

**Title:**

***Intravenous Infusions Medication Errors Among Patients Visiting  
Shiekh Khalifa Bin Zaid Combined Military Hospital Muzaffarabad;  
A Cross-sectional Study***

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## Cover letter for submission of manuscript

Dated:     /     / 2018.

To,  
Editor in Chief,  
JAMSA.

I, the principal author, **Amber Gul**, submit my article entitled ***“Irrational Use of IV Infusions in Muzaffarabad District; A Cross-sectional Study”*** for publication in Journal of Asian Medical Students Association.

Keeping in view of aims of JAMSA, this research article is going to have a very positive impact on our society. This article is an important piece of information to make our field of health much more efficient especially in the area under study.

With the submission of this article, I would like to undertake that:

- The material submitted to JAMSA is new, original and has not been submitted to another publication for concurrent consideration
- Upon acceptance by JAMSA, all copyright ownership of the article is transferred to JMSA.
- It is attested that all subjects undertaken as a part of the research are in compliance with the regulation of our institution and with generally accepted guidelines governing such work.
- It is hereby submitted that manuscript has been seen and approved by all authors'
- There is no conflict of interest in this manuscript.
- If there has been any prior publication of any part of the work, this should be acknowledged and appropriate written permission included.
- There are no directly related manuscripts or abstracts, published or unpublished, by any authors of this paper.
- My institution, Azad Jammu & Kashmir Medical College Muzaffarabad, are fully aware of this submission.
- This research project was conducted under the supervision of: Dr. Anwar-UL-Haq, HOD of Pathology department, AJKMC, Muzaffarabad.
- This research project was not sponsored by any agency or institution.

\_\_\_\_\_  
amber gul

Signature of corresponding (author on behalf of all).

**Abstract:**

IV Infusions are a rapid mean of infusing drugs. Hospitals are common place for their use, but at the same time they have many serious potential complications.

**Aims & objectives:** This study aims to know the prevalence of irrational use of intravenous infusions and awareness among patients visiting SKBZ/CMH regarding hazards of such use.

**Materials and Methods:** It was a cross-sectional study in which 270 subjects were studied. Oral intake of fluids, severity of dehydration, vomiting, and diarrhea was used as confirmatory criteria for using IV Infusions. The data was collected, analyzed and tabulated at last categorize as the irrational versus rational use of IV Infusions.

**Results:** Of 270 subjects, 73.1% were females. 7.8% subjects never used IV Infusions in their life. Of all users, 43.3% were unjustified users and this was a significant aggregate that people may get harmed. The subjects blind of its hazards were 78.9% among rational users and 85.3% among irrational users. In both categories 92.8% subjects were prescribed by doctors. Among unjustified users, all of them took fluid orally, while n=57, n=32, and n=41 subjects had mild and moderate vomiting, diarrhea and dehydration respectively. **Conclusion:** There is a significant unjustified use of IV Infusions in the current area. Both educated and non-educated people were prescribed IV infusions irrationally at almost an equal rate; it is because the majority of the subjects in both categories is blind of its hazards, so there is a dire need to create awareness about the proper use of IV infusions in the current area under study.

**Key words:** Intravenous infusions, dehydration, administration, prescribing, monitoring, rational, irrational or unjustified use, hazards, awareness, medication errors.

## **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 health care provider is to achieve optimal therapeutic benefits<sup>1</sup>. Rational use of medicine, as quoting by the World Health Organization (1995, 2001) **“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<sup>2,3</sup>.

Medication errors are incident results in patient harm through medicines either by themselves or when the medicines are in physician's regulation<sup>4</sup>. Operational definitions of IV medication error **“Any ingredient observed that was mixed in the IV bag and administered to the patients differed from the interpretable physician's orders written on the patient charts”**<sup>1</sup>. 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<sup>5</sup>.

Reporting medication errors are very important to refine the administration of IV infusion system and to make the right use of medicine certain<sup>4,6</sup>. 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. IV medication errors studied by a direct observational method in Europe are 26.9% to 49%<sup>1</sup>. 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 patient from complications like hypo or hypernatremia, fluid overload, organ damage or failure (lungs, brain, and kidneys), hyperchloraemic metabolic acidosis, coagulation abnormalities<sup>7,8</sup>.

