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A STUDY TO ASSESS THE CRITICAL ROLE OF END TIDAL CARBON DIOXIDE ($ETCO_2$) IN EARLY DETECTION OF METABOLIC ACIDOSIS AMONG MECHANICALLY VENTILATED PATIENTS ADMITTED IN SELECTED HOSPITAL, BANGALORE.

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STATEMENT OF THE PROBLEM

A study to assess the critical role of end tidal carbon dioxide (ETCO2) in early detection of metabolic acidosis among mechanically ventilated patients admitted in selected hospital, Bangalore.

INTRODUCTION AND BACKGROUND OF THE STUDY

Acid-base balance refers to the regulation of pH in the body's fluids, primarily blood, to ensure proper physiological functioning. The pH scale ranges from 0 to 14, with 7 being neutral. Values below 7 are acidic, while values above 7 are alkaline. In humans, the normal pH of arterial blood is between 7.35 and 7.45. Deviation from this range can lead to severe health problems. The body maintains acid-base balance through the lungs, kidneys, and serum buffers. The blood pH is determined by the ratio between bicarbonate concentration and

PaCO2.

The regulation of pH is achieved via three mechanisms: buffer systems, the respiratory system, and the renal system. Buffer systems neutralize excess hydrogen or hydroxide ions to resist pH changes. The respiratory system controls blood pH by adjusting CO2 levels through breathing rate and depth. High CO2 levels make blood more acidic, while low levels increase alkalinity. The kidneys regulate acid-base balance by excreting acids or reabsorbing bicarbonate.

Acid-base imbalances such as acidosis or alkalosis can arise from respiratory conditions (e.g., hypo/hyperventilation), metabolic disorders (e.g., diabetic ketoacidosis), or medication effects. Postoperative acidosis, particularly metabolic acidosis, is common after cardiac surgery. Metabolic acidosis, often diagnosed via arterial blood gas (ABG) analysis, can be life-threatening if untreated. It is typically characterized by low serum bicarbonate, decreased PaCO2, and a reduced blood pH. Approximately 64% of patients in intensive care units (ICUs) experience metabolic acidosis.

ABG analysis is a key diagnostic tool for acid-base disorders, guiding treatment and monitoring patients with respiratory and metabolic abnormalities. However, ABG sampling is invasive and can lead to complications such as hematoma, ischemia, or infections. It is also costly and time-consuming, prompting the need for non-invasive alternatives. One such method is capnometry, which measures end-tidal CO2 (ETCO2), the amount of carbon dioxide in exhaled air. Capnography, a more comprehensive technique, graphically represents ETCO2 and is increasingly used for patient monitoring in emergency and postoperative settings.

Capnography has shown promise as an alternative to ABG for assessing metabolic status. It is non-invasive and provides valuable information on ventilation and circulation. ETCO2 levels correlate with serum bicarbonate (HCO3-) and PaCO2, making it a potential indicator of metabolic acidosis. A study demonstrated a significant correlation between ETCO2 and HCO3- ($R2 = 0.616$) and PaCO2 ($R2 = 0.515$), although the relationship with pH was weaker ($R2 = 0.175$). Despite these findings, ETCO2 measurement is not yet a complete substitute for ABG but may serve as a useful tool in clinical practice, especially in post-operative or emergency care.

Furthermore, post-operative patients, particularly those at risk for respiratory complications (e.g., obstructive sleep apnea or opioid use), may benefit from ETCO2 monitoring alongside traditional methods like pulse oximetry to improve safety and outcomes. Studies suggest that ETCO2 monitoring can detect early signs of respiratory decline and guide timely interventions. In conclusion, while ABG remains the gold standard, capnography holds potential as a non-invasive alternative for monitoring acid-base status, particularly in critical care and post-operative settings.

METHODS

This study adopted a quantitative research approach to assess the role of end-tidal carbon dioxide (ETCO2) in the early detection of metabolic acidosis among mechanically ventilated patients. The research design was observational, aiming to collect and analyze data on ETCO2 values and their relationship to metabolic acidosis in a real-world setting. The study was conducted in the Adult Intensive Thoracic Care Unit at Narayana Hrudayalaya Cardiac Sciences Hospital in Bangalore. The independent variable was the presence of metabolic acidosis, and the

dependent variable was the ETCO2 value. The research population consisted of all patients admitted to the unit, while the target population was specifically mechanically ventilated patients who met the inclusion criteria. A sample of 60 patients from this group was selected to participate in the study. This sample was chosen based on specific inclusion criteria and aimed to provide insights into the relationship between ETCO2 levels and metabolic acidosis. The sample size of 60 was deemed adequate for statistical analysis and drawing meaningful conclusions regarding the clinical utility of ETCO2 monitoring in critically ill patients.The sample size for this study was based on a previous article that correlated ETCO2 and ABG values in predicting metabolic acidosis among mechanically ventilated patients. The study found that, among 60 samples, the mean bicarbonate level in patients with metabolic acidosis was 21.97 ± 3.37, and the mean ETCO2 was 44.70 ± 7.24. A purposive sampling technique was used to select patients who met the inclusion criteria, which included adults aged 30-60 years, on invasive mechanical ventilation, and with continuous ETCO2 monitoring. Exclusion criteria included patients with known primary respiratory diseases or those unwilling to participate.

