A STUDY TO ASSESS THE KNOWLEDGE OF INTRAVENOUS FLUID IN THIRD MBBS STUDENTS IN TERTIARY CARE HOSPITAL.

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ABSTRACT

INTRODUCTION

Intravenous (IV) fluid therapy is an essential and integral component of medical and surgical care. Use of intravenous fluid in patients requires a sound knowledge of fluid and electrolyte balance in the human body. IV therapy undoubtedly helps salvage patients but the other side of the coin is that inappropriate IV therapy has been associated with increased complications. Poor IV therapy has been associated with increased complications (1).

It is a fascinating paradox that though IV fluid knowledge forms an essential component of the curriculum of undergraduate medical training. Yet, only a minority (15%) of junior resident doctors are apparently adequately trained in this area. Additionally, approach to IV fluid prescribing amongst junior resident doctors across hospitals is highly variable and have poor awareness of the national guidelines. (2) Studies have also highlighted the fact that as many as 90% of IV fluid prescriptions managed by junior doctors which aggravate the gravity of the situation. (1)

Errors in prescribing IV fluids and electrolytes are not limited to emergency departments or acute admission units. Surveys have shown that many health care providers who prescribe IV fluids know neither the likely fluid and electrolyte needs of individual patients nor the specific composition of the many choices of IV fluids available to them. Likely, as many as 1 in 5 patients on IV fluids and electrolytes suffer complications or morbidity because to their inappropriate administration. Despite this known fact that there is mismanagement of fluid therapy is rarely reported as being liable for patient harm, yet it is lesser reported. (3) Hence, it has been debated that fluid prescribing should be attributed to the same status as drug prescribing (4).

The third MBBS students are the face of tomorrow's practitioners. They will prescribe the IV fluids to the patients in future and their knowledge about the type of IV fluids and adverse reactions due to them is critical for the benefit of the patients. As discussed earlier, despite the complexity of estimating a patient's IV fluid needs, assessment and prescription are usually delegated to healthcare professionals who have received little or no specific training on the subject. In 1999 National Confidential Enquiry into Perioperative Deaths (NCEPOD) report, which elaborated that a significant number of hospitalised patients were deteriorating as a result of the inappropriate infusion of intravenous fluid. (3)

The medical students & interns at any teaching hospital also play a pivotal role in administering the IV fluids to the patients; therefore their knowledge about the type of IV fluids and related adverse reactions are an important part of their training and application not only to them as doctors but also for the benefit of the patients. In an effort to improve current practice and the importance of accurate and proficient IV fluid prescribing as a measure the first step is understanding or assessing the basic knowledge possessed by third MBBS students about IV fluids. The aim of the study was to assess the knowledge of third MBBS students regarding Intravenous fluid administration by using a standard questionnaire.

MATERIALS AND METHODS

It was a prospective, observational, questionnaire-based study that was conducted among third MBBS students at Govt. Medical College, a tertiary care teaching hospital in Western Maharashtra. The study was carried out after approval from the Institutional Ethics Committee (BJGMC/IEC/Pharmac/ND-Dept 0819092-092) was obtained before initiating the study. The survey was performed amongst the third MBBS students using a validated, structured questionnaire. It included 25 questions pertaining to the responder's knowledge and its practical aspects regarding the use of intravenous fluids.

RESULTS

200 students gave consent to participate in this study and responded to the questionnaire.
1) Percentage of scores obtained by participants

Among the percentage of scores obtained by the 200 participants as shown in the Graph no.1, only 2 students obtained the highest marks between 61% - 70%. The lowest score obtained by 4 students between 0% - 10%. Maximum i.e. 88 students scored between 31% - 40%.