IV infusions are a non-oral way of giving fluids and medication directly into the bloodstream<sup>8</sup>. Their delivery becomes important in cases like adding fluid volume in case of electrolyte imbalance, maintaining life support in casualty or in the ICU and for easy access to medication. 90% of patients in the hospital got IV infusions at any stage during their admission<sup>6</sup>. Albeit it is very common, but also reported as a forceful factor of morbidity and mortality associated with nosocomial infections<sup>9,11</sup>. It is shocking to hear that 100,000 patients in United State develop Bloodborne pathogen due to the unethical use of IV infusions<sup>12</sup>.

The nonoperative complication is the most common in the medical field whether from drug treatment, therapeutic misadventure or diagnostic errors. 61% of life-threatening complications are the results of IV infusions errors<sup>13</sup>. Transmission of HBV, HCV, HIV, abscess, septicemia, malaria and viral hemorrhagic fever are important outcomes of misuse of IV infusions<sup>14</sup>.

It's the patients' inalienable right that he must be treated with a maximum of benefits and with the least harm<sup>2</sup>. Administration of medicine is the most vulnerable stage prior to the error, and in case of IV infusions, can lead to a life-threatening stage<sup>7</sup>. 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<sup>15</sup>.

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 <sup>9,10,16</sup>. Misuse (IV drug abuser of brown heroin and crack cocaine) of IV infusions can develop disseminated Candidiasis in the middle age group, which later on developed lesions of the skin, eye, osteoarticular areas and chest <sup>17</sup>. 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 <sup>18</sup>.

In past one decade, there is 500% rise in medication errors are reported <sup>19</sup>. Medication errors are the 8th leading cause of death in the USA. As quoted by Claudia Summa-Sorgini et.al, 1 Lac people died in the USA in 1999 <sup>19</sup>. Though the rate of deaths decreased in the USA as quoted by T Fekadu in which >7000 died/year. While another study says at least 1.5 million people/year with the cost implication of 2-3.5 billion/year <sup>20</sup>. The incidence of serious IV infusion errors in USA and UK is 60% and 56%, respectively, and in Germany, 23% of them occur during administration of drugs <sup>21</sup>. Of the 19% injuries reported by Harvard Medical Practice Study, 9.5% are the result of medication errors <sup>22</sup>. China surpasses other countries for using IV infusions i.e. 10.4 billion bottles/years that mean 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% <sup>23</sup>. ISMP reported 56% of medication errors are associated with IV infusions. Every day 1.7 medication errors are experienced by critically ill patients in ICU and also fahimi reported 66% of errors in the ICU are due to IV infusions <sup>19</sup>.

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 is conducted to create awareness among medical practitioner about this serious issue. Empirical research is needed to investigate the current breadth of practice and the risks associated with the prescription of the unjustified use of IV infusions and the effectiveness of various interventions in mitigating these issues.

This study aims to know the prevalence of irrational use of intravenous infusions and awareness among patients visiting SKBZ/CMH regarding hazards of such use.

**Materials and Methods:**

It was a cross-sectional study conducted at Sheikh Khalifa Bin Zaid Al Nahyan/Combined Military Hospital Muzaffarabad Azad Kashmir from 1<sup>st</sup> September 2012 to 10.January.2013. The convenient technique was used to collect data from 270 subjects. The self-administered pre-tested questionnaire was used for data collection and well understood, informed consent was taken from each participant of the study. The questionnaire included demographic data and questions according to the aims and objectives of the study like purpose for using IV infusion, number of times they used it, the advisor, and some questions used as confirmatory criteria for rational use of IV infusions can take food or liquid through the mouth or not, severity of dehydration or un-resolving dehydration, vomiting, and diarrhea.

All subjects irrespective of gender and age visiting CMH 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.

This study was approved by the **Research Committee of Azad Jammu& Kashmir Medical College.**

The data were assembled from **Sheikh Khalifa Bin Zayyad Al-Nahyan CMH Muzaffarabad.** 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 emergency department and OPD's with intractable vomiting or severe diarrhea or severe dehydration, trauma or accidents and pre-delivery and post-delivery cases. All the data were piled up by the principal author and analyzed by SPSS (20.version) software. Descriptive statistics were used to describe data.

## **Results:**

The sample comprised a total of 270 subjects, with a 100 % response rate. The prevalence of use of IV infusions was 92.2%, n=249 participants ( $p \approx <.01$ ), with the majority being women, 73.1% n = 181. Male to female ratio was 1.8:5. They have an average age of  $24.05 \pm 14.21$  years (mean  $\pm$  standard deviation).

