

Fluid and Electrolyte Alteration for Post-Surgical (ICU)Patients'¹

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ABSTRACT

Fluids are considered the cornerstone in management of patient post-surgical interventions & any disturbance or alterations of fluid / electrolyte has encountered problems that increase risk for complications & mortality rate, nurse staff play important role in detecting problem to provide optimal care .To assess parameters of vital signs, serum electrolyte measurement finding during (ICU)stay. A prospective follow-up study design was adopted from 1st of November 2022 until the 13th of July 2023 to achieve the objectives of present study & to meet requirement. Anon-probability (purposive) sample, & the sample size assignat was (67) patient, out others participant (22) patient were excluded from the sample. The results show potassium level hypokalemia in high percentage through the (1st ,2nd ,3rd ,4th &5th)while hyperkalemia show low percentage in (1st ,2nd ,&5th), and the sodium show hyponatremia majority of percentage in (1st ,2nd ,3rd ,4th &5th);while hypernatremia show high percentage along (1st ,2nd ,3rd ,4th &5th);with relation to results of calcium it show low percentage in (3rd ,&4th) observation. Fluid & electrolyte disturbance a common problem in (ICU) patient post-surgical intervention, high mortality rate occurs as outcome result of neurosurgical case that accompanied by these alterations.

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Keywords: *Post-surgical; Fluid, Electrolyte; alteration; intensive care unit.*

INTRODUCTION

Electrolytes play important role in maintaining homeostasis within the body. They help regulate myocardial and neurological functions, fluid balance, oxygen delivery, acid-base balance among others [1].

Fluid administration is associated with adverse outcomes such as prolonged stay in the (ICU), higher cost of care, and increased mortality rate [2]

Development of hyponatremia in critically ill patients is associated with disturbances in the renal mechanism of urinary dilution [3]

Fluid and electrolyte abnormalities in critically ill patients may lead to fatal consequences. More caution to electrolyte disturbances should be exercised in intensive care because it is often impossible to adequately assess symptoms and signs of critically ill patients [4]

A large number of patients die from surgical complications each year. It is hypothesized that numerous cases of these deaths are preventable. One of the potentially important preventable complications that can increase mortality risk is water-electrolyte imbalance [5]

Electrolyte abnormalities are common in patients who need intensive care. They occur in a variety of conditions, and many remain unrecognized and result in morbidity and mortality, irrespective of the primary problem. Timely recognition, a high index of suspicion and a thorough understanding of common electrolyte abnormalities is necessary

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to ensure their correction. Disturbances in electrolyte balances in mathematically measurable biochemical parameters in the blood stream determines the clinical manifestations of interactions between various metabolic events such as sepsis, hormones, vascular events, medications, hydration deficiencies and renal physiology [6]

Maintenance of an adequate fluid balance is vital to health. Inadequate fluid intake or excessive fluid loss can lead to dehydration, which in turn can affect cardiac and renal function and electrolyte management. Inadequate urine production can lead to volume overload, renal failure and electrolyte toxicity. Attention to fluid intake and output, and careful completion of fluid balance charts, are important elements of nursing practice [7]

METHOD AND MATERIAL

Quantitative prospective follow - up study design was adopted to conduct and accomplishment the research objectives, which are based to complete the requirements of research establishment, a period from 1st of November 2022 until 13July 2023. In order to access, collect data, and implementation of the instrument scale on patients' who admission to the surgical intensive care unit at AL-Jumhory, AL-Salam, Ibn Senna, and Al-Mosul General Teaching Hospitals in Mosul City

A non-probability (purposive) sample was chosen for the research task implementation, a (67) patients was the total size sample and (22) participants patients were excluded from the study sample that most patient had reach (3-5)days and their outcome result was either discharge or died , in the end of the total remain patient sample size for study requirement (45).

Data were collected throughout selection of subjects sample (participant) who admitted to (ICU) post-surgical intervention for critical care & continuous follow-up management

Step one:

which include the use of inclusion and exclusion criteria for patient selection; then start gathering information about sociodemographic, health status characteristics, from conscious patient or relative for unconscious patient next reviewing of patient file, surgical and anesthesia note to ensure adequacy and accuracy of information to determine period for data collection and information explanation for patient without giving suggestion that confused the result for that the researcher assume a time for data collection started (8:00 Am -till 4:00 Pm) along patient(ICU)stay until discharge or death each case take time between(10-20 min) to complete and review the data collection through interview process .