The data collection procedure took place at Narayana Hrudayalaya Cardiac Sciences Hospital, Bangalore, from April 1st to April 10th, 2024. Following approval from the hospital and nursing college, 60 participants were selected for the study. Data were collected from 8 AM to 8 PM over ten days, excluding night shifts. The researcher obtained informed consent from patients' relatives, ensuring confidentiality. Baseline data were gathered two hours after admission, and clinical variables were recorded using cardiac monitors and ventilator settings. ETCO2 and ABG samples were collected simultaneously, with capnography performed for one minute during each ABG sample collection. Data were analyzed using descriptive and inferential statistics.

OBJECTIVES

1. To find the correlation between $ETCO_2$ value and HCO_3 value in early detection of metabolic acidosis.

2. To determine the association of $ETCO_2$ value and HCO_3 value among patients on mechanical ventilator and selected baseline variable and clinical variables.

HYPOTHESES

H_1: There will be a correlation between $ETCO_2$ value and HCO_3 value in early detection of metabolic acidosis.

H_2: There will be a significant association with $ETCO_2$ value and HCO_3 value of patients on mechanical ventilator and selected baseline variables and clinical variables.

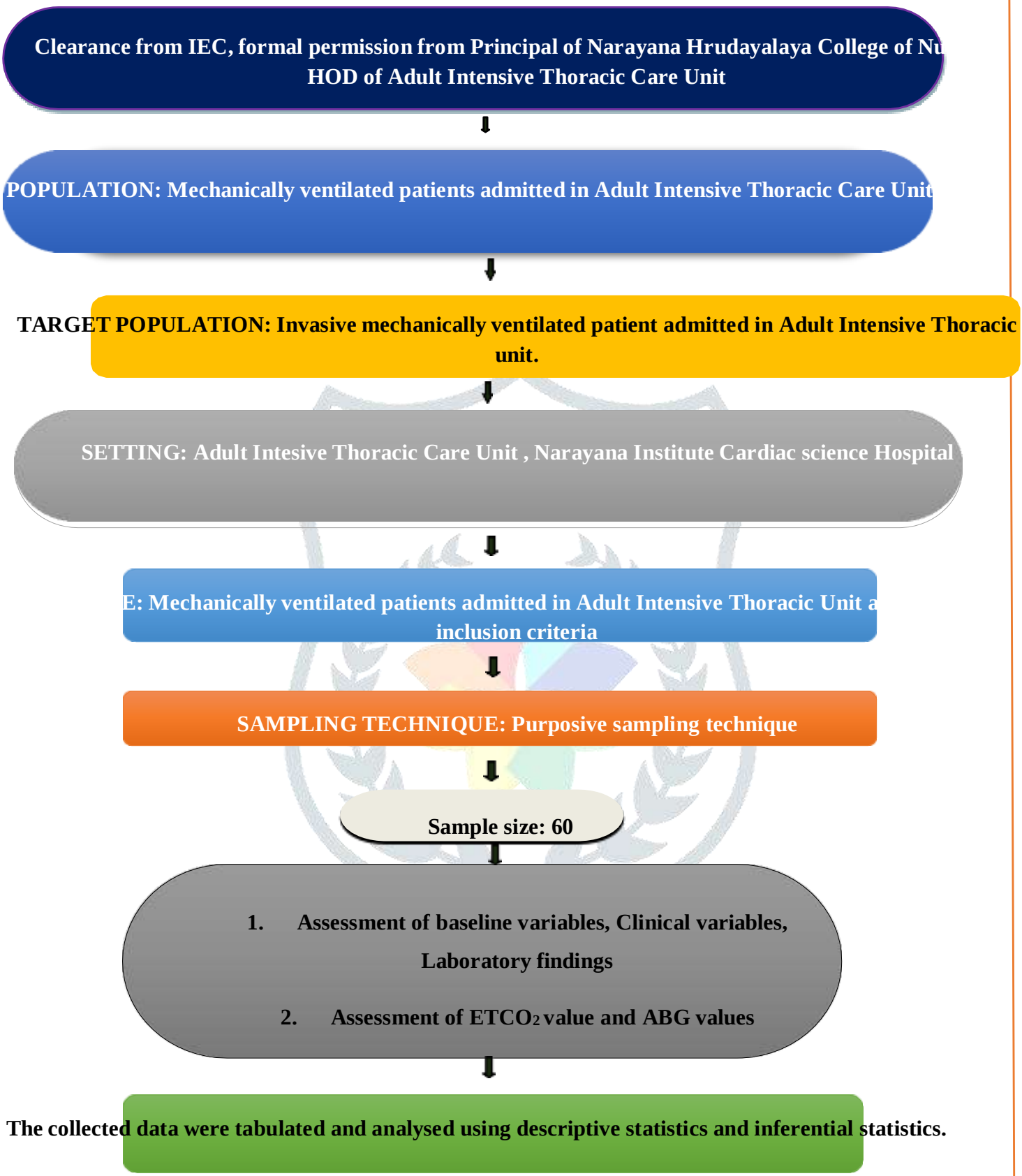

FIGURE 1: THE SCHEMATIC PRESENTATION FOR RESEARCH METHODOLOGY

RESULTS:

SECTION –A: Frequency and percentage of distribution of baseline variables of patients with mechanical ventilation admitted in AITU.

Table 1: Frequency and percentage of distribution of baseline variables of patients with mechanical ventilation admitted in AITU.

Baseline Variables	**Frequency (f)**	**Percentage (%)**
Age in year		
31 – 50	20	33
51- 60	21	35
>60	19	32
