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Mortality Prediction Among Critically Ill Patients During Intensive Care Unit Stays At Assuit University Hospital

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Abstract
Background: - Mortality of ICU patients is a global parameter reported as an endpoint in numerous studies. However, causes and characteristics of patients' death studied only in particular pathologies such as sepsis, cardiac arrest or ARDS. Therefore, **Aim** of this study was to predict mortality rates among critically ill patient admitted to the intensive care units at Assuit University Hospital over a period of one year, and to identify the predisposing factors that affect mortality rates in intensive care units. **Design:** Descriptive Exploratory research design used to conduct this study. **Setting:** This study carried in the Trauma, General and Postoperative Intensive Care Units at Assuit University Hospital. A sample of convenience of all adults' critically ill patients admitted over a period of one year from January to December 2016. **Three main Tools** was used, **Tool I:** Personal and medical data sheet, **Tool II**: predisposing factors for hospital death of the critically ill patient assessment tool, **Tool III:** hospital mortality prediction scales" (SAPS II). **The main result** revealed that mean SAPS II score of the studied sample was (41.61 ± 18.54), With the estimated mortality risk of (33.82 ± 29.28%) and the observed mortality of the total sample, 600 patients in the three intensive care units were (45.7%).Postoperative complication, shock mainly septic shock, respiratory failure and trauma were the most prominent contributor to the mortality. **Conclusion: -** Majority of the studied patients at Assuit University Hospital was a high risk of mortality with total mortality rate of 45.7 and about 21.3 of them were at sever mortality risk. **Recommendations:-**Using the mortality prediction model (SAPS II) is very useful that help for comparing actual and expected outcomes, optimize allocation of critical care resources and evaluate effect of both Nursing and Medical care efforts.
Keywords: SAPS II, mortality prediction.

1. Introduction

Critically ill patient are those at high rate for actual or potential life threatening health problems. Care of critically ill patients can occur in a different number of locations in hospitals **(Elliott, et al 2012).** Critical illness leading to prolonged length of stay (LOS) in an intensive care unit (ICU) is associated with significant mortality and resource utilization. Many Critically ill patients require a prolonged stay in an intensive care unit (ICU) before they recover from their critical illness **(Williams, et al 2010).**

Mortality in critically ill patients depends on factors such as demographic and clinical characteristic of population, infrastructure, non-medical factors (management and organization), and admission practice and by ICU performance **(Abhulimhen, et al 2014).** ICU beds are limited in any hospital, So rationalized the use for needy patients is necessary. Length of stay (LOS) is, therefore, used to assess quality of care and resource utilization **(Ray, et al 2009).** Although pathophysiological processes and new treatment approaches are extensively analyzed in laboratory and clinical research, comparably less data are available on the causes of death, short- and long-term outcomes of critically ill patients **(Viktoria, et al 2006).** Many studies have evaluated the causes of mortality in patients who were admitted to ICU in western countries, but a few are known about the causes of mortality among critically ill patients who were admitted in the ICU in our region **(Daly, 2001).**

Predicting the outcome for groups of critically ill patients by means of scoring systems or mortality probability models has become an important tool of intensive care medicine. The Simplified Acute Physiology Score, version II (SAPS II) is one of the systems widely in use. The global severity of disease and outcome prediction scoring models is derived from age, acute pathophysiology, pre- and comorbidity, state at admission, and underlying disease. The underlying disease category has an independent role for outcome of hospital treatment in critically ill patients. The reliability of outcome prediction in a given population, therefore, depends on the case mix of that population **(Omar, et al 2015).** The critical care nurse provides critically ill patient with holistic nursing care begin with an accurate patient assessment that has a crucial role in both planning and implementing appropriate care and consequently affecting the outcomes of the patients. Hence, this study was conducted to identify most common causes of death in mixed critically ill patients and address role of critical care nurse to improve their outcomes.

2. Significance of the study

Statistics of Egyptian records of Intensive Care Units at Assuit University Hospital in 2016 revealed that the number of patients admitted to the Trauma Intensive care were (500 patients), General Intensive care unit were (425 patients) and to Postoperative Intensive Care were (185 patients) and total death were more than quarter of the total admission to the units. Clinical observation of researcher revealed that critically ill patients admitted to intensive care units are at high risk of death due to the severity of illness on admission, complex and multiple Interventional procedure they undergo in these settings. And many studies had evaluated the causes of mortality in patients who were admitted to ICU in western countries, but a few are known about the causes and predisposing factors of mortality among critically ill patients who were admitted in the ICU in our region and in our governorate and specially in the nursing field. So the findings of the current study clarify that the proper use of SAPAII scale as a mortality prediction model could help in decision making at the right time, decreasing ICU cost and burdens, allocating resources, describing ICU populations at risk for death and explain the mortality difference among admission groups.

3. Patients and Methods

3.1. Aim of the study

The aim of this study was to predict mortality rates among critically ill patient admitted to the intensive care units at Assuit University Hospital over a period of one year. And to identify the predisposing factors that affect mortality rates in intensive care units.

3.2. Research questions: - the study was directed to answer the following research questions.
A-What is the profile characteristic of patients with high mortality predication rate?
B- What are predisposing factors that affect mortality rates in critically ill patients?
C- What is the prevalence of deaths in critically ill patients?

3.3. Research design

A descriptive research design was utilized to fulfill the aim of this study.

3.4. Setting:

The study was conducted at the Trauma Intensive Care Unit (10 beds), General Intensive Care Unit (14 beds) and Postoperative Intensive Care Unit (10 beds) in Assuit University Hospital.

3.5. Sample:

A descriptive one year study (January 2016 to December 2016) of all adult male and female critically ill patients, with different educational and occupational levels admitted to the above mentioned settings who are willing to participate in the study (No of cases = 600) were included.

