea or severe dehydration, trauma or accidents and pre or post-delivery cases (as per recommendations of National Institute for Health and Care Excellence (NICE). All the data were piled up by the principal author and analyzed by SPSS (20. version) software. Descriptive statistics were used to describe the data.

RESULTS

Total n249 (100%) subjects, n68(27.3%) males and n181 (72.7%) females (male to female ratio=1.8:5) participated with a 100% response rate. Their average age was 24.05±14.21years (mean±standard deviation). Among n116(46.6%) irrational users, females n76(30.5%) were more than males n40(16.1) with significant difference, p=0.018. However, no significant difference was found between age groups, profession, education, awareness and rational or irrational use of IV infusion, (p=0.124, 0.384, 0.191 and 0.49 respectively).

Among n249, n204 (81.9%) were not aware of the IV infusion medication error and however, most of them n105 (42.2%) were rationally treated for different diseases (Table 1).

Among irrational users of IV infusion n116 (100%), it was found that doctors are the most common prescribers n105 (90.5%). Majority of females n70 (60.3%), age group of 21-30 years n36 (31.0%), school going children n40 (34.5%) especially the secondary grade n37(31.9%) were more prevalent users of irrational IV infusion (Table 2, 3, 4 and 5). In acute conditions of patients, like trauma and peri-operative conditions, no irrational use of IV infusion was observed (Figure 1).

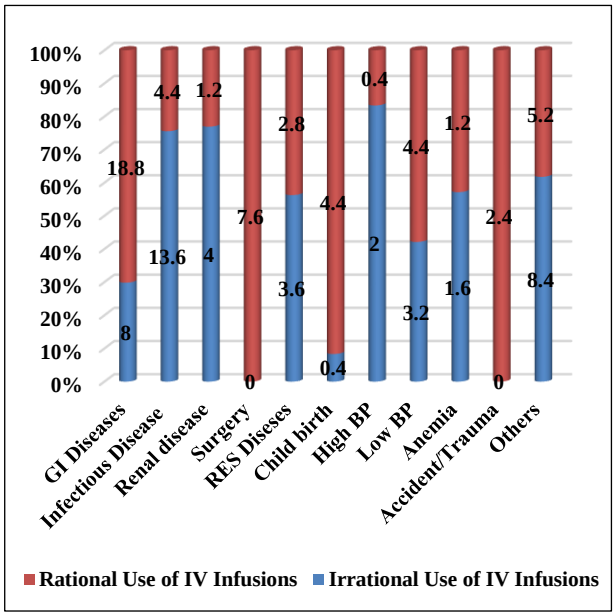

Figure 1: Percentages comparison of indications for prescribing IV infusions irrationally and rationally.

Table 1: Demographic variables and rational and irrational use of IV infusions.

Variables	Frequency=n (%)		Total	p value
Gender	**Rational users**	**Irrational users**		
Male	28 (11.2%)	40 (16.1%)	68 (27.3%)	0.018
Female	105 (42.2)	76 (30.5%)	181 (72.7%)	
Total	133 (53.4%)	116 (46.6%)	249 (100%)	
Age groups				
<10 years	13 (5.2%)	16 (6.4%)	29 (11.6%)	0.124
11-20 years	34 (13.7%%)	35 (14.1%)	69 (27.7%)	
21-30 years	44 (17.7%)	39 (15.7%)	83 (33.3%)	
31-40 years	26 (10.4%)	9 (3,6%)	35 (14.1%)	
41-50 years	11 (4.4%)	9 (3.6%)	20 (8.0%)	
Above 51-60 years	5 (2%)	8 (3.2%)	13 (5.2%)	
Profession				
Student	63 (25.3%)	43 (17.3%)	106 (42.6%)	0.384
Job holders	35 (14.1%)	36 (14.5%)	71 (28.5%)	
Children	10 (4.0%)	13 (5.3%)	23 (9.2%)	
Job less	25 (10%)	24 (9.6%)	7 (2.8%)	
Awareness				
Yes	28 (11.2%)	17 (6.8%%)	45 (18.1%)	
No	105 (42.2%)	99 (39.8%)	204 (81.9%)	0.149
Education				
Illiterate	25 (10%)	32 (12.9%)	57 (22.9%)	
Upto 10th grade	42 (16.8%)	43 (17.2%)	85 (34%)	
11-12th Grade	23 (9.2%)	12 (4.8%)	35 (14.1%)	
Graduation	16 (6.4%)	14 (5.6%)	30 (12%)	
Post-graduation	27 (10.8%)	15 (6%)	42 (16.9%)	