Out of 249 participants, 53.41% n=133 were infused rationally whereas 46.58% n=116 were found irrational.

On applying t-test **Table:2** shows highly significant results that doctors were the most common prescribers of IV infusions found in irrational users  $t(115) = 2.69$ , p value=0.004 (90.5% and=105) and also in rational users  $t(132) = 2.64$ ,  $p=0.02$  (94.7%, n=126).

**Table.1** also shows students were the most common participants who get prescription of IV infusion rationally (47.4% n=64) and irrationally (36.8% n=42).

### ***Factors affecting the rational and irrational use of IV infusions on applying the Chi - square test:***

**Table.1** shows risk factors affecting the rational and irrational use of IV infusions.

On applying Chi-square test, more IV infusions were prescribed to female participants (male: female, 1:1.9) irrationally with significant correlation of phi & Cramer's V value of 0.15 and  $p \leq 0.05$ . Female students prescribed by doctors (98.8% n=83  $p < 0.01$ ) and unaware of its hazards (78.6% n=66) having a marginal association with the use of IV infusions irrationally (75%. n=33  $p \leq 0.05$ ).

Lack of awareness about the hazards has marginally significant correlation that more participants get unjustified IV infusions prescriptions i.e. 14.9% n=17 aware of its hazards and 85.1% n=97 unaware of its hazards  $p \leq 0.1$ .

Age has highly significant relation with the justify and unjustified use of IV infusions phi & Cramer's V value of 0.344 and  $p \leq 0.01$ . Participants between the age of 11-20 years are more likely to get prescription of IV infusions whether irrationally (47.4% n= 55) than rationally (27.8% n= 37) as compare to other variables.

**Table.3**, participants with no dehydration (56% n=65) and moderate dehydration (44% n=51) are more likely to get prescription of IV infusions irrationally phi & Cramer's V value of 0.56 and  $p < 0.01$ . Also, Binary logistic regression analysis showed that participants who have dehydration without vomiting ( $p=0.022$ , odd ratio=0.401, 95% CI = 0.183-0.878) are more likely to get IV infusions prescriptions rationally than irrationally.

**Table.1** also shows the factor vomiting, dehydration and diarrhea has highly significant correlation with the use of IV infusions rationally and irrationally i.e.  $p \leq 0.01$ .

In irrational users, 60.3% cases and in rational users, 42% cases paid each time for using IV Infusions. On applying the chi - square test, it shows paying for IV infusions have significant correlation with the use of IV infusions irrationally i.e. 60.3% n= 70  $p < 0.01$ .

## **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. IV cannulation must be applied only when there is a genuine indication of giving intravenous drugs otherwise it must be avoided to prevent from its complications. The unjustified use of IV Infusions is more commonplace in hospitals of developing countries than in health care units of developed countries, that's why there is not enough data from these areas on this issue.

In this study, 92.2% subjects were infused with IV infusions, which matches the results of another study where 90% patients were infused with IV line<sup>6</sup> while in Central Java, Indonesia 80-90% patients left the clinic after using IV infusions. 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<sup>24</sup>.

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<sup>24</sup>, 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. Our evidence is confirmed by a report which shows junior doctors are commonly responsible for the errors in prescribing 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<sup>(25)</sup>. A study told, IV infusion should be authorized after an accurate diagnosis<sup>24</sup>. But in the present study in some cases, IV infusions were prescribed just for the satisfaction of the patient like gastric pain, general weakness during pregnancy, pimple on the skin, epistaxis, diarrhea, vomiting when oral intake was satisfactory, that makes its use entirely unjustified and malpractice. But when IV drugs were used with sanity, they are used as an important tool for management of severe ailments; severe diarrhea (20.3%), surgery (14.3%), childbirth (8.3%), severe dehydration (9%), unconscious (4.5%), pneumonia (0.8%), renal failure (2.3%), intractable vomiting (1.5%), paralysis (0.8%), food poisoning (1.5%), DM/HTN (0.8%), abortion (0.8%), low BP (8.3%), severe sepsis (1.5%).

In the current study, more students get IV infusions prescription irrationally than other participants and the majority use it for low blood pressure; the survey in the Iraqi postgraduate medical journal does not make any such result. A report of China 2012, where school authorities infuse their students with amino acid drips to boost up their energy for exam preparation, that was not supported by any clinical physician in the country<sup>26</sup>.