Gender		
Male	50	83
Female	10	17
Primary Reason for admission to AITU		
CABG	26	43
MVR	10	15
Pulmonary Thromboendarterectomy	0	0
Other Surgical Procedures	24	42
Co-morbidities		
Hypertension	15	25
Diabetes mellitus	16	27
Both A and B	9	33
CKD	20	15
Baseline Variables	**Frequency (f)**	**Percentage (%)**
Medical	2	3
Cardiac	58	97

Section B: Frequency and percentage of distribution of clinical variables of patients with mechanical ventilation admitted in AITU.

Table 2: Frequency and percentage of distribution of clinical variables of patients with mechanical ventilation admitted in AITU.

n=60

Clinical variables	**Frequency (f)**	**Percentage (%)**
Heart Rate per minute		
50-60	2	3
61-70	6	10
71-80	16	27
>80	36	60
MAP in mm of Hg		
60-70	2	3
71-80	10	17
81-90	21	35
>90	27	45
Breaths per minute		
12-15	56	94
16-18	2	3
>18	2	3
Body Temperature in Fahrenheit		
98-98.6	60	100
>98.8	0	0
Oxygen saturation (Spo_2)		
91 – 95	0	0
96 – 100	60	100
Clinical variables	**Frequency (f)**	**Percentage (%)**
Mode of ventilator		
PRVC-SIMV	16	27
V-SIMV	44	73
FiO_2		
40 – 60 %	44	73
61 – 80%	16	27
>81%	0	0

The table 2 clinical variables shows that, heart rates (>80 b/min) in 60% of cases, Mean Arterial Pressure (MAP) distributions revealed 45% with values exceeding 90 mm Hg, Breath rates were stable, with 94% maintaining a normal range of 12-15 breaths per minute. Body temperatures were consistently normal (98-98.6°F) across all patients. Oxygen saturation levels were uniformly high (96-100%), ensuring effective oxygenation. Ventilator support predominantly utilizes V-SIMV mode (73%), with most patients requiring moderate FiO_2 levels (40-60%).

n=60

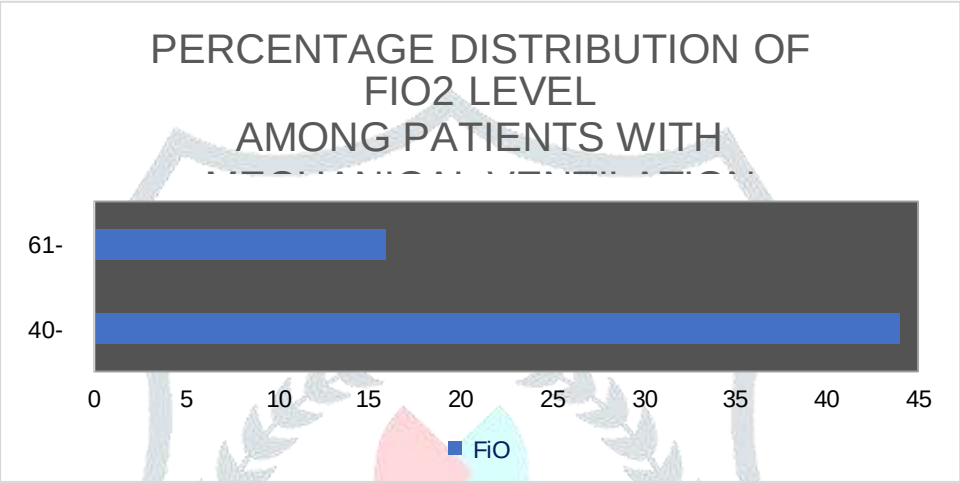

Figure 5: Bar diagram shows percentage distribution of FiO_2 level among patients with mechanical ventilation.