3.6. Inclusion criteria

The following patients were included in the study:
1.The Patient's newly admitted to the ICU during the study period was included.
2.Expected to stay more than a 24hr period in ICU. Patients were followed up until ICU discharge in order to registrar their survival status

3.7. Study tools

Three tools were used to collect the data in this study.
-Tool one: "Personal and medical data sheet" this tool was developed by the researcher after reviewing the related literature's to assess patient's demographic data and health relevant data it comprised two parts.
Part I: Socio-demographic date: which include unit of admission, patient's code, age, sex, marital status and level of education, date of admission and discharge.
Part II: Medical data: include history of past medical and surgical problems, causes of ICU admission (respiratory, cardiovascular, trauma, neurology, gastrointestinal, or post-operative cause), In addition to presence of past family history of chronic disease, to fulfill patient profile criteria.
-Tool two: " Predisposing factors for hospital mortality of the critically ill patient assessment tool: This tool developed by the researcher to assess causes of patient death in the ICU including (cardiovascular system disorder, Acute Renal failure, Malignancy, respiratory cause, shock, post-operative complications, and sepsis….etc) during ICU stay.
-Tool three: "hospital mortality prediction scale" using the Simplified Acute Physiology scale (SAPS II score):- SAPS II was developed in 1993 by Le Gall and colleagues to provide a method of converting the obtained score to a probability of hospital mortality. It is the most widely used version and like its predecessor,

calculates a severity score using the worst values measured during the initial 24 hours of ICU admission for 17 variables (12 physiologic variable, age, type of admission (scheduled surgical, unscheduled surgical, or medical) and 3 underlying dichotomous disease variables (AIDS, metastatic cancer and hematologic malignancy). The physiological variables are continuous variables that have been made categorical by assigning points to a range of values. SAPS II was developed and validated using data from 13,125 patients admitted to 137 adult ICUs in 12 countries. It excluded patients younger than 18 years, burns patients, coronary care unit patients and cardiac surgery **(Le Gall, et al 1993).** It did, however, perform well for patients with cardiovascular disease as the primary reason for admission and may be applied to these patients **(Metnitz, et al 1999)**. SAPS II can be entered into a mathematical formula, which predicts hospital mortality. It has excellent discrimination and calibration and may be suitable for use in the intermediate care unit settings **(Castella, et al 1995 & Auriant, et al 1998).**
The SAPS II is the most widely used version, and the worst physiological variables were collected within the first 24 hours of ICU admission. The "worst" measurement was defined as the measure that correlated to the highest number of points.
SAPS II Score / Approximate Mortality Interpretation as follows
- 29 = 10%
- 40 =25%
- 52 = 50%
- 64 = 75%
- 77 =90% **(Le Gall, et al 1993).**

- Scoring system for SAPS II:-
A Scoring system of mortality risk of critically ill patients was designed by the researcher based on mortality risk given by SAPS II and were classified as follows:

Item	Score
Mild	SAPS II $\leq$ 25% (less than 40 points)
Moderate	SAPS II 25 -75% (from 40 - 64 points)
Severe	SAPS II $\geq$ 75% (more than 64 points)

3.8. Methods: - the study conduct through two main phase as following.
3.8.1. Preparatory phase:-

- **Content validity:** Content validity of the developed tools was done by 3 experts in the related fields. Two assistant professor of critical care nursing from Faculty of Nursing Assuit University. One professor of critical care medicine from Assuit Faculty of Medicine.
- **Pilot study:** carried out before starting of data collection to test the feasibility and the clarity of the study tools on 10% of the sample, the analysis of pilot study define the modification required in the tool used, and the necessary modification was done prior to data collection.
- **Protection of human rights:** An Official approval was obtained from the hospital administrative authority to collect the necessary data after explanation of the aim and nature of the study. Patients' anonymity and confidentiality were ascertained, patients' was maintained and voluntary participation and right to refuse to participate in the study were emphasized to the patients. Written consent was obtained from patients who are willing to the study.

3.8.2. Implementation phase.

- Data was collected at the Trauma, General and Postoperative Intensive Care Units at Assuit University Hospital during the period from January 2016 to December 2016. The purpose of the study was explained to all conscious patients and the relatives of comatose patients prior to data collection.
- Once the permission was granted to proceed with the proposed study, the researcher's proposal was submitted to the research committee in Assuit University, the name of the patients who have admitted to each unit and who met the criteria were obtained from the responsible nurse in each unit.
- After taking the patient oral agreement for voluntary participation in the study, each patient was communicated personally by the researcher to fulfill the patients assessment sheet throughout the following.
- Data was collected 3 days a week, during the morning and evening shift across the 3 units.
- The researcher went to one of the three units at 9 am, introducing herself for the nursing staff and to the oriented patients, and then explains the nature and purpose of the study ensuring oral agreement to participate. And spend about 3 hours on each unit.
- The researcher used tool one (part A, B) to assess patients socio-demoghraphic data and Personal data (age, gender and cause of admission), Past history of chronic diseases (chronic kidney disease, hypertension, cardiopulmonary, neurological, and hepatic disease respiratory), Past surgical or family history and causes of ICU admission. This was done through asking and reviewing patient sheet.

- To fulfil the parameters of the SAPS II score (tool three) that used to assess patient's mortality risk for each patient, the researcher collect the data from patient sheet based on the worst values recorded during the first 24 h of admission and throughout the subsequent days until discharge.
- To calculate the SAPS II score, 17 variables (12 physiologic variable) and laboratory values are marked and calculated with SAPS II electronic software electronic calculator. The sum of this value is added to a mark adjusting of type of admission (scheduled surgical, unscheduled surgical, or medical), a mark for 3 underlying dichotomous disease variables (AIDS, metastatic cancer and hematologic malignancy), and a mark adjusting for patient age to achieve the SAPS II score.
- Assessing the physiological parameter of SAPS II scale the researcher monitor Vital signs (blood pressure (mm Hg), heart rate (beats/ min), temperature (degree°), respiratory rate (cycles/ minute), mean arterial blood pressure (mm Hg), central venous pressure (cm / h2o), and fluid balance (ml/24hr) it is done through collecting the data from patient sheet using the worst value of physiological parameters through the last 24 hours.
- Laboratory tests were recorded from the patient sheet using the worst value during last 24 hours to complete the physiological parameter of SAPS II scale, including (serum sodium, serum potassium, bilirubin, leukocyte count, serum bicarbonate).
- SAPS II score was calculated based on the worst values recorded during the first 24 h of admission. All enrolled patients were followed during their ICU stay until discharge or death, and the outcome was recorded as survivors or non-survivors.
- The online ICU Mortality Calculator (SAPS II scores to predict hospital mortality (Simplified Acute Physiology Score (SAPS II) Calculator-http://clincalc.com/Icu Mortality/SAPSII.aspx) was used to calculate the corresponding score for each patient. The data included age, gender, vital signs, Glasgow Coma Scale scores, and urine output, which were abstracted at the bedside by trained nurses, according to a formalized protocol, and which were entered into the computer by trained specialists.
- This simplified acute physiology score (SAPS II) calculator determines the severity of health at ICU admission and predicts mortality rates. There is in depth information below the form about all the parameters involved and the mortality correlation equations.
- The parameters are each awarded a particular number of points depending on severity and the evaluator is advised to use the worst determination results for each parameter.
- The original study was developed on a cohort of 13,152 patients divided in developmental and validation groups. Patients under 18 years, patients in cardiac care or having had cardiac surgery were excluded. Both groups performed similarly and the under the receiver operating characteristic curve was 0.88 for development group and 0.86 in the validation group.
- Mortality rates correlated with SAPS II: - Mortality prediction is based on the following formula that employs certain study based variables and the integer result from SAPS II. There is a sigmoidal relationship between score and mortality rates.
- The researcher assessed and document causes of mortality in death group during ICU stay from direct observation and from patient records on discharge, which was obtained from responsible nurse.
- And finally the researcher assessed the studied patients with previous mentioned setting for ICU discharge criteria (monitoring of the outcomes) by recording the following:

1- Discharge to home.
2- Transfer to another unit.
3- Mortality.
4- The length of patients' stays (LOS) from ICU admission till discharge.

3.9. Statistical analysis:

The data were tested for normality using the Anderson-Darling test and for homogeneity variances prior to further statistical analysis. Categorical variables were described by number and percent (N,%), where continuous variables described by mean and standard deviation (Mean, SD). Chi-square test and fisher exact test used to compare between categorical variables where comparisons between continuous variables by t-test, Binary Logistic Regression was used to explain the predictive power in the study (Multiple regressions used for multivariate analysis). A two-tailed $p < 0.05$ was considered statistically significant. All analyses were performed with the IBM SPSS 20.0 software.

4. Results

Table (1): Percentage distribution of the study sample in relation to the socio-demographic data (N=600)

Variables	No.	%
Type of ICU		
Trauma ICU	152	25.3
General ICU	302	50.3
Postoperative ICU	146	24.3
Sex		
Male	384	64.0
Female	216	36.0
Age group		
From 18 - > 30 years	186	31.0
From 30 - > 50 years	160	26.7
From 50 - ≥ 65 years	254	42.3
Occupation		
Student	98	16.3
Employer	212	35.3
Retired	154	25.7
Unemployed	136	22.7
Level of education		
Illiterate	104	17.3
Read & write	72	12.0
Primary	88	14.7
Secondary	142	23.7
Bachelor	194	32.3
Marital status		
Single	134	22.3
Married	386	64.3
Divorced	16	2.7
Widow	64	10.7

4.1. Table 1: Shows that more than half of the studied patients (50.3 %, 64.0 %, and 64.3%) were admitted to the General Intensive Care Unit, male gender and married respectively. As well shows that a high percentage of the sample (42.3%, 35.3%, 32.3%) was aged from (50 – 65 years), employer and had bachelor's degrees.

Table (2): Percentage distribution of the study sample in relation to the Medical data & Causes of ICU admission (N=600)

Variables	No		Yes	
	No.	%	No.	%
A) Past medical & surgical history				
1-Cardiovascular disease	514	85.7	86	14.3
2-Respiratory disease	468	78.0	132	22.0
3-GIT disease	492	82.0	108	18.0
4-Neurological disease	568	94.7	32	5.3
5-Renal disease	540	90.0	60	10.0
6-Neuromuscular disease	578	96.3	22	3.7
7-Traumatized patient	600	100.0	0	0.0
8-Allergy	586	97.7	14	2.3
9-Surgical history	400	66.7	200	33.3
10-Endocrine disorder	576	96.0	24	4.0
B) Cause of ICU admission)				
a- Non-operative causes				
1. Cardiovascular cause	530	88.3	70	11.7
2. Respiratory cause	518	86.3	82	13.7
3. GIT cause	560	93.3	40	6.7
4. Neurological cause	556	92.7	44	7.3
5. Traumatized patient	358	59.6	242	40.3
6. Gynecological & Obstetric cause	594	99.0	6	1.0
7. Post arrest	564	94.0	36	6.0
8. Organ phosphorus Poisoning	588	98.0	12	2.0
9. Heat stroke& Electrolyte disturbances	594	99.0	8	1.6
10. Toxicity	578	96.3	22	3.7
11. Hematologic disease	598	99.7	2	0.3
12. shock[1]	594	99.0	6	1.0
13. Burn	598	99.7	2	0.3
14. Animal Bite	598	99.7	2	0.3
15. Drowning	598	99.7	2	0.3
b- Elective operation	446	74.3	154	25.7
c- Emergency operation	486	81.0	114	19.0
d- Co-morbidities (chronic health condition)				
d-1-Cirrhosis	542	90.3	58	9.7
d-2-Malignancy	574	95.7	26	4.3
d-3-Kidney failure	564	94.0	36	6.0
d-4-HTN[2]	405	67.5	195	32.5
d-5-DM[3]	499	74.8	151	25.2

1inculde both hypovolemic and septic shock . 2 Hypertension, 3 Diabetes Mellitus.

4.2. Table 2: Demonstrate that regarding presence of past medical and surgical history about one third of the studied sample had past surgical history (33.3%), and high percentage had respiratory, GIT and cardiovascular disease (22%, 18%, 14.3%) respectively. Regarding causes of ICU admission the table shows, more than one third of patients were admitted due to Trauma cause (40.3%), and (25.7%, 19.0%) were admitted due to elective postoperative and emergency postoperative causes respectively. Also revealed that a high percent of patients have comorbidities (32.5%, 25.2%) have hypertension and DM respectively.

Table (3): Distribution of the study sample according to hemodynamic parameter on admission until 5th day of ICU stay (N=600)

Variables	1st day	2nd day	3rd day	4th day	5th day	P. Value
Temperature (o)	37.75±1.44	37.3±1.71	38.8±1.45	37.5±1.7	37.5±1.65	**<0.001****
Pulse (BM)	105 ±32.5	110.1±25.8	89.8±49.6	107.8±32.5	102.7±30.4	**<0.001****
Respiration (RR)	22.4±4.1	28.2 ±7.5	24.1±6.6	26.8 ±3.5	22.4±4.8	**1.000**
MABP (mmhg)	70.6±14	63.9±14.5	65.9±20.5	75.2±24.4	73.7±12.2	**0.004****
CVP (mmh2o)	9.3 ±7.3	11.8±4	13.3±5.6	11.8±7.3	10.5 ±8.5	**<0.001****
Fluid balance	1315.4±1333.9	1410.1±1571.8	1277.9±1213.8	1260.8±1219.3	1347.7±1272.2	**0.667**
-ve	440(73.3%)	426(71%)	338(56.3%)	298(49.7%)	258(43%)	-
+ve	160(26.7%)	174(29%)	156(26%)	124(20.7%)	88(14.7%)	-

MABP (Mean Arterial Blood Pressure)**, CVP** (Central Venous Pressure).