Steps Two:

After completion of data collection, the

investigator starts gathering patient

parameter which include:

A. Vital Signs: Temperature, pulse, respiration, & blood pressure

B. Serum electrolyte: potassium, sodium ,calcium , and chloride

Validity and reliability of the study accomplished by A penal of (11) experts from different related specialties & agencies was included to read and review the initial draft of study instrument sheets to meet the requirement of study objectives by giving their opinion about the contents of instrument items and its adequacy ; while a sample consist of (5) patient who admitted to (ICU) post-surgical intervention included & the study tools was implemented on them to determine the reliability of parameters measurement& to find out the error techniques that could occurred to modify the approaches or skills needed during data collection

RESULTS

Table 1: Distribution of patient sample description according to their demographic characteristic. (n=45)

| Variable | Group | Frequency | Percentage | \bar{X} | S.D | |
|----------|---------------------|------------------|------------|-----------|-------|-------|
| Age | 15-25 year | 9 | 20.0% | 45 | 18.24 | |
| | 26-35 year | 5 | 11.1% | | | |
| | 36-45 year | 6 | 13.3% | | | |
| | 46-55 year | 10 | 22.2% | | | |
| | 56-65 year | 10 | 22.2% | | | |
| | 66-75 year | 5 | 11.1% | | | |
| Gender | Male | 25 | 55.6% | | | |
| | Female | 20 | 44.4% | | | |
| Habits | Smoking | Non- Smoker | 34 | 75.6% | 1.42 | 0.783 |
| | | Ex-Smoker | 3 | 6.7% | | |
| | | Currently Smoker | 8 | 17.7% | | |
| | Alcohol Consumption | Not | 42 | 93.3% | | |
| | | Yes | 3 | 6.7% | | |

Table 2: Descriptive Statistics for patient sample according to vital signs parameter with alteration changes during (5) observation episode interval

| Variable | Parameter Group | Observation Episodes Intervals | | | | | | | | | |
|------------------|-----------------|--------------------------------|------|-------------------|------|-------------------|------|-------------------|------|-------------------|------|
| | | E1 | | E2 | | E3 | | E4 | | E5 | |
| | | F | % | F | % | F | % | F | % | F | % |
| Temperature | Hypothermia | 5 | 11.1 | 2 | 4.4 | 6 | 13.3 | 8 | 17.8 | 8 | 17.8 |
| | Normal | 35 | 77.8 | 34 | 75.6 | 27 | 60.0 | 33 | 73.3 | 32 | 71.1 |
| | Hyperthermia | 5 | 11.1 | 9 | 20.0 | 12 | 26.7 | 4 | 8.9 | 5 | 11.1 |
| | Mean \pm S.D | 1.0 \pm 0.476 | | 1.155 \pm 0.474 | | 1.133 \pm 0.625 | | 0.911 \pm 0.514 | | 0.933 \pm 0.539 | |
| Pulse | Bradycardia | 2 | 4.4 | 1 | 2.2 | 2 | 4.4 | 0 | 0.0 | 3 | 6.7 |
| | Normal | 21 | 46.7 | 22 | 48.9 | 22 | 48.9 | 29 | 64.4 | 23 | 51.1 |
| | Tachycardia | 22 | 48.9 | 22 | 48.9 | 21 | 46.7 | 16 | 35.6 | 19 | 42.2 |
| | Mean \pm S.D | 1.444 \pm 0.586 | | 1.466 \pm 0.547 | | 1.422 \pm 0.583 | | 1.355 \pm 0.484 | | 1.355 \pm 0.608 | |
| Respiratory Rate | Bradypnea | 0 | 0.0 | 0.0 | 0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| | Normal | 16 | 35.6 | 26 | 57.8 | 18 | 40 | 32 | 71.1 | 25 | 55.6 |
| | Tachypnea | 29 | 64.4 | 19 | 42.2 | 27 | 60 | 13 | 28.9 | 20 | 44.4 |
| | Mean \pm S.D | 1.644 \pm 0.484 | | 1.422 \pm 0.489 | | 1.600 \pm 0.458 | | 1.288 \pm 0.458 | | 1.444 \pm 0.502 | |
| Blood Pressure | Hypotension | 7 | 15.6 | 12 | 26.7 | 12 | 26.7 | 6 | 13.3 | 11 | 24.4 |
| | Normal | 18 | 40 | 13 | 28.9 | 12 | 26.7 | 20 | 44.4 | 16 | 35.6 |
| | Hypertension | 20 | 44.4 | 20 | 44.4 | 21 | 46.6 | 19 | 42.3 | 18 | 40 |
| | Mean \pm S.D | 1.288 \pm 0.726 | | 1.177 \pm 0.833 | | 1.200 \pm 0.842 | | 1.288 \pm 0.694 | | 1.155 \pm 0.796 | |