Price elasticity demand study in Iran for the intravenous medication prescription shows non-significant ( $p=0.55$ ) relationship between two categories. While the present study shows significant ( $p=0.01$ ) relationship between paying for IV medications and justified or unjustified prescription IV medications<sup>(25)</sup>.

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 lack of awareness hazards of unsafe IV injections participants significantly

influences ( $p \leq 0.1$ ) the unjustified use of IV infusions. 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 <sup>(27)</sup>. This factor is also supported by a study on the assessment of educational intervention measures 3<sup>rd</sup> 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 <sup>(25)</sup>.

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 use of IV infusions, and also educating health care staff about the legitimate or the rightful use of IV infusions.

***Conclusion:***

There are a significant number of irrational users of IV Infusions in district Muzaffarabad. It's a dominant point in this area. Albeit in some cases, IV Infusions are prescribed irrationally by patient's persuasion. Educated, as well as non-educated people, get unjustified prescription of IV infusions at almost an equal rate it is because they were unaware of its hazards.

***Limitations:***

The current study is limited to one hospital in district Muzaffarabad, so it can't be generalized. Type of fluids prescribe to the patient is also not assessed in this study. Awareness and knowledge of health care providers about proper use and hazards of its unnecessary use are also not assessed.

***Recommendations:***

People are affected by the misuse of IV Infusions at a medium scale. If this pitfall in handling IV infusions is not getting resolved in future, then more and more people will get harmed instead of being treated in our hospitals.

There is a dire need to create awareness about the proper use of IV infusions in our society.

Therefore media (electronic and paper media, both) can play an important role in realizing people about the right use of IV infusions. Besides this, workshops and awareness program for each level of health workers about the right use of IV infusion can be organized, because the very little effort has been done to create awareness among relevant health workers regarding proper use of IV infusions so far.

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.

Table.1 Risk factors affecting rational and irrational use of IV infusions

Variables		Frequency=n (%)		Chi square test
Gender	Total frequencies	Rational users	Irrational users	
Male	68	28 (41.17%)	40(58.8%)	P < 0.01
Female	181	105(58.01)	76(41.9%)	
Age groups				
Few months- 10 years	29	19 (14.3%)	24 (20.7%)	P < 0.01
11-20 years	86	37 (27.8%)	55 (47.4%)	
21-30 years	80	52 (39.1%)	18 (15.5%)	
31-40 years	24	18 (13.5%)	7(6.0%)	
41-50 years	17	3 (2.3%)	6 (5.2%)	
51-60 years	8	3 (2.3%)	3 (2.6%)	
61-70 years	2	0	1 (0.9%)	
71-80 years	1	0	1 (0.9%)	
81-90 years	2	1(0.7%)	1(0.9%)	
Profession				
Student		63 (47.4%)	43 (37.1%)	
Employee		35 (26.3%)	36 (31%)	
Housewife		22 (16.5%)	20 (17.2%)	
Children		10 (7.5%)	13 (11.2%)	
Job less		3 (2.3%)	4 (3.4%)	
Awareness				
Yes		28 (20.7%)	17 (14.9%)	P < 0.1
No		107( 79.3%)	97 (85.1%)	
Vomiting				
				P < 0.01
Yes	65 (48.9%)		42 (36.2%)	
No	66 (49.6%)		59 (50.9)	
Diarrhea				
				P < 0.01
Yes	58 (43.9%)		32 (27.6%)	
No	84 (72.4%)		84 (72.6%)	
Dehydration				
				P < 0.01
Yes	74 (55.6%)	41(35.3%)	Yes	
No	59 (44.4%)	75 (64.7%)	No	



Table 1. Who advised you to use IV infusions?

Advisors of IV Infusions		Frequency =n(%)			Chi-square test
Variables	Total frequency	Rational users	Irrational users		P ≤ 0.1
Doctor	231	126 (94.7)	105	(90.5%)	
Nurse	11	6 (4.5%)	5	(4.3%)	
Relative	2	0 (0%)	2	(1.7%)	
Siblings	2	1 (0.8%)	1	(.9%)	
Parents	3	0 (0%)	3	(2.6%)	