4.3. Table 3: Illustrate hemodynamic parameters for the studied sample on the 1st until the 5th day of ICU stay. It observed that mean value of temperature (37.6±1.2 on 1st day) versus (37.9±1 on the 5th day), while regarding MABP it was (68.6±19 on 1st day) versus (71.7±18.2on 5th day). The CVP reading mean was (9.6±7.4 on 1st day) versus (11.6±7.5 on the 5th day).

Table (4): percentage distribution of the studied sample according to presence of comorbidities.

Comorbitidites	No	%
Cirrhosis	58	9.7
Kidney failure	36	6.0
Malignancy	26	4.3
DM	151	25.2
HTN	195	32.5
Cirrhosis & kidney failure	6	1.0
Cirrhosis & DM	2	0.3
HTN& cirrhosis	2	0.3
Cirrhosis, kidney failure, DM, HTN	2	0.3
Malignancy, DM, HTN	10	1.6
DM & HTN	151	25.1

4.4. Table 4: shows that a high number of the studied patients had chronic disease include HTN, DM (32.5%, 25.2%) and cirrhosis represent (9.7%). Also shows a high percent had more than one chronic disease and more common HTN and DM (25.1).

Table (5): Distribution of the study sample according to SAPS II scale parameters all through five days of ICU stay (N=600)

Variables	1st day	2nd day	3rd day	4th day	5th day
a)Physiological parameter	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
1. SBP	109.65 ± 35.23	110.87 ± 35.08	119.52 ± 33.85	119.2 ± 35.84	121.95 ± 32.85
2. Temperature	37.61 ± 1.18	37.73 ± 1.15	37.83 ± 1.08	37.8 ± 1.03	37.9 ± 1.01
3. PaO2	81.93 ± 41.88	83.1 ± 40.44	79.71 ± 39.06	74.7 ± 35.8	75.85 ± 37.77
4. UOP	2419.75 ± 1644.8	2798.66 ± 1697.31	2811.77 ± 1584.84	2833.27 ± 1632.3	3097.93± 1627.27
5. Urea	12.94 ± 16.67	13.05 ± 15.25	11.94 ± 10.08	11.54 ± 9.88	11.02 ± 8.88
6. Total leukocyte count	14.98 ± 7.64	14.4 ± 8.09	13.34 ± 7.23	13.08 ± 6.92	13.28 ± 7.23
7. Serum potassium	4.67 ± 8.61	4.66 ± 8.6	3.99 ± 0.9	4.06 ± 0.84	4.07 ± 0.77
8. Serum sodium	142.27 ± 12.38	142.32 ± 12.74	142.01 ± 9.47	142.17 ± 8.2	141.2 ± 7.34
9. Serum HCO3	22.35 ± 6.17	23.04 ± 6.4	23.34 ± 6.02	23.48 ± 5.76	24.45 ± 5.81
10. Bilirubin	9.61 ± 11.74	8.42 ± 10.38	8.47 ± 10.11	8.24 ± 9.35	8.2 ± 9.2
11. GCS	9.54 ± 4.48	9.67 ± 4.52	10.19 ± 4.54	10.45 ± 4.68	10.49 ± 4.62
b) Age point	43.44 ± 16.13	43.38 ± 16.11	42.94 ± 15.99	42.73 ± 16.2	42 ± 16.03
c) Chronic health status	212 (35.3%)	212 (35.3%)	170 (28.3%)	150 (25%)	120 (20%)
d) Type of admission					
Emergency surgery	138 (23%)	138 (23%)	128 (21.3%)	116 (19.4%)	104 (17.3%)
Medical	138 (23%)	138 (23%)	108 (18%)	96 (16%)	70 (11.7%)
Scheduled surgery	324 (54%)	322 (53.7%)	260 (43.3%)	210 (35%)	174 (29%)
Total day score	41.61 ± 18.54	40.33 ± 19.23	37.66 ± 18.71	36.66 ± 18.73	35.39 ± 19.17
Mortality risk	33.82 ± 29.28	32.35 ± 29.69	28.68 ± 28.24	27.48 ± 28.39	26.23 ± 28.44

SBP (systolic Blood pressure), **Pao2** (Partial Pressur Of Oxygen), **UOP** (Urine Out Put), **GCS** (glusco coma scale)

4.5. Table 5: Show study sample criteria according to SAPS II scale parameters, it noted that the mean total day score of 1st day of admission was (41.61 ± 18.54) versus (35.39 ± 19.17) on the 5th day of ICU stay. Also regard mortality rate, the mean on 1st day of admission was (33.82 ± 29.28) versus (26.23 ± 28.44) on the 5th day of ICU stay.

Table (6): Percentage distribution of the study sample according to predisposing factors of death during ICU stay (N=274)

Variables	No.	%
1. Postoperative complication [1]	92	33.58
2. Shock[2]	88	32.2
3. Respiratory failure	72	26.28
4. Head injury	68	24.82
5. Acute renal failure	52	18.98
6. Cardiovascular system disorder	40	14.5
7. Malignancy[3]	20	7.30
8. Acute cerebral infarction	16	5.84
9. Acute abdominal disease	6	2.19
10. Diabetic ketoacidosis	20	0.73
11. Others	42	15.3
- Acid base disturbance	6	14.3
- Decrease conscious level	2	4.8
- Electrolyte disturbance	6	14.3
- Fever	6	14.3
- Hepatic failure	2	4.8
- Metabolic acidosis	4	9.5
- Respiratory acidosis	4	9.5
- Poisoning	2	4.8
- Post arrest	4	9.5
- Chronic renal failure	2	4.8
- Severe hypothermia	2	4.8
- Toxicity	2	4.8

1include infection, fever - 2 Include both hypovolemic and septic shock - 3 include infection, fever lung cancer is the most common type

4.6. Table 6: Demonstrate predisposing factors for mortality in ICU, it revealed that about one third (33.5%, 32.2%) experienced postoperative complications and shock respectively. As well high percent of the studied patients (26.2 %, 24.8%, 18.9%) experienced respiratory failure, head trauma and acute renal failure respectively. (14.3%) of dead group experienced acid base disturbance, electrolyte disturbance and fever.