Section C: Frequency and percentage distribution of laboratory findings of patients with mechanical ventilation admitted in AITU.

Table 3: Frequency and percentage distribution of laboratory findings of patients with mechanical ventilation admitted in AITU.

n=60

Laboratory Findings	**Frequency (f)**	**Percentage (%)**
Total WBC count		
4000 – 9000 cells	28	47.0
9001 – 12000 cells	27	45.0
12001 - 15000 cells	5	8.0
Hemoglobin level		
8 - 10 mg/dl	14	23
10.1 – 13 mg/dl	27	45

13.1 - 16 mg/dl	16	27
>16.1 mg/dl	3	5
BUN level		
6 -11 mmol / lit	23	35
12 – 17 mmol / lit	21	38
18 - 24 mmol / lit	10	17
>24 mmol/lit	6	10
Serum Creatinine		
0.6- 1 mEq/lit	34	57
1.1 to 2 mEq/lit	26	43
Laboratory Findings	**Frequency (f)**	**Percentage (%)**
Random blood sugar		
00-200 mg/dl	35	58
201– 300 mg/dl	19	32
301-400 mg/dl	6	10

The table 3 laboratory findings shows, white blood cell (WBC) counts balanced distribution, with 47% falling within the normal range of 4000-9000 cells, and 45% between 9000-12000 cells, hemoglobin levels vary widely, with 23% of patients having levels between 8-10 mg/dl, 45% between 10.1-13 mg/dl, and 27% between 13.1-16 mg/dl, Blood

Urea Nitrogen (BUN) levels distributed among 35% (6-11 mmol/lit), 38% (12-17 mmol/lit),

17% (18-24 mmol/lit), and 10% (>24 mmol/lit). Serum Creatinine levels similarly vary, with 57% having levels within 0.6-1 mEq/lit and 43% between 1.1-2 mEq/lit, Random blood sugar levels exhibit varied glycemic control, with 58% falling within 100-200 mg/dl, 32% between 201-300 mg/dl, and 10% between 301-400 mg/dl.**Section D: Frequency and percentage distribution of ABG values and $ETCO_2$ value of patients with mechanical ventilation admitted in AITU.**

Table 4: Frequency and percentage distribution of ABG values and $ETCO_2$ value of patients with mechanical ventilation admitted in AITU.

n=60

ABG Values	Frequency (f)	Percentage (%)
pH		
7.1 – 7.35	19	31.67
7.36 – 8	41	68.33
Bicarbonate value		
18-22 mEq/lit	11	18.33
22.1– 26 mEq/lit	26	43.33
26.1-30 mEq/lit	23	38.33
$PaCO_2$		
20 – 30	10	17
31 – 40	22	53
>41	18	30
PaO_2		
80 -100 mmHg	2	3
101 - 200 mmHg	25	42
201 - 300 mmHg	26	43
>301 mmHg	7	12
ABG Values	**Frequency (f)**	**Percentage (%)**
BE ecf		
0.1-2	6	10
-2.1 - -3.1	15	25
-3.2 - -4.1	15	25
>-4.2	24	40
$ETCO_2$ value		
20 - 25 mmHg	35	58
26 – 30 mmHg	11	18
>30 mmHg	14	24

The table 4 shows that ABG (Arterial Blood Gas) values and $ETCO_2$ values. pH levels were predominantly

within normal limits, with 68.33% falling between 7.36-8, bicarbonate value vary, with 43.33% between 22.1-26 mEq/lit, $PaCO_2$ values show 53% within 30-40 mmHg, PaO_2 levels were predominantly between 100-300 mmHg, Base excess (BE ecf) values indicate metabolic balance, with 40% having values greater than -4.2. End-tidal CO_2 ($ETCO_2$) values were 58% between 20-25 mmHg.

Section E: Correlation between the $ETCO_2$ value and Bicarbonate value and among patients with mechanical ventilation admitted in AITU.