Table 2: Gender-wise IV infusion cross tabulation against prescribers (p=0.18).

IV infusions	Gender	Prescribers				Total
		Doctor	Nurse	Parents	Siblings/Relatives	
Irrational use	Male	35 (30.2%)	2 (1.7%)	1 (0.9%)	2 (1.7%)	40 (34.5%)
	Female	70 (60.3%)	3 (2.6%)	2 (1.7%)	1 (0.9%)	76 (65.5%)
	Total	105 (90.5%)	5 (4.3%)	3 (2.6%)	3 (2.6%)	116 (100.0%)
Rational use	Male	24 (18.0%)	3 (2.3%)		1 (0.8%)	28 (21.1%)
	Female	102 (76.7%)	3 (2.3%)		0 (0.0%)	105 (78.9%)
	Total	126 (94.7%)	6 (4.5%)		1 (0.8%)	133 (100.0%)
Total	Male	59 (23.7%)	5 (2.0%)	1 (0.4%)	3 (1.2%)	68 (27.3%)
	Female	172 (69.1%)	6 (2.4%)	2 (0.8%)	1 (0.4%)	181 (72.7%)
	Total	231(92.8%)	11(4.4%)	3(1.2%)	4(1.6%)	249(100.0%)

Table 3: Comparison of different age groups IV infusion users against prescribers.

IV infusions	Age groups	Prescribers				Total
		Doctor	Nurse	Parents	Sibling/Relatives	
Irrational use	<10 years	15(12.9%)	1(0.9%)	0(0.0%)	0(0.0%)	16(13.8%)
	11-20 years	32(27.6%)	0(0.0%)	2(1.7%)	1(0.9%)	35(30.2%)
	21-30 years	36(31.0%)	2(1.7%)	0(0.0%)	1(0.9%)	39(33.6%)
	31-40 years	7(6.0%)	0(0.0%)	1(0.9%)	1(0.9%)	9(7.8%)
	41-50 years	9(7.8%)	0(0.0%)	0(0.0%)	0(0.0%)	9(7.8%)
	Above 51	6(5.2%)	2(1.7%)	0(0.0%)	0(0.0%)	8(6.9%)
	Total	105(90.5%)	5(4.3%)	3(2.6%)	3(2.6%)	116(100.0%)
Rational use	< 10 years	13(9.8%)	0(0.0%)		0(0.0%)	13(9.8%)
	11-20 years	32(24.1%)	2(1.5%)		0(0.0%)	34(25.6%)
	21-30 years	42(31.6%)	1(0.8%)		1(0.8%)	44(33.1%)
	31-40 years	23(17.3%)	3(2.3%)		0(0.0%)	26(19.5%)
	41-50 years	11(8.3%)	0(0.0%)		0(0.0%)	11(8.3%)
	Above 51	5(3.8%)	0(0.0%)		0(0.0%)	5(3.8%)
	Total	126(94.7%)	6(4.5%)		1(0.8%)	133(100.0%)
Total	< 10 years	28(11.2%)	1(0.4%)	0(0.0%)	0(0.0%)	29(11.6%)
	11-20 years	64(25.7%)	2(0.8%)	2(0.8%)	1(0.4%)	69(27.7%)
	21-30 years	,	3(1.2%)	0(0.0%)	2(0.8%)	83(33.3%)
	31-40 years	30(12.0%)	3(1.2%)	1(0.4%)	1(0.4%)	35(14.1%)
	41-50 years	20(8.0%)	0(0.0%)	0(0.0%)	0(0.0%)	20(8.0%)
	Above 51	11(4.4%)	2(0.8%)	0(0.0%)	0(0.0%)	13(5.2%)
	Total	231(92.8%)	11(4.4%)	3(1.2%)	4(1.6%)	249(100.0%)