Table (3): Descriptive Statistics for patient sample according to serum electrolyte parameter with alteration changes during (5) observation episode interval.

| Variable | Parameter Group | Observation Episodes Intervals | | | | | | | | | |
|-----------|-----------------|--------------------------------|------|-------------|------|-------------|------|-------------|------|-------------|------|
| | | E1 | | E2 | | E3 | | E4 | | E5 | |
| | | F | % | F | % | F | % | F | % | F | % |
| Potassium | Hypokalemia | 14 | 31.1 | 14 | 31.1 | 18 | 40.0 | 18 | 40.0 | 19 | 42.2 |
| | Normal | 30 | 66.7 | 30 | 66.7 | 27 | 60.0 | 27 | 60.0 | 24 | 53.3 |
| | Hyperkalemia | 1 | 2.2 | 1 | 2.2 | 0 | 0.0 | 0 | 0.0 | 2 | 4.5 |
| | Mean ± S.D | 0.711±0.505 | | 0.711±0.505 | | 0.600±0.495 | | 0.600±0.495 | | 0.622±0.575 | |
| Sodium | Hyponatremia | 14 | 31.1 | 8 | 17.8 | 13 | 28.9 | 12 | 26.7 | 15 | 33.3 |
| | Normal | 27 | 60.0 | 25 | 55.6 | 17 | 37.8 | 19 | 42.2 | 18 | 40.0 |
| | Hypernatremia | 4 | 8.9 | 12 | 26.6 | 15 | 33.3 | 14 | 31.1 | 12 | 26.7 |
| | Mean ± S.D | 0.777±0.599 | | 1.088±0.668 | | 1.044±0.796 | | 1.044±0.767 | | 0.933±0.780 | |
| Calcium | Hypocalcemia | 27 | 60.0 | 20 | 44.4 | 23 | 51.1 | 24 | 53.3 | 25 | 55.6 |
| | Normal | 18 | 40.0 | 25 | 55.6 | 21 | 46.7 | 19 | 42.2 | 20 | 44.4 |
| | Hypercalcemia | 0 | 0.0 | 0 | 0.0 | 1 | 2.2 | 2 | 4.5 | 0 | 0.0 |
| | Mean ± S.D | 0.400±0.495 | | 0.555±0.502 | | 0.511±0.548 | | 0.511±0.588 | | 0.444±0.502 | |
| Chloride | Hypochloremia | 5 | 11.1 | 1 | 2.2 | 2 | 4.4 | 1 | 2.2 | 3 | 6.7 |
| | Normal | 28 | 62.2 | 29 | 64.4 | 24 | 53.3 | 29 | 64.4 | 24 | 53.3 |
| | Hyperchloremia | 12 | 26.7 | 15 | 33.4 | 19 | 42.3 | 15 | 33.4 | 18 | 40.0 |
| | Mean ± S. D | 1.155±0.601 | | 1.311±0.514 | | 1.377±0.575 | | 1.311±0.514 | | 1.333±0.603 | |

DISCUSSION

Distribution of patient sample description to their demographic characteristics. Throughout the data analysis, the findings results of table (1) indicate that (45) patient enrolled and distributed to the variables such as age group, which ranged between (15-75) years old. In addition to that the study findings reveal the mean & standard deviation age (45±18.24), & the majority (22.2%, & 22.2%) of sample was in age group between (46-55), (56-65) years alternatively and the lowest value of (11.1%, 11.1%) of the sample between age group (26-35) & (66-75) years alternatively. This finding result of participants show that most of patients were in middle aged group, so this could give suggestion that they were at risk group for complication & other alteration in varies type. This finding is in congruent [8] which showed that more than (74%) of patient with electrolyte & fluid disturbance admission to (ICU) their age group between (31-50) years. So these findings were also consistent with a previous study by (Futier et al., 2020) that found (36%) of total (ICU) admission patient age group between (55-65) years. In contrast of this result a study of [9] which finds that most of (100) patients their age group were between (60 years & above) where (40%) are susceptible to at risk of fluid & electrolyte disturbance post-operative intervention.