Graph-1: Scores of Participants

2) Total percentage of correct response given for each question

<table>
<thead>
<tr>
<th>Q No.</th>
<th>Total % of correct response</th>
<th>Q No.</th>
<th>Total % of correct response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>59.82</td>
<td>11</td>
<td>33.93</td>
</tr>
</tbody>
</table>

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Graph-3: Knowledge About Drug Dilution In Normal Saline

Overall less than 13% of students knew that Phenytoin (12.5%) and Ampicillin (7.14%) should not be diluted in 5% dextrose but should be diluted in normal saline. (Graph No–4)

Graph-4: Knowledge About Drug Dilution In 5% Dextrose

5) Evaluation of knowledge about clinical use of IV fluids

Student's knowledge about the clinical use of IV fluids was evaluated using 10 various disease-related questions. The Correct response obtained for those 10 questions shown in Table-3

Table No-3: CLINICAL USE OF IV FLUIDS

<table>
<thead>
<tr>
<th>CLINICAL USE OF IV FLUIDS</th>
<th>Type of IV fluid used in Cerebral Edema</th>
<th>Type of IV fluid used in Haemorrhagic Shock</th>
<th>Calculation of no. drops in 1 ml</th>
<th>Best non-invasive method of Monitoring IV fluid</th>
<th>C/I of use of Colloid plasma expander</th>
<th>Indication of Albumin</th>
<th>Indication of Dextrose 5%</th>
<th>Choice of IV fluid in Dehydration</th>
<th>Dose of IV fluid in Seizure due to hypoglycaemia in a new born</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32.14 %</td>
<td>44.64 %</td>
<td>33.04 %</td>
<td>28.57 %</td>
<td>33.93 %</td>
<td>8.04 %</td>
<td>25 %</td>
<td>32.14 %</td>
<td>33.93 %</td>
</tr>
</tbody>
</table>

Albumin is the safest and most commonly used colloid yet only 8.04% of students knew the correct indication for use of same. Similarly, only 25% of students knew the correct indication for 5% dextrose.

As regards to the correct choice of IV fluids in certain important clinical scenarios such as cerebral oedema, haemorrhagic shock, dehydration and hyponatraemia only 32.14%, 44.64%, 32.14% and 51.76 % respectively knew the appropriate fluid to be used for rehydration and therapy.

In clinical set up giving correct dose and monitoring of IV therapy is important but only 33.04% students knew the correct drip rate and 33.93% students possessed correct knowledge of dose of 10% dextrose in seizure due to hypoglycaemia in newborn. The best non-invasive method of monitoring is urine output this fact was known only by 28.57% of students. Knowledge regarding contraindications for use of plasma colloid expander is also important to avoid the serious adverse event. This was correctly known by only 33.93%. (Graph No–5)

6) Evaluation of adverse effects & limitations of IV fluids

Only 34.82% of students that polyvinylpyrrolidone i.e. it interferes with the grouping and cross-matching of blood. Astonishingly a small proportion i.e. 15.18 % of the students knew the immediate corrective action for a simple adverse like phlebitis due to the intravenous therapy. (Graph No–6)
Tonicity is the capability of a solution to modify the volume of cells by altering their water content. Cells swell by gaining water if the solution is hypotonic, and shrink by losing water if the solution is hypertonic. Consequently, proper management of disturbances in tonicity is critical and requires an understanding of the qualitative and quantitative aspects of their pathophysiologic mechanisms. (9)

In clinical situations, solutions are usually described in terms of their tonicity rather than their osmolarity. An IV solution is said to be isotonic or hypotonic. More than half the number of students i.e. 61.07% gave correct response regarding the tonicity & use of fluids.

A lot of research is going on to decrease the wastage of IV fluids and decrease the economic burden on the hospital but in our study, we found 17.86% students were aware regarding the storage about IV fluids which may account to disastrous increase in the wastage of IV fluid and false increase in consumption. There aren't many studies that have assessed this part of knowledge in students which is an important aspect of pharmaco economics in resource limited settings.

Intense research studies and meta-analysis have suggested the use of crystalloids preferably over colloids due to a higher incidence of adverse effects with colloids. (10) Additionally in SAFE study researcher found that in patients in the ICU, use of 4% albumin is comparable with normal saline for fluid resuscitation with results had similar outcomes at 28 days. Albumin is the only natural colloid used for intravascular volume replacement in humans. (11)

Albumin is the safest and most commonly used colloid yet only 8.04% of students knew the correct indication for 5% dextrose. These aspects are not studied by other researchers.