Table (7): Percentage distribution of study sample according to their discharge criteria, length of stay, connection to Mechanical ventilation connection and Glascow Coma Scale on admission (N=600)

Variables	No.	%
Discharge criteria		
1- Alive	326	54.3
a- Discharge to home	58	15.4
b- Transfers to another unit	268	71.3
2- Death	274	45.7
Length of stay		
- <15 days	538	89.7
- ≥15 days	62	10.3
- Mean ± SD	6.54 ± 4.66	
MV connection	320	53.3
GCS (Mean±SD)	9.86±4.94	

4.7.Table 7: illustrate a patient's condition on discharge from Intensive Care Unit, more than half of the sample were discharged alive, connected to the MV (54.3%, 53.3%) respectively. And more than two third of the sample were transferred to other units within the hospital (71.3%). Regard LOS majority of the sample stay less than 15 days with Mean ± SD (6.54 ± 4.66). In relation to GCS score the Mean ± SD (9.86±4.94).

Table (8): - Profile chrachterisitic of death group of the study population (N= 274)

Death group Characteristic	Trauma ICU		General ICU		Postoperative ICU		P. Value
	No	%	No	%	No	%	
Sex							
Male	42	72.4	84	53.2	38	65.5	
Female	16	27.6	74	46.8	20	34.5	0.023*
Age group							
From 18 - 30 years	26	44.8	26	16.5	8	13.8	
From 30 - 50 years	18	31.0	22	13.9	12	20.7	
From 50 - 65 years	14	24.1	110	69.6	38	65.5	0.001**
Mean ±SD	37.83±14.84		52.08±14.76		49.41±14.16		0.001**
Length of stay							
<15 days	48	82.8	140	88.6	52	89.7	
>15 days	10	17.2	18	11.4	6	10.3	0.444NS
SAPS II							
Total score	25.76±6.82		29.15±7.16		27.97±6.68		0.007**
Mortality risk	51.89±23.34		60.71±25.14		52.71±26.06		0.024*

4.8. Table 8: Shows that regard sex in Trauma, General and postoperative intensive care, Majority of the sample were male (72.4%, 53.2, 65.5%) respectively. Regard age group more than one third of the patients admitted to Trauma ICU were aged from 18-30 years with Mean ±SD (37.83±14.84), while more than half of the patients admitted to General and postoperative ICU aged from 50-65years with a highly significant difference P.Value (0.001). Regard LOS in Trauma, General and postoperative intensive care more than two thirds of the patients stay less than 15 days (82.8%, 88.6%, 89.7%) respectively with no difference P.Value (0.444). Regarding Mortality risk in patients admitted to Trauma, General and postoperative ICU there was significant difference P.Value (0.024) Mean ±SD (51.89±23.34, 60.71±25.14, 52.71±26.06) respectively.

Table (9): percentage distribution of the both alive and deaths studied sample according to mortality risk using SAPS II scale

Mortality	**Mild ≤ 25%**		**Moderate 25 -75%**		**Severe ≥ 75%**		**Total**	
	No	%	No	%	No	%	No	%
Alive	286	75.3	18	20.0	20	15.6	324	54.2
Death	94	24.7	72	80.0	108	84.4	274	45.8
Total	380	100.0	90	100.0	128	100.0	598	100.0

4.9. Table 9: Illustrate that more than two thirds of a live group had mild mortality risk (≤ 25%) and about (24.7% of death group only had mild mortality risk. While for sever mortality risk (≥ 75%) in both a live and death group it was (15.6%, 84.4%) respectively.

Table (10):- Outcomes of the studied patients according to GCS the ICU length of stay and the mechanical ventilator connection (N=600)

Patient characteristics	Outcomes							
	Discharge to home = 58		Transfers to another unit =268		Experience Co morbidities = 50		Death = 274	
	No.	%	No.	%	No.	%	No.	%
GCS								
- Severe	4	**1.5**	38	**14**	40	**14.7**	230	**84.6**
- Moderate	4	**4.9**	68	**82.9**	0	**0**	10	**12.2**
- Mild	48	**20.2**	158	**66.4**	12	**5**	30	**12.6**
P value	< 0.001**		< 0.001**		< 0.001**		< 0.001**	
LOS								
- <15 days	56	**10.4**	240	**44.6**	46	**8.6**	240	**44.6**
- >15 days	2	**3.2**	26	**41.9**	6	**9.7**	34	**54.8**
P value	0.07		0.688		0.765		0.126	
MV connection								
- Yes	16	**5.7**	84	**30**	38	**13.6**	180	**64.3**
- No	42	**13.1**	182	**56.9**	14	**4.4**	94	**29.4**
P value	0.002		0.001**		0.001**		0.001**	

LOS: length of stay, MV: mechanical ventilator, GCS: Glasco Coma Scale.
Ns >0.05 non-significant *P<0.05 significant **P<0.01 highly significant

4.10. Table 10: Show the relationship between patients' outcomes and their characteristics. It revealed there was highly relationship between severity of disturbed conscious level and mortality rate with a highly significant difference (P <0.001**), where majority of death group had a severe loss of consciousness (84.6%). Regard LOS a high percent of patient discharge to home, transfer to other units and die were staying less had 15 days (10.4%, 44.6%, 44.6%) respectively with no significant difference. Regard MV connection more than two third of death patient was connected to the MV (64.3%) with a highly significant difference.

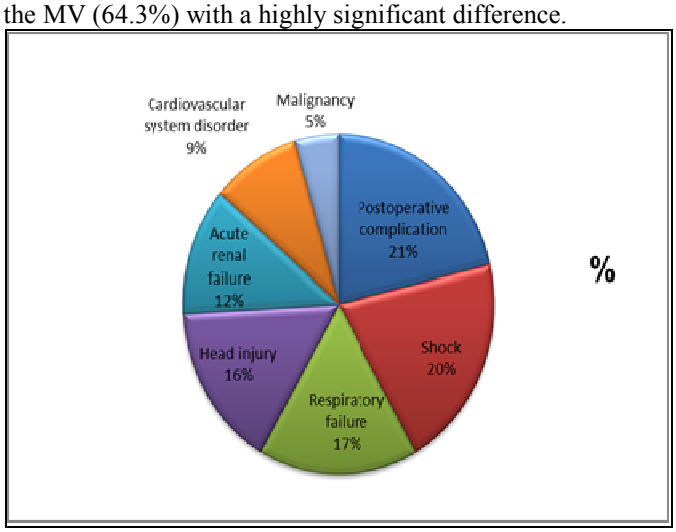

Figure 1: Distribution of the studied sample according to predisposing factors of death during ICU stay