The next result showed frequency & percentage according to gender variable, which indicates that the majority of group are male patients they (55.6), while female patient record (44.4%). These finding were extremely reliable for studied group according to result commitment of post-operative cause of surgical intervention related to injuries that occurred in male more female patient who admitted for other type of surgical intervention. These finding are in consentient with a study by [10] which found that (8583) patients (58.6%) of total sample consisting of (14654) patient were admitted to (ICU) was male patients according to admission which higher than female patients. In controversial of these finding study result by [11] found the proportion & ratio (57%) of gender female patient group were the majority of sample enrolled in study than male patient (43%) according to statistics of surgical intervention post-operative of admitted to hospital.

Ongoing to interpretation of patient's result about habits variable which included smoking. The findings showed most (75.6%) of sample were non-smoker, while (17.8, 6.7%) alternatively were currently smoker & Ex-smoker with mean & standard deviation (1.42±0.783), & this finding would be important factors specially for (ICU) admission related to respiratory problem which effect on disturbance of fluid and electrolyte complication.

These finding agreed with study by [12] which find that most patient who admitted to intensive care unit that high percent nonsmoker by (34.8%, 65.2%) alternatively, while a study by ([13] disagree with result finding; that found

majority of patient with electrolyte & fluid disturbance were (20.1%) of total sample (24, 818)patients, who were smoker & remain long hospital stay with a high mortality rate comparison with non-smokers.

At end of this table , the finding record a majority of sample (n=42) (93%) were non-alcoholic & (n=3) (6.7%) were alcohol consumption. From obvious findings, the interpretation could reveal. That most case non-alcoholic for religious, believes customs which limit the consumption of alcohol in local society, & this came along with study by [14]which found most patient had no history of alcohol consumption with short stay in (ICU) and minimum fluid or electrolyte disturbance ,while study by[15] controversial our finding by most patient who had history of alcohol consumption and had high mortality rate, with sever electrolyte disturbance which lead to organ failure

Descriptive Statistics for patient sample according to vital signs parameter with alteration changes during (5) observation episode interval.

Throughout the course of the present study, table (2) showed finding for general description of vital signs parameter with alteration change during (5) observation episode for temperature, pulse, respiratory rate, and blood pressure which showed variant alteration of value either decrease or increase above normal and that come by many factor during early stay of patient with hemorrhage, or decrease fluid result by surgical intervention or may be result by accompanied complication and later alteration of these parameter could be result by long stay and infection occurrence or due to alteration of fluid and electrolyte these finding outcomes are compatible with study by [16]which found (55%) of patients reporting alteration of vital signs post-operatively result by factors such as fluid and electrolyte disturbance, type of operation, and infection occurrence.

Descriptive Statistics for patient sample according to serum electrolyte parameter with alteration changes during (5) observation episode interval.

By reviewing of findings result of table (3) which dealt with electrolyte parameters along (5) observation episodes, the alteration of increase or decrease demonstrate changes of patient status that most (ions & cations) such as potassium, sodium, calcium, & chloride can effect on early complication occurrence & continue to be effect on body system, most findings showed either hypo or hyper for each parameter & increase in number during (1st, 2nd, 3rd, 4th, & 5th) observation that may result from loss of fluid during surgical intervention, or hemorrhage occurrence, or disturbance of fluid result by lack of fluid intake for some patient and other cases in last observation had much more complication that result by long stay in (ICU).

These findings were in consentient with a study by [17]which found that (50) patient were admitted to (ICU) post-operative complication with electrolyte disturbance of potassium which effect on heart causing arrhythmia & other is such as calcium that effect on renal system, in controversial of these finding a result of [18]for patient who admitted to postoperative care unit showed minimum value of electrolyte alteration. due to periodic evolution of serum electrolyte & early correction of deficit or hyper value that prevent most case from late complication such as cardiac arrest or renal failure

CONCLUSIONS

Fluid & electrolyte is a major problem in patient post-operative specially those admission to (ICU). Most common fluid & electrolyte complication among patient are hypokalemia, hyponatremia, & hypocalcemia.

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