Table 5: Correlation between the $ETCO_2$ values and Bicarbonate value of patients with mechanical ventilation admitted in AITU.

n= 60

Variables	**Mean**	**S.D**	**Karl Pearson's 'r' & p-value**
Bicarbonate value	22.37	3.57	**r= - 0.401**
$ETCO_2$ value	47.28	8.73	**p=0.019, S***

*p<0.05, S – Significant

The table 5 shows that mean score of Bicarbonate level among patients with mechanical ventilation was 22.37 with SD of 3.57 and the mean score of $ETCO_2$ was 47.28 with SD of 8.73. The calculated Karl Pearson's Correlation value of r = -0.401 shows a negative correlation which was found to be statistically significant at p<0.05 level. This clearly infers that when the $ETCO_2$ value increased ultimately Bicarbonate value decreased among the patients on mechanical ventilation admitted in AITU.CORRELATION BETWEEN THE $ETCO_2$ VALUE AND BICARBONATE VALUE

n=60

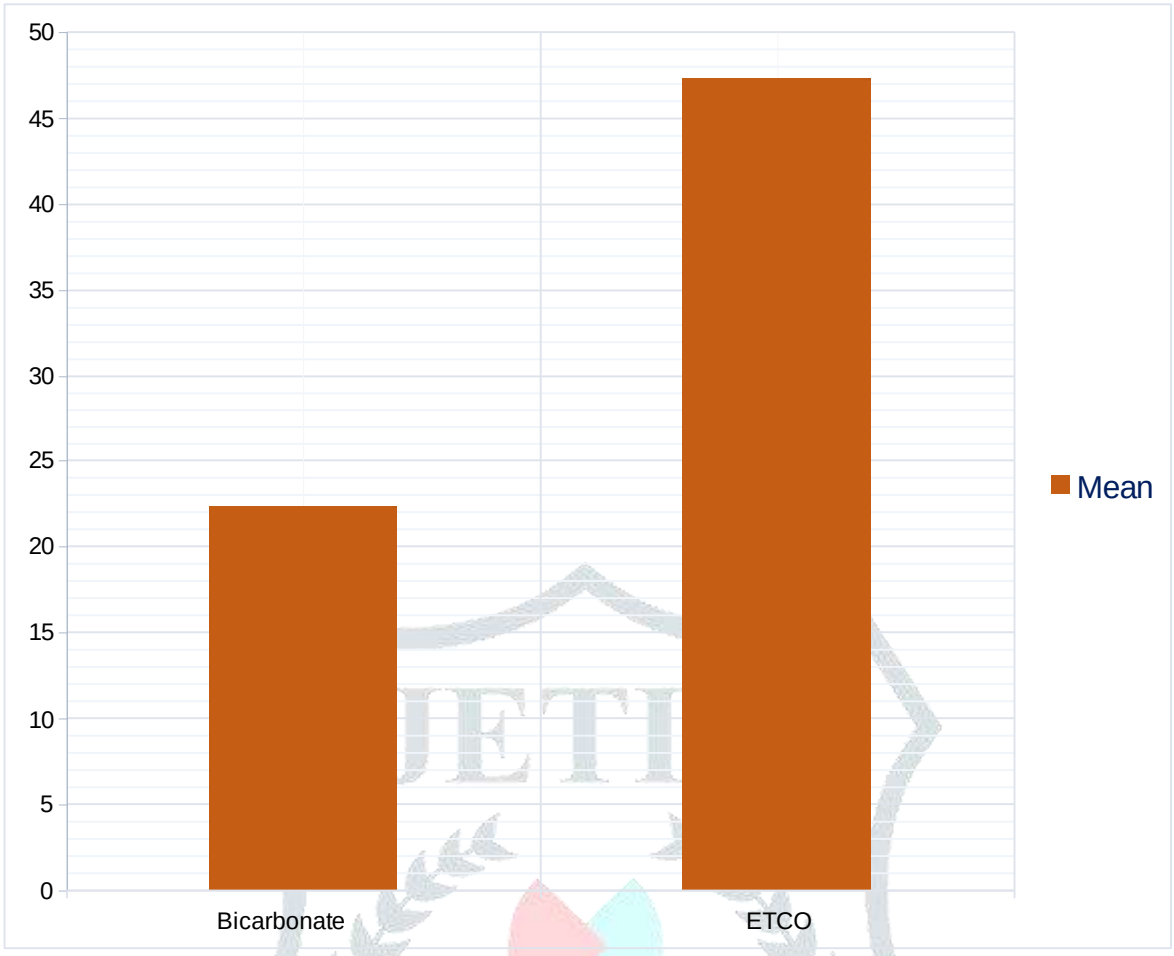

Figure 6: Bar diagram shows the correlation between the $ETCO_2$ value and Bicarbonate value and among patients with mechanical ventilation admitted in AITU.Section F: Association of $ETCO_2$ value and bicarbonate value among patients with mechanical ventilation admitted in AITU with their selected baseline variables and clinical variables