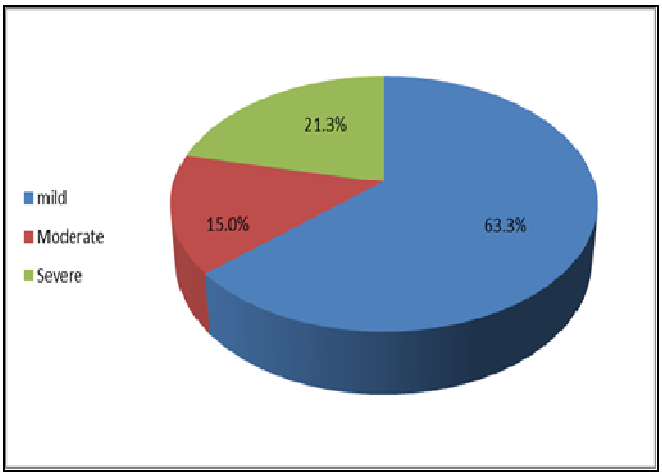

Figure 2: percentage distribution of the studied sample according to mortality risk using SAPS II scale.

5. Discussion

Regarding description of current study sample the result revealed that study sample, include 600 mixed critically ill patient who were admitted to General intensive care unit, trauma care unit and Post- Operative intensive care unit (302, 152 and 146 respectively). Male outnumbered female in the present study, there were 384 (64%) male and 216 (36%) female, this may be due to the high number of male trauma patients as they exposed more for traffic accidents in our country and **(Ala. S, et al, 2012)** documented it. Percentage of males being admitted to the hospital are more than female patients may be because it is a male dominating community, which gives importance to males in the families with least priority to females in this region.

Regard age group most common age group were those from (50 ≥ 65 years) account for 42.3%. This comes in line with the study done by (Poluyi, et al 2016) where his sample included 647 patients were admitted into the ICU, there were 352 (54.4%) males and 295 (45.6%) females giving a male to female ratio of 1.2: 1. The young and the middle-aged group (20-59 years) accounted for 66.9% (433) of all the ICU admissions. On the other hand It comes in contrast with the study done by **(Lange, et al, 2009)** as his study sample had Mean ± SD (63 ± 23 years) and while most patients (28%) were between 70-80 years old. Also the same result reported by **(Ala, et al, 2012)** reported the similar result, where patient aged 20-29 years old (19.4%) were more common, and **(Ashwini, et al, 2016)** who reported that Patients aged 20-39 year old (38.54%) were the most common age group admitted to the ICU.

In relation to studying the causes of ICU admission, the type of admission differs enormously between countries and is probably related to the health care system. The result of current study showed that trauma cause 242 (40.3%); elective post-surgery 154 (25.7%) and emergency post-surgery 114 (19.0%) were the most common causes of admission to ICU. Another study done by **(Lange, et al, 2009)** reported that were from 91179 studied patients (13,734 (15.0%) & 34,499 (43.4%)) were admitted after emergency surgery and planned surgery respectively. In the Netherlands (43%) are admitted after planned surgery, while (53%) are admitted for non-surgical reasons or after emergency surgery.

Regarding other causes of ICU admission in the current study revealed that respiratory diseases, cardiovascular and neurological diseases are common causes of ICU admission by percent of (13.7%, 11.7% and 7.3) respectively. Agreed to this study done by **(Khwannimit & Geater, 2007)** who mentioned that during the study period, data were collected on 1,316 patients and the common causes of admission were Respiratory disease 86 (6.5%), Cardiovascular disease 350 (26.7%), Neurological disease 16 (1.2%).

Regard post arrest as causes of admission to intensive care units in the current study revealed that of 600 admitted patients about 36 (6.0%) were admitted as post arrested patient. While those admitted for Gynecological and obstetric causes were 6 (1.0%) of total admission this low number related to presence of separated obstetrics and gynecology ICU but not occluded in the sample. This agreed with the study done by **(Abed, et al, et al 2010)** that reported that of total 873 studied patients were 37 (4.2%) and 33 (3.8%) admitted for post arrest and Gynecological and obstetric causes respectively.

The most severe cases of patients who have overdosed on drugs usually require intensive care unit (ICU) admission. Knowing risk factors that can divide poisoned patients into different survival groups necessary because of limited ICU beds. Various scoring systems have been performed as a tool for triage and ICU quality management. The results of a current study documented a low rate of admission for Drug toxicity, Organophosphorus poising and Animal bits by 22 (3.7%), 12 (2.0%) and 2 (0.3%) respectively.

Most of patients of drug toxicity in current sample related to drug addiction, “Drugs are usually a reflection of deeper problems, such as rising unemployment, bad economic conditions and social frustrations,” The young

are "more easily influenced," reported by Amir Othman, the director of the organization for the treatment of addiction and abuse. Also reported that the younger age is "easily get into drugs and are sometimes pressed into drug trafficking." A report by the National Council for Battling Addiction attributes increased substance abuse to the availability and affordability of street drugs, especially in "light of the security vacuum society is witnessing." Officials said a lack of police presence has allowed dealers to push new drugs onto the market.

In Current study 22 (3.7%) were admitted due to mixed drug toxicity that need to identify their probability of death after ICU admission, it is may be due to several attempts of the suicidal idea in some patients due to the low economic status and physiological affairs. This agreed with **(Eizadi-Mood, et al. 2011)** who reported that mixed drugs poisoning is common in the emergency departments.

Organophosphorus poising in result of current study represents also a low rate of admission 12 (2.0%), this may be due to the rampant use of Organophosphorus pesticides in our country, the ease of their availability, and their low cost are probably some of the reasons why these are commonly employed for self- poisoning. The majority of the patients 88% consumed the poison with suicidal intent as compared with 12% of the patients exposed accidentally. This was mentioned by **(Ashwini, et al, 2016)** where OP poisoning (12.5%) followed by Unknown poisoning (7.94%) and Snake bite (7.56%) was the most common type of poisoning. In contrast, with other studies in India by **(Ahuja, et al, 2015)** who reported Organophosphorus compounds (32.8%) to be the commonest poison consumed, followed by aluminum phosphide (20.9%) and **(Ramesha, 2015)** reported Organophosphorus (36%) to be most common poisoning followed by Snakebite (16.2%), Similar findings were reported by **(Maharani & Vijayakumari, 2013)** war (98.66%) cases were of intentional poisoning and (1.44%) were due to accidental poisoning.