Table 4: Comparison of different occupations' IV infusion users against prescribers.

IV infusions	Occupation	Prescriber				Total
		Doctor	Nurse	Parents	Siblings/ Relatives	
Irrational Use	Child	13(11.2%)	0(0.0%)	0(0.0%)	0(0.0%)	13(11.2%)
	Student	40(34.5%)	2(1.7%)	1(0.9%)	0(0.0%)	43(37.1%)
	Job Holder	32(27.6%)	2(1.7%)	0(0.0%)	2(1.7%)	36(31.0%)
	Job Less	20(17.2%)	1(0.9%)	2(1.7%)	1(0.9%)	24(20.7%)
	Total	105(90.5%)	5(4.3%)	3(2.6%)	3(2.6%)	116(100.0%)
Rational Use	Child	10(7.5%)	0(0.0%)		0(0.0%)	10(7.5%)
	Student	61(45.9%)	2(1.5%)		0(0.0%)	63(47.4%)
	Job Holder	31(23.3%)	3(2.3%)		1(0.8%)	35(26.3%)
	Job Less	24(18.0%)	1(0.8%)		0(0.0%)	25(18.8%)
	Total	126(94.7%)	6(4.5%)		1(0.8%)	133(100.0%)
Total	Child	23(9.2%)	0(0.0%)	0(0.0%)	0(0.0%)	23(9.2%)
	Student	101(40.6%)	4(1.6%)	1(0.4%)	0(0.0%)	106(42.6%)
	Job Holder	63(25.3%)	5(2.0%)	0(0.0%)	3(1.2%)	71(28.5%)
	Job Less	44(17.7%)	2(0.8%)	2(0.8%)	1(0.4%)	49(19.7%)
	Total	231(92.8%)	11(4.4%)	3(1.2%)	4(1.6%)	249(100.0%)

Table 5: Comparison of different educational status of IV infusion users versus prescribers.

IV infusions	Education status	Prescribers				
		Doctor	**Nurse**	**Parents**	**Siblings/Relatives**	**Total**
Irrational use	Secondary	37(31.9%)	3(2.6%)	2(1.7%)	1(0.9%)	43(37.1%)
	Higher secondary	11(9.5%)	0(0.0%)	1(0.9%)	0(0.0%)	12(10.3%)
	Graduation	14(12.1%)	0(0.0%)	0(0.0%)	0(0.0%)	14(12.1%)
	Post graduation	15(12.9%)	0(0.0%)	0(0.0%)	0(0.0%)	15(12.9%)
	Illiterate	28(24.1%)	2(1.7%)	0(0.0%)	2(1.7%)	32(27.6%)
	Total	105(90.5%)	5(4.3%)	3(2.6%)	3(2.6%)	116(100.0%)
IV infusions	**Education status**			**Prescribers**		
		Doctor	**Nurse**	**Parents**	**Siblings/relatives**	**Total**
Rational use	Secondary	38(28.6%)	3(2.3%)		1(0.8%)	42(31.6%)
	Higher secondary	21(15.8%	2(1.5%)		0(0.0%)	23(17.3%)
	Graduation	16(12.0%)	0(0.0%)		0(0.0%)	16(12.0%)
	Post graduation	27(20.3%)	0(0.0%)		0(0.0%)	27(20.3%)
	Illiterate	24(18.0%)	1(0.8%)		0(0.0%)	25(18.8%)
	Total	126(94.7%)	6(4.5%)		1(0.8%)	133(100.0%)
Total	Secondary	75(30.1%)	6(2.4%)	2(0.8%)	2(0.8%)	85(34.1%)
	Higher Secondary	32(12.9%)	2(0.8%)	1(0.4%)	0(0.0%)	35(14.1%)
	Graduation	30(12.0%)	0(0.0%)	0(0.0%)	0(0.0%)	30(12.0%)
	Post graduation	42(16.9%)	0(0.0%)	0(0.0%)	0(0.0%)	42(16.9%)
	Illiterate	52(20.9%)	3(1.2%)	0(0.0%)	2(0.8%)	57(22.9%)
	Total	231(92.8%)	11(4.4%)	3(1.2%)	4(1.6%)	249(100.0%)