Table 6.a: Association of $ETCO_2$ value among patients with mechanical ventilation admitted in AITU with their selected baseline variables.

n=60

Baseline Variables	**$ETCO_2$ value**			**Chi-Square Test**
	20 – 25	**26 – 30**	**>30**	
Age in year				χ^2=6.006 d.f=4 p=0.197 N.S
31 – 50	2	16	5	
51- 60	0	6	19	
>60	2	0	10	
Gender				χ^2=1.431 d.f=2 p=0.748 N.S
Male	4	18	30	
Female	0	5	5	
Primary Reason for admission to ICU				χ^2=11.385 d.f=14 p=0.365 N.S
CABG	8	10	19	
MVR	0	4	6	
Pulmonary Thromboendarterectomy	0	2	1	
Other Surgical Procedures	1	6	3	
Co-morbidities				χ^2=7.107 d.f=6 p=0.431 N.S
Hypertension	4	6	8	
Diabetes mellitus	2	1	3	
Both A and B	0	7	5	
CKD	0	0	2	

*p<0.05, S – Significant, N.S – Not Significant.

The table 6.a analysis depicted that there was no significant association between $ETCO_2$ value and baseline variables.

Table 6.b: Association of Bicarbonate value among patients with mechanical ventilation admitted in AITU with their selected baseline variables.

n= 60

Baseline Variables	**Bicarbonate value**			**Chi-Square test**
	18 – 22	**22.1– 26**	**26.1- 30**	
Age in year				χ^2=1.755 d.f=4 p=0.847 N.S
31 – 50	8	16	5	
51- 60	0	6	13	
>60	3	4	5	
Gender				χ^2=3.573 d.f=2 p=0.193 N.S
Male	14	12	24	
Female	0	4	6	
Primary Reason for admission to ICU				**χ^2=22.170 d.f=14 p=0.033 S***
CABG	17	10	10	
MVR	0	5	5	
Pulmonary Thromboendarterectomy	0	2	1	
Other Surgical Procedures	1	6	3	
Co-morbidities				χ^2=7.472 d.f=6 p=0.763 N.S
Hypertension	8	6	4	
Diabetes mellitus	2	2	2	
Both A and B	1	5	6	
CKD	0	1	1	

*p<0.05, S – Significant, N.S – Not Significant.The table 6.b provided an analysis of the relationship between baseline variables (including age, gender, primary reason for ICU admission, and co-morbidities) and bicarbonate values categorized into three ranges: 18-22, 22.1-26, and 26.1-30, using Chi-Square tests.
It shows that the baseline variable primary reason for admission to AITU **(χ^2=22.170, p=0.033)** had shown statistically significant association with level of Bicarbonate value among patients with mechanical ventilation admitted in AITU at p<0.05 level and did not show statistically significant association with bicarbonate value among patients with mechanical ventilation admitted in AITU.

Table 6.c: Association of $ETCO_2$ value among patients with mechanical ventilation admitted in AITU with their selected clinical variables.

n=

Clinical Variables	$ETCO_2$value			Chi-Square test
	20 – 25	26 – 30	>30	
Heart Rate per minute				
50-60	8	9	4	**χ^2=12.843 d.f=6 p=0.023 S***
61-70	6	5	2	
71-80	7	4	6	
>80	3	4	2	
MAP in mm of Hg				
60-70	6	1	2	χ^2=2.763 d.f=2 p=0.176 N.S
71-80	0	6	5	
81-90	5	8	9	
>90	0	10	8	
Breath per minute				
12-15	7	6	11	χ^2=1.608 d.f=3 p=0.806 N.S
16-18	0	11	14	
>18	0	7	4	
Body temperature in Fahrenheit				**χ^2=9.316 d.f=4 p=0.013 S***
98-98.6	15	24	21	
>98.8	0	0	0	
Oxygen saturation (Spo_2)				
91 – 95	0	0	0	χ^2=4.350 d.f=4 p=0.361 N.S
96-100	15	36	9	

60*p<0.05, S – Significant, N.S – Not Significant.