Regarding the presence of co-morbidities before admission to ICU the results of the current study showed that cirrhosis 58 (9.7%), kidney failure 36 (6.0%) and malignancy, especially lung cancer 26 (4.3%) are the most common forms of co-morbidities. Complications and co-morbidities may reflect the standard of care delivered in the ICU. This may be attributed to the shortage of the nursing staff, overcrowded ICU and an overworked nursing staff is the cause of low productivity.

Regard Past medical history, the presence of medical problems or even trauma or having surgical history has a major effect on patient survival and improvement statue. Current study documented that most common past history were 200 (33.3%) past surgical history, 132 (22.0%) has a history of respiratory disease including (COPD, asthma... act). 108 (18%) has GIT problems and 86 (14.0%) has cardiovascular disease. This in line with, **(Mayr et al 2006), (Yousuf, et al 2013)** they indicated that the chronic illness is a common factor for death in the ICU.

To predict mortality of critically ill patient when admitted to ICU is important to allocate resources and improve outcome, so it's important to study their criteria in admissions. Regarding GCS of the current sample the Mean±SD was (9.86±4.94), As more deterioration of conscious level on admission cause poor outcomes and increase risk of complications during the period of ICU stay.

For the length of ICU stay result of current study the Mean±SD was (6.54 ± 4.66), the number of patient stay less than 15 days were 538 (89.7%) while those stay more than 15 days were 62 (10.3%) of all the studied sample, As the Prolonged ICU stay and mortality are more frequent in more severely ill patients at admission and in patients submitted to emergency surgery. Hospital mortality is more frequent in patients who stayed longer in ICU. It is due to exposure to more invasive procedures and nature of ICU atmosphere, This agrees with the study done by **(Mukhopadhyay, et al 2014)** who mention that LOS were about 3 days with a mean (3-6 days) for his study sample. Another study done by **(Ala, et al, 2012)** documented that GCS Mean±SD in his studied sample was (11.5 ± 0.32) and ICU stays (7.9 ± 0.8).

Regard mechanical ventilation connection there were 320 (53.3%) connected. Were the risk of mortality and exposure to comorbidities in patients connected to mechanical ventilation is more than those not connected. Regarding main measured outcomes (death & survival rate) the result of current study revealed that from total 600 admitted patient to ICU 326 (54.3%) were discharged while still alive and 274 (45.7%) were dying on discharge from the ICU. This agreed with the study done by **(Salma, 2013)** Reported that of 114 patients (56.4%) were discharged from the ICU after improvement while 88 patients (43.6%) were dying during ICU stay.

Hence, the outcome prediction is very important to compare actual and expected outcomes for groups of patients. They are used to compare ICU performance, to determine optimal allocation of critical care resources, and to evaluate the effect of new treatments, procedures, or ICU organization. Intensive care beds are a limited and expensive resource and must be used judiciously **(Frontera, et al 2011).**

Mortality in the ICU is high not due to nosocomial infections, but is likely due to other causes, due to the severity of the patient when entering the ICU. Vice versa, the severity of the patient's disease can also affect the length of patients admitted to the ICU **(Sakr, et al 2016).**

As regards studying the causes of death in current study sample, the study revealed that the common causes of death were post-operative complications 92 (33.58%), shock (septic-hypovolemic) 82 (29.93), respiratory failure 72 (26.28%), head trauma 68 (24.82%) and Acute renal failure 52 (18.98%). The Society of Critical Care

Medicine (SCCM) said the cause of death in the ICU is multiple organ failure (Multiple Organ Failure / MOF), cardiovascular disorders, and sepsis. Multiple organ failure has a mortality rate 11% - 18%. Sepsis is the second leading cause of death in the ICU with a mortality rate of 25% - 30%. In diagnosed with sepsis, more than 51% progress to acute renal failure, more than 18% progress to acute respiratory failure, and over 80% develop into myopathy or polyneuropathy **(Society of Critical Care Medicine, 2006).**

The results of the current study are consistent with the findings of the previous study done by **(Gartika & Lubis, 2016)** who mention that the samples of his research are patients who have passed away in the primary class ICU from 1st January 2014 until 31st December 2014. Throughout the year 2014, 184 patients were treated in ICU, about 110 patients (59, 8%) died. There are three main causes of death occurred in the primary class ICU of PTPN II Bangkatan General Hospital, which are circulation system related (23, 4%), infectious disease (11, 4%), and endocrine related (10, 9%).

Result of current study revealed that Postoperative complications are the commonest cause of mortality in the studied sample; this may be due to overcrowded ICU, decrease ICU resources for the care of surgical patients, also case mixed. While the post-operative patient needs a special protocol for care and reduce the risk of mortality. This agreed with **(Martos-Benítez, et al, 2016)** who reported that are frequent disorders that are associated with poor clinical outcomes; thus, structural and procedural changes should be implemented to reduce postoperative morbidity and mortality. Infections represent a significant aspect in the evaluation of postoperative clinical outcomes, primarily because of the epidemiological implications involved **(Williams &Wheeler, et al 2014)**

Postoperative morbidity and mortality rates often vary across different hospitals and healthcare systems, including within the context of critical care **(Ghaferi, 2009 & Rhodes and Moreno, 2012)** some complications are difficult to avoid, particularly among high-risk patients with multiple comorbidities. However, the frequencies of complications and mortality can be reduced by improving the structure and process of health care. The implementation of therapeutic strategies such as goal-directed fluid therapy **(Grocott, et al 2013 & Hamilton, et al 2011)** enhanced recovery after surgery programs **(Knott, et al 2012 & Teeuwen, et al 2010)** and expanding the provision of critical care services enables a greater number of high-risk patients to be managed with intensive monitoring and treatment. These measures can help to improve postoperative clinical outcomes. Adherence to postoperative infection prevention programs can help reduce the incidence of infection and improve clinical outcomes **(Stulberg, et al 2010).**

The current study show that the mortality rate from septic shock is high about 82 (29.9%) of the study sample were dying during ICU stay due to sepsis and septic shock. This comes in line with the study done by **(Daviaud, et al. 2015)** that shows the in-ICU and in-hospital mortality rates were 37.2% and 45 %, respectively, and remained consistent over the study period. Among 244 patients deceased in the hospital, 78 (32 %) died within the first 3 days of ICU admission (early deaths) and 166 (68 %) died thereafter (late deaths) in the ICU (n = 124) or in the hospital (n = 42)