DISCUSSION

IV infusion is a direct and prompt way of treatment, but it is menacing too. That's why so much vigilance is entailed in dealing with them. The present analysis shows the significant outcome where 46.58% unjustified prescriptions of IV infusions are observed because more people get maltreatment than the study in Iraq where only 36.8% participants used it unnecessarily.[20]

As claim by a survey in Iraq, 80% patients in the emergency ward and 90% in the surgical ward are directed to use IV infusions by doctors, in this study 92.8% cases were prescribed by doctors. When the doctors were asked about the rationale, they replied that it is by the patient's persuasions they want rapid treatment.[20]

Our evidence is confirmed by a report which shows junior doctors are commonly responsible for the errors in prescription of IV medications. This is explained by a study in south wales, which says 58% junior doctors never attend any formal teaching session on this subject and 38% never go into the details of the effect of drugs on blood before prescribing them.[21] IV infusion should be authorized after an accurate diagnosis.[20] But in the present study in some cases, IV infusions were prescribed just for the satisfaction of the patient like gastric pain, general weakness, diarrhea, vomiting when oral intake was satisfactory, that makes its use entirely unjustified. In the current study, more students 37% get IV infusions prescription irrationally than other participants and a survey in the Iraqi postgraduate medical journal does not make any such result. WHO study shows, two of the major factors contributing to transmission of blood borne pathogens are overuse of IV injections and lack of awareness of risk of unsafe injections.

In present study, 81.9% of patients were unaware of the hazardous use of irrational IV infusion. WHO has a major focus on raising awareness of the risks of unsafe injections among patient and health care providers to decrease the IV medication errors.[22] This factor is also supported by a study on the assessment of educational intervention measures 3rd year medical students and postgraduate students for aseptic measures to be taken while passing peripheral cannula shows significant decline in the rate of CR-BSI.

In the present study vomiting and dehydration is another important factor for unjustified prescription of IV infusions ($p < 0.01$ for both variables). But oral re-hydration is considered more beneficial than IV medications for the treatment of above-mentioned ailments. It also has a low cost-effectiveness as it decreases hospital workload, decrease rate of admissions and also save the patient from peripheral cannulation's complications.[21] These results may be an alarming sign for the health care providers and policy makers to pay more attention towards creating awareness among people about the hazards of the unjustified prescription of IV infusions, and also educating health care staff about the

legitimate or the rightful use of IV infusions. There is still more room for further research to be done in this regard to properly identify the extent of damage being caused by this malpractice and propose precautionary measures to be taken while using IV infusions especially in this area, to make medical facilities far better in the future.

CONCLUSION

The study concludes with the more prevalent irrational IV infusion use in our setup. Doctors appeared the dominant prescriber of irrational IV infusion. This statement is astonishing and must not be overlooked. Female gender, adult age, under-grade patients and students are more exposed to irrational IV infusion. Majority of unjustified IV infusion users were unaware of it hazards. So there is a dire need to create awareness about the proper use of IV infusions in the current area under study.

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