



A STUDY TO ASSESS THE EFFECTIVENESS OF AN EDUCATIONAL PROGRAM ON FLUID, ELECTROLYTE, ACID-BASE DISTURBANCES AND ITS MANAGEMENT IN CARDIAC FAILURE PATIENT IN NURSES WORKING AT NAMO HOSPITAL SILVASSA

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ABSTRACT

Fluid, electrolyte, and acid-base balance play a crucial role in maintaining normal physiological function, especially in patients with cardiac failure. Imbalances in these parameters can lead to severe complications, prolonged hospitalization, and increased mortality. Nurses, being at the forefront of patient care, are responsible for early identification, monitoring, and management of such imbalances. However, lack of adequate knowledge and appropriate clinical decision-making may contribute to mismanagement and adverse outcomes. An educational intervention can significantly enhance nurses' understanding and equip them with the skills necessary for safe and effective care. Therefore, the present study was undertaken to assess the effectiveness of an educational program on knowledge of fluid, electrolyte, and acid-base disturbances and its management in cardiac failure patients among nurses working at NAMO Hospital, Silvassa.

KEYWORDS : Effectiveness, Educational Program, Knowledge, Fluid, Electrolyte, Acid-Base Disturbance, Cardiac Failure

INTRODUCTION

The global burden of heart failure is increasing and poses significant morbidity, mortality, and healthcare costs worldwide. It is estimated that more than 64 million people are living with heart failure globally, and the numbers continue to rise due to an aging population. Cardiac failure, commonly known as heart failure (HF), is a complex clinical syndrome resulting from structural or functional cardiac disorders that impair the ability of the ventricles to fill with or eject blood effectively. Fluid, Electrolyte and acid-base imbalances are common and potentially serious complications in patients with cardiac failure. These disturbances may result from the underlying pathophysiological changes associated with cardiac failure, such as neurohumoral activation-including stimulation of the renin-angiotensin-aldosterone system and increased sympathetic nervous system activity. Patients with cardiac failure often develop hyponatremia, as well as magnesium and potassium deficiencies, with the latter two significantly increasing the risk of cardiac arrhythmias. Early recognition of these imbalances and a solid understanding of their underlying mechanisms are essential for effective patient management.²

Fluid imbalance, particularly volume overload, is one of the hallmark features of decompensated heart failure. It manifests as peripheral edema, ascites, pulmonary congestion, and elevated jugular venous pressure³. Sodium and water retention are driven by decreased renal perfusion and compensatory hormonal mechanisms. Inappropriate diuretic use may further contribute to hyponatremia, which is associated with increased mortality in heart failure patients⁴. Potassium imbalance is another critical concern-hypokalemia may result from loop diuretics, increasing the risk of life-threatening arrhythmias, while hyperkalemia, particularly due to renin-angiotensin-aldosterone system renin-angiotensin-aldosterone system inhibitors, can impair cardiac conduction and muscle function⁵. Magnesium, calcium, and phosphate imbalances can exacerbate arrhythmias and compromise myocardial function⁶. Identifying and correcting these abnormalities is essential for optimizing pharmacologic therapy and stabilizing the patient.

Acid-base imbalances commonly observed in heart failure include metabolic acidosis (due to tissue hypoperfusion and lactic acid accumulation), respiratory alkalosis (from

hyperventilation and anxiety), and metabolic alkalosis (secondary to diuretic therapy)⁷. These disturbances may exacerbate cardiac workload, reduce drug efficacy, and increase the risk of ventricular arrhythmias and organ dysfunction⁸. Monitoring arterial blood gases, serum bicarbonate, and pH levels is crucial in guiding appropriate interventions.

Nurses are frontline healthcare providers responsible for ongoing assessment, monitoring, and intervention in patients with heart failure. Their responsibilities include tracking fluid input and output, interpreting laboratory results, recognizing clinical symptoms of electrolyte imbalance, and initiating nursing actions such as electrolyte replacement, fluid restriction, and escalation of care⁹. Additionally, they play a key role in patient education, medication adherence, dietary modifications, and discharge planning, all of which are essential for preventing readmissions and improving quality of life¹⁰. However, numerous studies have shown that nurses often possess inadequate knowledge and training related to fluid, electrolyte, and acid-base management. A cross-sectional study conducted among ICU nurses revealed that only 52% demonstrated satisfactory knowledge of fluid and electrolyte balance¹¹. Another study in cardiac care units found that over one-third of nurses were unable to correctly identify signs of hyperkalemia or metabolic alkalosis, suggesting a significant knowledge gap¹². These deficiencies may stem from several factors: limited continuing education opportunities, lack of structured protocols, high workload, and insufficient integration of applied pathophysiology in nursing curricula¹³. Without adequate knowledge, nurses may fail to detect subtle signs of deterioration, delay interventions, or misinterpret laboratory findings, ultimately compromising patient safety.

There is growing evidence supporting the use of an educational programs to improve nurses' knowledge and competence in managing fluid and electrolyte disturbances. Structured training sessions, simulation-based learning, and clinical decision-making tools have shown to enhance nurses' performance, confidence, and patient outcomes in cardiac and critical care settings¹⁴. For instance, an educational intervention conducted among nurses in a coronary care unit resulted in a statistically significant improvement in

knowledge scores and reduced medication errors related to electrolyte replacement¹⁵. Given the high prevalence of heart failure and its associated complications, empowering nurses with up-to-date knowledge and clinical skills is essential. An educational program tailored to the pathophysiology, clinical signs, interpretation of diagnostic data, and nursing interventions related to fluid, electrolyte, and acid-base disorders can fill this critical gap. It can also foster better teamwork, timely escalation of care, and evidence-based practice.¹⁶

MATERIALS AND METHODS

This is a pre-experimental research design (one group pretest post-test) was adopted for the study. 50 nurses were selected by using a non-probability convenient sampling technique. The inclusion criteria for nurses were informed consent, presence during the data collection period.