Table 3: Analogy of severity of dehydration in Rational and Irrational users

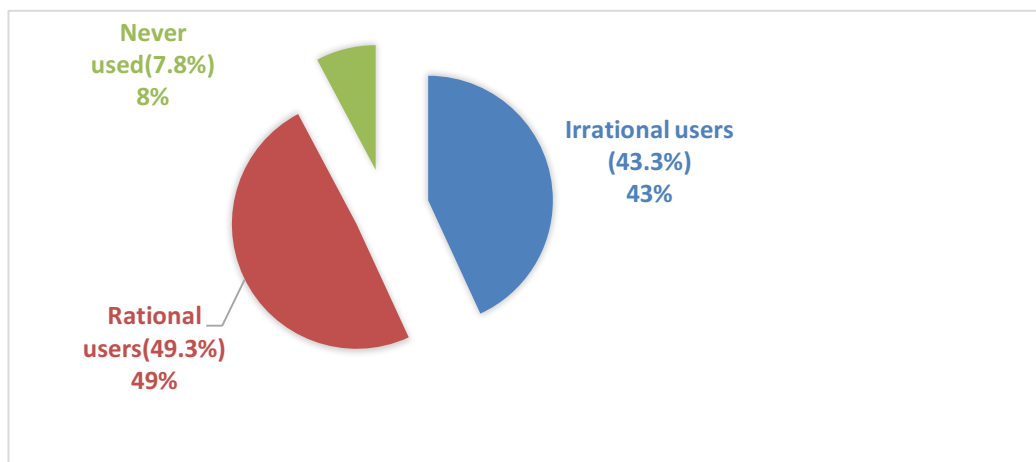
Severity of dehydration	Frequency =n (%)		Chi-square test p value
	Rational users	Irrational users	
Moderate	21 (15.7%)	51 (44.7%)	P ≤ 0.01
Severe	55 (41%)	0	
No dehydration	57 (42.5%)	63 (55.3%)	

**Table.4 Analogy of Vomiting, diarrhea, and dehydration in rational and irrational users**

Variables	Frequency=n (%)		Chi-square test ( p value)
	Rational users	Irrational users	
Vomiting			P < 0.01
Yes	65 (48.9%)	42 (36.2%)	
No	66 (49.6%)	59 (50.9)	
Diarrhea			P < 0.01
Yes	58 (43.9%)	32 (27.6%)	
No	84 (72.4%)	84 (72.6%)	
Dehydration			P < 0.01
Yes	74 (55.6%)	41(35.3%)	
No	59 (44.4%)	75 (64.7%)	