As regards to the correct choice of IV fluids in certain important clinical scenarios such as cerebral oedema, haemorrhagic shock, dehydration and hyponatremia only 32.14%, 44.64%, 32.14% and 51.76% respectively knew the appropriate fluid to be used for rehydration and therapy.

The aptitude to use IV fluids in the clinical the setting was poor. This is supported by a study from Nottingham. This study showed that many prescribers had a poor understanding of physiological concepts and fluid electrolyte balance and, thus, inappropriate prescribing of IV fluid (8). This emphasizes the fact that third year students who later enrol for PG courses carry on with the lack of knowledge.

Prescribing and administering medications involves not only knowing what and when to give but also how much to administer. Knowing the dose calculation, dose of drug and infusion rate is important to lower the risk of potential medication errors and help doctors to administer the right amount of medicine to patients. (12)

In clinical set up giving correct dose and monitoring of IV therapy is important but only 33.93% students possessed correct knowledge of dose of 10% dextrose in seizure due to hypoglycaemia in new born. Similarly, According to data from the National Patient Safety Agency (NPSA), Dose calculation errors comprise 28.7% of all reported drug errors. (NPSA, 2007). (13)

The best non-invasive method of monitoring was known only by 28.57% of students.

Knowledge regarding contraindications for use of plasma colloid expander is also important to avoid the serious adverse event. This was correctly known by only 33.93%. Only 34.82% students that polyvinylpyrrolidone i.e. it interferes with the grouping and cross matching of blood.

The reported incidence of phlebitis in clinical practice ranges from 25 to 59% (14). Still, Astonishingly a small proportion i.e. 15.18 % of the students knew the immediate corrective action for a simple adverse like phlebitis due to the intravenous therapy.

A study done by Cousin et al to determine medication errors in intravenous drug preparation and administration shows that the wrong
diluent was used in 1%, 49% and 18% of cases. (15) Systemic evidence review of intravenous admixture drug preparation errors says that selection of a wrong diluent solution was reported to have occurred with results varying across studies (0%-90.9%), (16)

As shown in the current study less than 10% of students know about the dilution of vancomycin & quinidine, & less than 13% of students know about the dilution of phenytoin and ampicillin.

Not only imparting knowledge regarding fluid use, fluid composition and monitoring important but also its use as diluent should be emphasized in the undergraduate curriculum.

A study was done in final year medical students by McCloskey et al, students expressed that teaching of fluid prescription varied considerably, not only within and between years but also across specialties & also insufficient vertical and horizontal integration of the teaching between and within years. (17)

A survey done in undergraduate medical textbooks by Powell and Dortmund showed that textbooks for undergraduates cover the topic of intravenous therapy badly, which may partly explain the poor knowledge and performance of junior resident doctors in intravenous fluid prescribing. (18)

In a study done by Mansour Tobaieq et al in first year foundation doctors agreed that more extensive undergraduate education was required in clinical pharmacology and therapeutics. (19)

A very few theory lectures about intravenous fluid types and its clinical application are incorporated in the MBBS curriculum. In the current study also 97.5% student emphasizes the need for training of IV fluid not only for knowledge but also for its application.

A study done by Swayamprakasam et al showed that after a single focused teaching session in first year junior resident doctors baseline knowledge of intravenous fluid therapy which was inadequate (36%) significantly improved (85%) and this knowledge was retained (79%) after 2-5 weeks. Inadequate teaching on intravenous fluids is believed to be responsible for poor baseline knowledge. (20) Prior research has shown the benefits of interventions such as lectures, workshops, teaching measures in improving the knowledge and application of IV fluids in doctors. (21,22,23)

**CONCLUSION**

The present study shows that participants had an idea but lacked detailed knowledge about intravenous fluids. This was reflected in their responses to the questionnaire. Therefore providing detailed information about intravenous fluids and impart its practical application in form of case based scenario, discussions is utmost important to improve the knowledge among third MBBS students and to promote the accurate and proficient IV fluid prescribing.

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**REFERENCES** -