The table 6.c shows that the clinical variables heart rate **(χ^2=12.843, p=0.023)** and Body temperature **(χ^2=9.316, p=0.013)** have statistically significant association with $ETCO_2$ value among patients with mechanical ventilation admitted in AITU at p<0.05 level and other clinical variables did not show statistically significant association with level of $ETCO_2$ value among patients with ventilation

admitted in AITU.**Table 6.d:** Association of bicarbonate value among patients with mechanical ventilation admitted in AITU with their selected clinical variables. **n=60**

Clinical Variables	Bicarbonate value			Chi-Square test
	18 - 22	22.1– 26	26.1- 30	
Heart Rate per minute				χ^2=6.223 d.f=6 p=0.222 N.S
50-60	2	16	5	
61-70	0	6	10	
71-80	2	0	10	
>80	0	6	4	
MAP in mm of Hg				χ^2=0.275 d.f=2 p=0.834 N.S
60-70	0	5	5	
71-80	0	4	8	
81-90	8	10	11	
>90	0	4	6	
Breath per minute				χ^2=5.680 d.f=3 p=0.226 N.S
12-15	1	16	3	
16-18	2	14	6	
>18	4	6	8	
Body temperature in Fahrenheit				χ^2=3.536 d.f=4 p=0.472 N.S
98-98.6	6	13	17	
>98.8	3	7	14	
Oxygen saturation (Spo_2)				χ^2=4.979 d.f=4 p=0.289 N.S
91 – 95	7	18	12	
96-100	2	16	5	

*p<0.05, S – Significant, N.S – Not Significant.
The table 6.d shows that the clinical variables did not show statistically significant association with level of bicarbonate value among patients with mechanical ventilation admitted in AITU.

DISCUSSION

The findings of the study based on objectives are, The first objective of the study: To find the correlation between ETCO2 value and HCO3 values in early detection of metabolic acidosis.

The investigator assessed the correlation between ETCO2 value and HCO3 value in mechanically ventilated patients.

The analysis depicted that the correlation between ETCO2 value and HCO3 value in mechanical ventilation patients. The calculated Karl Pearson's Correlation value of r = -0.401 shows a negative correlation which was

found to be statistically significant at p<0.05 level.

The results indicate that as ETCO2 values increase, HCO3 values decrease, and establishing the inverse relationship between these two variables. The study supports the research hypothesis H1, which suggests a correlation between ETCO2 value and HCO3 value.

A similar study aimed to compare of end-tidal carbon dioxide and arterial blood bicarbonate levels in patients with metabolic acidosis referred to emergency medicine in Tabriz University of Medical Sciences, Iran. A descriptive-analytical study was adopted. 262 patients was evaluated. The result shows that mean of ETCO2 and HCO3 levels in patients with metabolic acidosis were 22.29 ± 4.15 and 12.78 ± 3.83, respectively. In all patients, the significant direct linear relationship was found between ETCO2 with HCO3 (r=0.553, P<0.001). According to the results of this study, capnography can be used for primary diagnosis of metabolic acidosis in spontaneously breathing patients.60

The second objective of the study: To determine the association of ETCO2 value and HCO3 value among patients on mech1anical ventilator and selected baseline variable and clinical variables.

The investigator assessed the association of ETCO2 value and HCO3 value among patients on mechanical ventilator and selected baseline variable.The analysis revealed that the baseline variable primary reason for admission to AITU ($\chi 2=22.170$, p=0.033) had shown statistically significant association with level of bicarbonate value among patients with mechanical ventilation admitted in AITU at p<0.05 level and did not show statistically significant association with other baseline variables and bicarbonate level among patients with mechanical ventilation admitted in AITU.

Also the analysis depicted that there was no significant association between ETCO2 value and any of the baseline variables.

The investigator assessed the association of ETCO2 value and HCO3 value among patients on mechanical ventilator and selected clinical variable.

The analysis revealed that the clinical variables did not show statistically significant association with level of bicarbonate level among patients with mechanical ventilation admitted in AITU.

But, clinical variables heart rate ($\chi 2=12.843$, p=0.023) and body temprature ($\chi 2=9.316$, p=0.013) had shown statistically significant association with ETCO2 value among patients with mechanical ventilation admitted in AITU at p<0.05 level and other clinical variables did not show statistically significant association with ETCO2 value.

A similar study aimed to comparison of a study to correlate the ETCO2 and ABG in predicting metabolic acidosis among patient on mechanical ventilation in intensive care unit at Saveetha Medical College and Hospital, Thandalam. One of the objective in this study was to find the association of bicarbonate level and ETCO2 level among patients with mechanical ventilation admitted in ICU with their selected baseline variables. Result showed that the baseline variable primary etiology for admission to ICU ($\chi 2=19.440$, p=0.035) had shown statistically significant association with level of bicarbonate level among patients with metabolic acidosis admitted in ICU at

p<0.05 level and did not show statistically significant association with bicarbonate level among patients with metabolic acidosis admitted in ICU.

The clinical variables heart rate ($\chi 2$=13.437, p=0.037) and body temperature ($\chi 2$=9.928, p=0.042) had shown statistically significant association with level of ETCO2 level among patients with metabolic acidosis admitted in ICU at p<0.05 level and other clinical variables did not show statistically significant association with ETCO2 value.