## Figures:

Figure 1: Frequency of use of IV Infusions



**Figure 2: Analogue of oral intake, vomiting and diarrhea of Rational and Irrational**

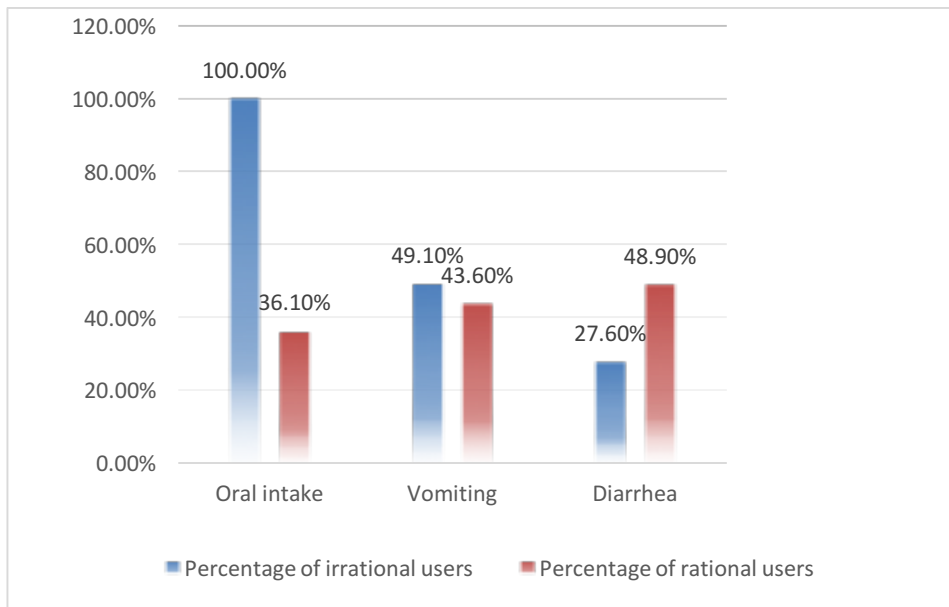


Figure 3: Comparison of educational status of Rational and Irrational

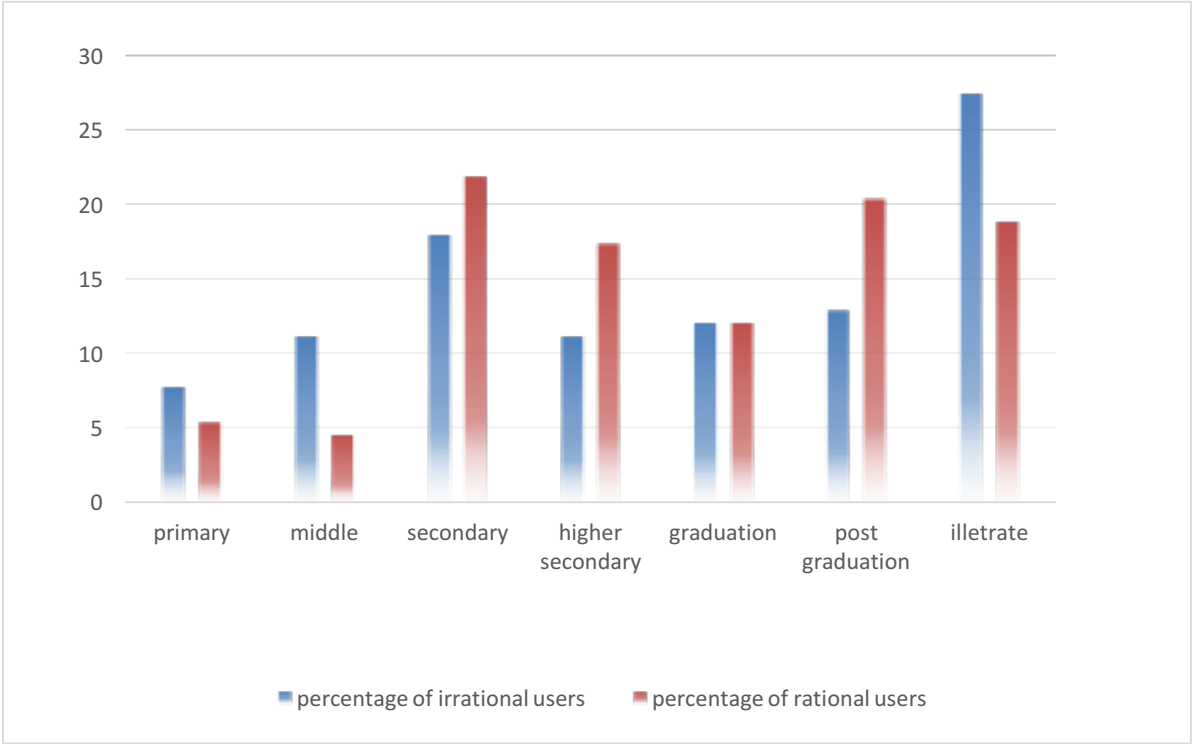
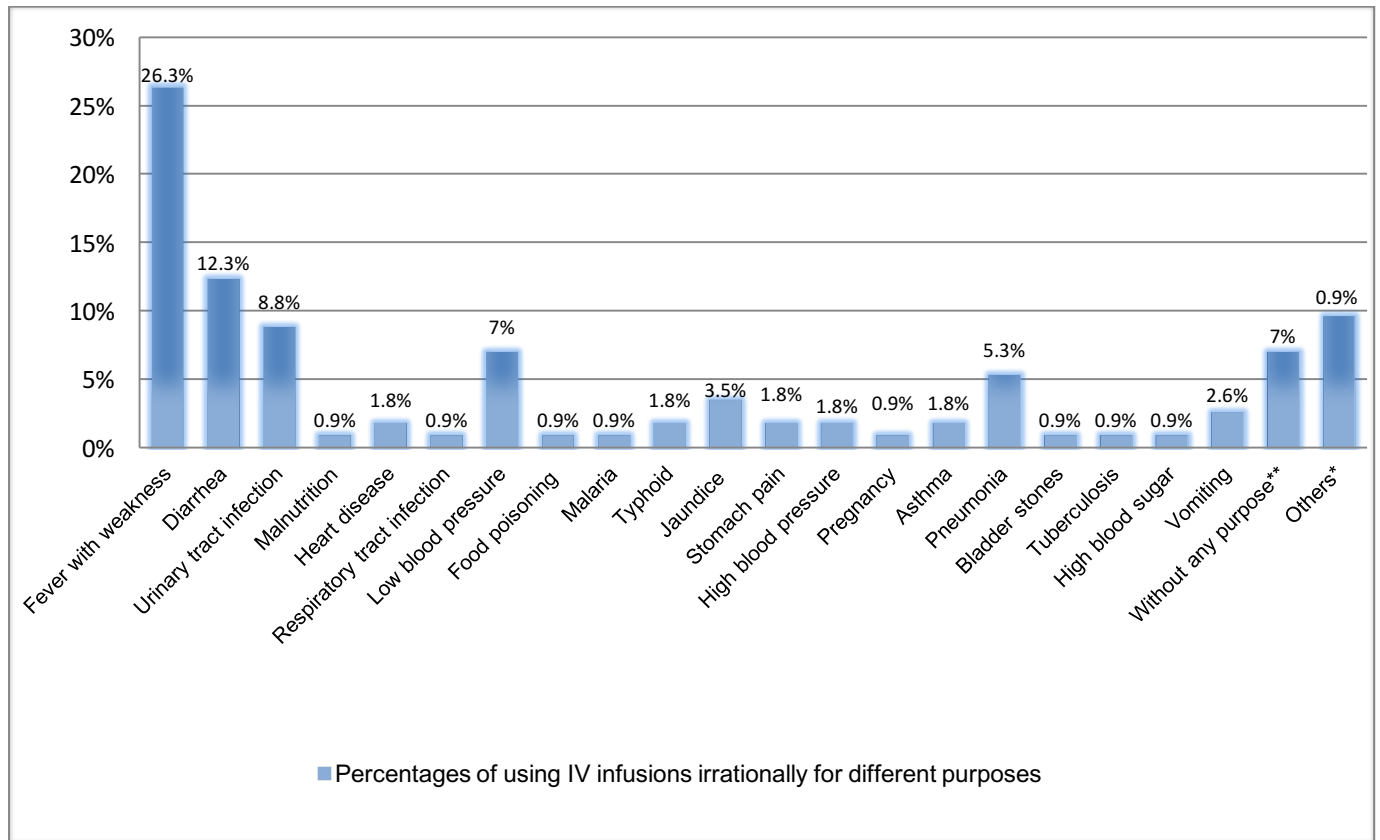