A well designed data and validated expert data collection tool was used dividing in different sections in which the first section of document included sociodemographic details such as age, gender, education, designation, current working area collected. second section of the document include structured knowledge questionnaire of fluid, electrolyte, acid-base disturbances and its management in cardiac failure consist of 45 items. the scoring is 34-45: adequate knowledge, 23-33: moderate knowledge, <22: inadequate knowledge. A pre-test and post-test were done by using those tools. The collected data were analyzed and inferential analysis with a significance level of 5% was performed using spearman's test and chi-square test (0.05).

Table 1. Frequency and Percentage Wise Distribution of Samples Based on Demographic Variables

Sr. No	Demographic variables	Variables	Frequency (f)	Percentage (%)
1	Age in years	21 – 30 years	31	62.0
		31 – 40 years	19	38.0
		41 – 50 years	0	0
		>35	0	0
2	Gender	Male	1	2.0
		Female	49	98.0
3	Total work experience in current hospital	1 to 3 years	18	36.0
		4 to 6 years	21	42.0
		7 years and more	11	22.0
4	Educational qualification	General nursing and midwifery	40	80.0
		B.Sc. nursing	9	18.0
		M.Sc. Nursing	1	2.0
5	Designation	Nursing officer	50	100.0
		Senior staff nurse/in charges	0	0
		Senior nursing officer	0	0
6	Working area	Female medical ward	16	32%
		Male medical ward	17	34%
		Intensive care unit	17	34%

Table 1 shows that : frequency and percentage distribution of nursing officers according to the demographic variables, In this study majority 31 (62%) were in the age group of 21–30 years indicating that most participants were young professionals. The remaining 19 (38%) fell into the 31–40 years age. In the present study as most of 49(98%) nurses were female, and only 1(2%) was male. When assessing total work experience at NAMO Hospital 21(42%) had 4 to 6 years of experience, 18(36%) 1 to 3 years of experience and only 11(22%) nurses reported 7 years or more experience.

Regarding educational background, majority of participants 40(80%) held a general nursing and midwifery qualification, 9(18%) had Bachelor of Science in nursing, while only nurse 1(2%) passed M.Sc. Nursing. In this study majority 50(100%) of the nurse's designation of Nursing officers. In the working area distribution of nurses at NAMO Hospital, 16 nurses (32%) were posted in the Female Medical Ward (FMW). An equal proportion of nurses were working in the Male Medical Ward (MMW) and the Intensive Care Unit (ICU), with 17 nurses (34%) in each. This indicates a relatively balanced allocation of nursing personnel across the three major service areas, ensuring adequate staffing in both general wards and critical care units.

RESULTS

A paired t-test was conducted to compare the pre-test and post-test knowledge scores regarding fluid, electrolyte, and acid-base disturbances and their management in cardiac failure patients. The mean pre-test knowledge score was 21.96 ± 4.94 , indicating inadequate baseline knowledge. Following the educational intervention, the mean post-test score increased to 32.78 ± 3.83 , demonstrating a notable improvement. The mean difference was 10.08, with a t-value of 12.754 and a p-value < 0.001, which is highly statistically significant. This clearly indicates that the educational program was effective in enhancing the overall knowledge of nurses. Therefore, the null hypothesis is rejected, and the research hypothesis is accepted.

The area-wise comparison of knowledge scores before and after the intervention. General information about cardiac failure: The mean knowledge score increased from 5.54 ± 1.73 (55.4%) in the pre-test to 6.78 ± 2.07 (67.8%) in the post-test. The improvement was statistically significant ($t = 3.502$, $p = 0.001$). Types and causes of fluid, electrolyte, and acid-base disturbances: The pre-test mean score of 2.50 ± 1.07 (50%) increased to 3.62 ± 1.02 (72.4%) in the post-test. The improvement was highly significant ($t = 4.664$, $p = 0.001$). Importance of fluid, electrolyte, and acid-base balance in cardiac failure: The mean score increased from 4.18 ± 1.76 (41.8%) to 7.28 ± 1.44 (72.8%), showing a marked improvement ($t = 8.736$, $p = 0.001$). Management of fluid, electrolyte, and acid-base disturbances: The score increased from 4.04 ± 1.88 (40.4%) to 7.40 ± 1.47 (74.0%), showing the highest level of improvement ($t = 10.093$, $p = 0.001$). Role of nurses: The score increased from 5.70 ± 1.87 (57.0%) to 7.70 ± 1.38 (77.0%), which was statistically significant ($t = 6.163$, $p = 0.001$).

Overall, the knowledge score increased from 21.96 ± 4.94 (48.8%) to 32.78 ± 3.83 (72.84%), with a highly significant improvement ($t = 12.754$, $p = 0.001$).

The association between pre-test knowledge scores and selected demographic variables statistically significant association was found between current working area and knowledge score ($\chi^2 = 18.253$, $df = 2$, $p = 0.001$). other demographic data do not have association with age, gender, education qualification, working experience, designation.

CONCLUSIONS

The study concludes that there was a significant knowledge gain in nurses about fluid, electrolyte, acid-base disturbances and its management in cardiac failure patients after an educational program intervention.

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