CONCLUSION

The $ETCO_2$ values are really good and effective tool for predicting the metabolic acidosis among critically ill patients in intensive care unit.

FINDINGS OF THE STUDY

Frequency and percentage of distribution of baseline variables of patients with mechanical ventilation admitted in AITU.

The age distribution revealed that 33% of patients were between 31 and 50 years old, and 35% aged 51-60 years, while no patients were under 30 years.

The gender distribution was heavily skewed towards males, who constitute 83% of the population, compared to 17% females. Regarding the primary reasons for admission, Coronary Artery Bypass Grafting (CABG) was the most common, accounting for 43% of admissions, followed by other surgical procedures at 42%, and mitral valve replacement (MVR) at 15%.

Co-morbidities were prevalent, with 25% of patients having hypertension, 27% with diabetes mellitus, and 33% having both conditions. Chronic kidney disease (CKD) was present in 15% of the patients.

The diagnosis data highlights a predominant focus on cardiac issues, with 97% of patients admitted for cardiac-related reasons, and only 3% for medical reasons.

Frequency and percentage of distribution of clinical variables of patients with mechanical ventilation admitted in AITU

The findings revealed that 60% of patients Heart rates was >80 b/min. Mean Arterial Pressure (MAP) distributions reveal 45% with values exceeding 90 mm Hg. Respiratory rates were stable, with 94% maintaining a normal range of 12-15 breaths per minute. Body temperatures were consistently normal (98-98.6°F) across all patients. Oxygen saturation levels were uniformly high (96-100%), ensuring effective oxygenation among 60 patients. 73% of patients were on V-SIMV mode, with 44 patients requiring moderate FiO_2 levels (40-60%).

Frequency and percentage distribution of laboratory findings of patients with mechanical ventilation admitted in AITU.

White blood cell (WBC) counts balanced distribution, with 47% falling within the normal range of 4000-9000 cells, and 45% between 9001-12000 cells. Hemoglobin levels vary widely, with 23% of patients having levels between 8-10 mg/dl, 45% between 10.1-13 mg/dl, and 27% between 13.1-16 mg/dl. Blood Urea Nitrogen (BUN)

levels distributed among 35% (6-11 mmol/lit), 38% (12-17 mmol/lit), 17% (18-24 mmol/lit), and 10% (>24 mmol/lit). Serum Creatinine levels similarly vary, with 57% having levels within 0.6-1 mEq/lit and 43% between 1.1-2 mEq/lit. Random blood sugar levels exhibit varied glycemic control, with 58% falling within 100-200 mg/dl, 32% between 201-300 mg/dl, and 10%
between 301-400 mg/dl.

Frequency and percentage distribution of ABG values and $ETCO_2$ value of patients with mechanical ventilation admitted in AITU

pH levels were predominantly within normal limits, with 68.33% falling between 7.36-8. Bicarbonate value vary, with 43.33% between 22-26 mEq/lit. $PaCO_2$ values showed 53% within 30-40 mmHg, PaO2 levels were predominantly between 100-300 mmHg. Base excess (BE ecf) values indicated metabolic balance, with 40% having values greater than -4.2. End-tidal CO_2 ($ETCO_2$) values were 58% between 20-25 mmHg.

Correlation between the $ETCO_2$ value and bicarbonate value of patients with mechanical ventilation admitted in AITU

Bicarbonate value among patients with mechanical ventilation was 22.37 with SD of 3.57 and the mean score of $ETCO_2$ was 47.28 with SD of 8.73. Thecalculated Karl Pearson's Correlation value of r = -0.401 shows a negative correlationwhich was found to be statistically significant at $p<0.05$ level.

Association of $ETCO_2$ value and bicarbonate value among patients with mechanical ventilation admitted in AITU with their selected baseline variables

Roehrborn F, Dohle DS, Waack IN, Tsagakis K, Jakob H, Teloh JK. Postoperative
The baseline variable primary reason for admission to AITU **(χ^2=22.170, p=0.033)** had shown statistically significant association with level of Bicarbonate valueamong patients with mechanical ventilation admitted in AITU at $p<0.05$ Adeva-Andany MM, Fernández-Fernández C, Mouriño-Bayolo D, Castro-Quintela E, ıg patients with mechanical ventilation admitted in AITU.

Association of $ETCO_2$ value and bicarbonate value among patients with mechanical ventilation admitted in AITU with their selected clinical variables.

The clinical variables heart rate **(χ^2=12.843, p=0.023)** and Body temperature **(χ^2=9.316, p=0.013)** had shown statistically significant association with level of $ETCO_2$ value among patients with mechanical ventilation admitted in AITU at $p<0.05$ level and did not show statistically significant association with level of $ETCO_2$ value and other clinical variables.

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