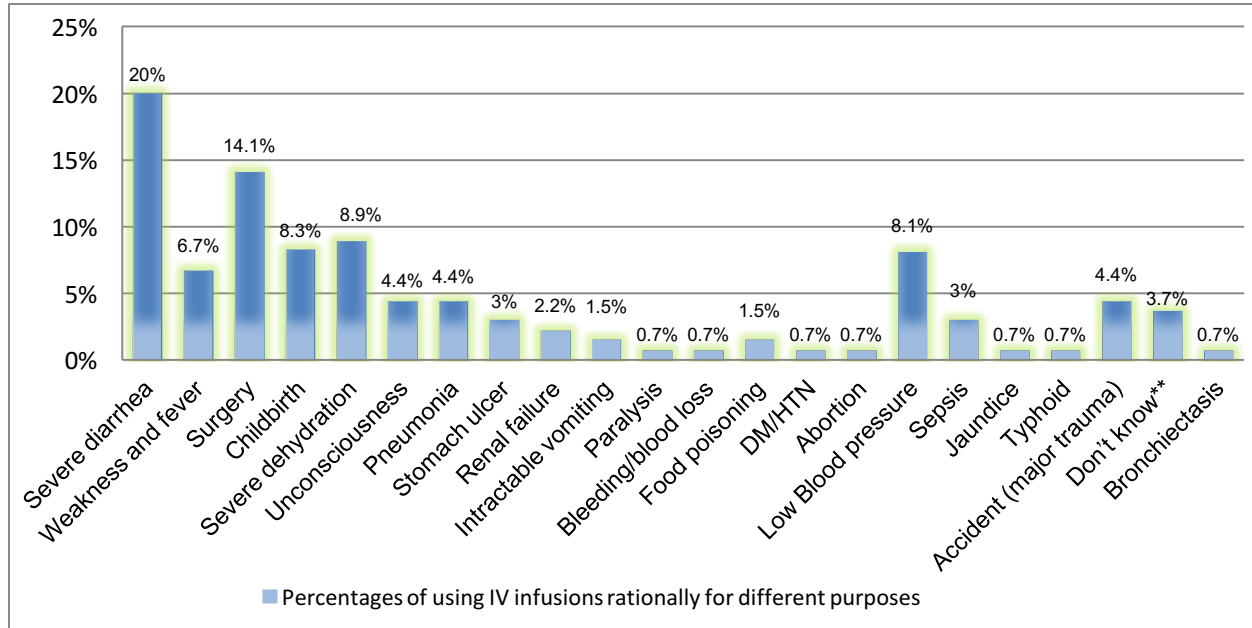
Figure 4: Purpose for using IV infusions irrationally



\*\_categorize as 'others' it includes; a pimple on skin, general weakness, epistaxis, abdominal pain, and without any reason all of them have cumulative percentage of 9.5%.

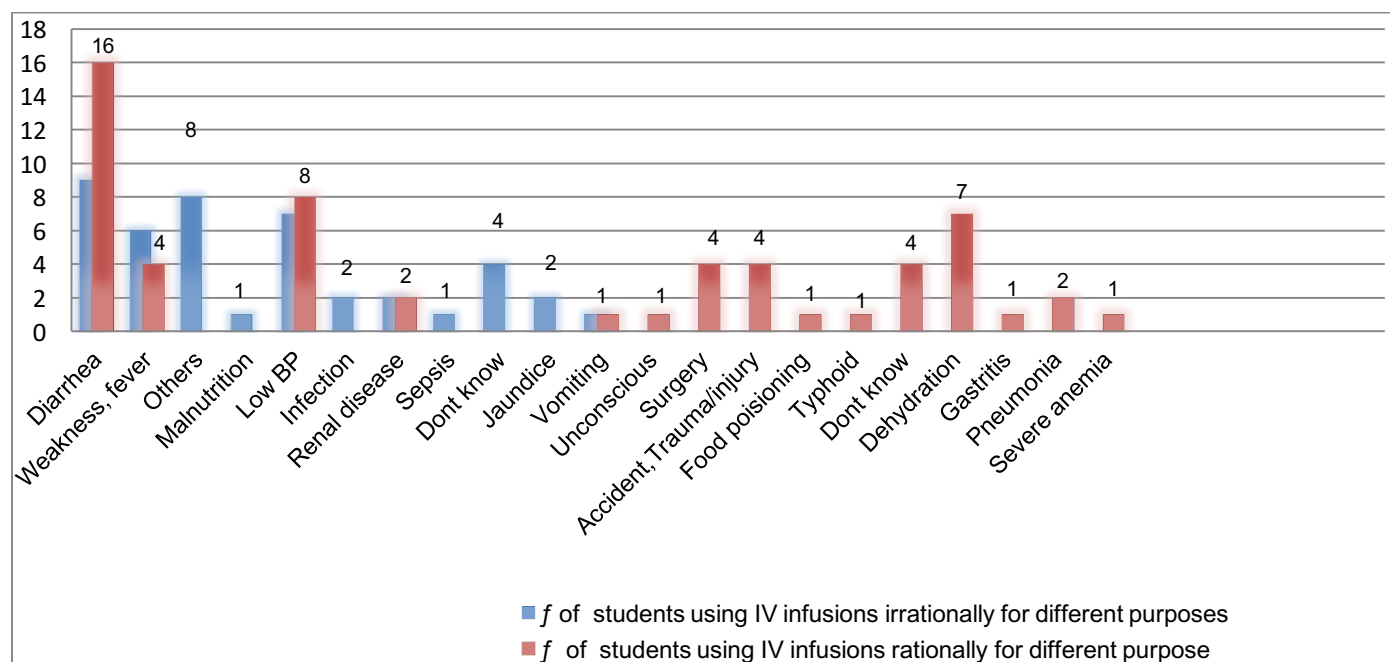
\*\* Only 8(6.5%) cases **did not know** the purpose, they are also classify as unjustified users because they are not fulfilling the criteria of rational use of IV Infusions use in this study

Figure 5. Purpose for using IV infusions rationally



\*\* In this figure 5. 3.7%cases **did not know** the purpose using IV infusions, they are classified as justified users because in this case they are fulfilling the criteria of rational use of IV Infusions use in this study

Figure 6. Comparison of students using IV infusions rationally and irrationally



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