The incidence of sepsis is increasing because of population's aging and associated comorbidities such as cancer, immunosuppression, diabetes mellitus, or chronic organ dysfunctions. Despite the higher number of cases accounted for an overall increase in sepsis-related deaths, the attributable fatality rate significantly dropped at the turn of the century. About 20 years ago, the crude mortality rate of septic shock exceeded 50 % in non-selected populations **(Alberti, et al 2003 & Pavon, et al 2013)**. Since then, improvements in management of severe sepsis and septic shock translated into increased survival rate in observational studies **(Zuber, et al 2012 & Ranieri, et al 2012).** This also emphasized by the low mortality rates ranging from 24.2 to 32 % observed in the control arms of recent intervention studies on severe sepsis and septic shock **(Opal, et al 2013 & Caironi, et al 2014).**

Regarding respiratory diseases, especially respiratory failure is the third most common causes of death in our study sample 72 (26.28%) were dying due to respiratory causes. This comes in line with the study done by **(Sakr, et al. 2016)** who mentions that of the overall ICU mortality in all patients admitted to the contributing centers (n = 5550) was 13.1 % and the median ICU stay was 3 (2–8) days. Patients with respiratory infection had a higher ICU mortality (20.2 vs. 12.2 %, $p < 0.001$) and longer ICU lengths of stay [5 (2–12) vs. 3 (2–8)] days, $p < 0.001$) than those without respiratory disease.

Traumatic brain injury is heterogeneous in terms of cause, pathology, severity, and prognosis, which poses diagnostic challenges. A severe traumatic brain injury (TBI) is defined by a Glasgow coma scale (GCS) score of 8 or less during the first post-traumatic day. Such trauma need intensive treatment in the intensive care unit (ICU), and their management puts enormous strain on emergency because mortality is dramatically in the first day with more than 40% of all deaths occurring in the first 24 h and 60% in the first 48 h **(Cooper, et al 2004)** of which resources are particularly and frequently limited. Much research has been done to identify early predictors of mortality and functional outcome, as assessed by the Glasgow outcome scale on admission, after moderate or severe TBI **(Lingsma, et al 2014)**. A number of factors are believed to influence the outcome of head trauma patients, including age, gender, GCS, intracranial pressure (ICP), pupillary size and responsive.

The current study revealed that head trauma is the fourth leading cause of death 68 (24.82%) it is due to high prevalence of road traffic accident in the country, this agree with what founded by **(Petroni, et al 2010)** that total mortality rate form head injury in his study sample was 58.8%. Also **(Mosenthal, et al 2002)** found that despite varying mortality rates among young TBI and older TBI patients following discharge, the highest rates of mortality occurred during the first 48 hours regardless of age or injury severity. (Marei, et al 2015) describes the outcome of 82 patients who have severe TBI, and reports a mortality of 63.4%.

The Acute Kidney Injury is a common complication in patients admitted to the intensive care unit (ICU) and numerous causes is responsible for its development. Moreover, it occurs as a part of a multiple organ dysfunction syndrome or as a separate event. The AKI incidence in ICU patients varies widely from 3 to 30%, with mortality ranging from 36 to 90%, depending on the type of ICU, study population, the period during which the study is conducted, and the criteria used to define AKI **(Samimagham, et al 2011).**

The result of the current study was the ARF mortality rate represent 52 (18. 98%) of total death and this is comparable to **(Omar, et al. 2015)** who classify acute renal failure as the second most common cause of mortality 102 (20.36%). Also **(Samimagham, et al, 2011)** reported that from the medical records of 263 patients admitted in the ICU of Shahid Mohammad Hospital, Hormozgan, Iran, between May 2005 and May 2006, were reviewed retrospectively. There were 73 (31.06%) patients who developed AKI during the admission time.

The mortality rate of cancer patients in ICU was as high as 44-98% before 1996 but, currently decreased to 21- 57%.The common negative prognostic factors for all patients are multiple organ failure, the requirement for mechanical ventilation, vasopressors, renal replacement therapy, advanced age and high disease severity scores at admittance **(Aygencel, et al 2014)** Other factors that may be responsible of mortality are the etiology and severity of respiratory failure, duration of invasive mechanical ventilation, the source of infection, presence of sepsis and neutropenia, the timing of ICU admittance and the procedures applied for diagnosis and treatment **(Libório, et al 2011).**

Regarding mortality rate in-patient with malignancy especially lung cancer in current study 20 (7.3%) was dying from total 26 patients admitted to ICU. It agreed with the study done by **(Omar, et al 2015)** reported that the malignancy was the third leading cause of death 35 (6.99%). However, this is contrasted with what's reported by **(Savran, et al 2016)** who mention Overall mortality rate of cancer patient in the intensive care unit was 46% (n=236). The ICU mortality rate of patients with hematologic malignancy was significantly higher than patients with solid tumors (68.6% vs. 53%; $p<0.001$) and patients without cancer (68.6% vs. 39.8%; $p<0.001$).

Identification of acid base disturbances in the critically ill patients is of central importance, as it may lend valuable insight into the status of a patient or provide information about the underlying pathophysiology of a patient's disease process. To this end, mathematical models aid the clinician in conceptualizing acid-base alterations involved in order to better treat and diagnose the patients. Several models and algorithms exist to evaluate this. The traditional approach to evaluating these perturbations has been using pCO2, HCO3, pH, and the anion gap **(Puthawala, 2002).**

The modern intensive care unit is a place where complex acid base and electrolyte disorders are common, with one study, showing that 64% of critically ill patients have acute metabolic acidosis (Gunner son &Saul 2006). Although it is generally believed that most cases of acid–base derangement are mild and self-limiting, extremes of blood pH in either direction, especially when happening quickly, can have significant multiorgan consequences. Advances in evaluating acid–base balance have helped in understanding the impact of fluids in the critically ill **(Story, 2005).**

In current study we use SAPSπ for mortality prediction from first day of admission to intensive care unit and they were mixed critically ill patient, regarding the mean SAPSπ score for the first day was described in Mean ± SD and was (41.61 ± 18.54), and the mean mortality prediction mortality rate was (33.82 ± 29.28), and the study result revealed that death group has high SAPS score than alive group (53.4 ± 16.2 Vs. 31.6 ± 13.9) respectively with a highly statically significant difference (P value = 0.001) and a higher mortality predication rate (52.9 ± 27.4 death group Vs. 17.7 ± 19.5 alive group). This is similar to that mention by **(Abelha, et al 2007)** who study mortality risk in post-surgical admission to ICU which was (27.74 ± 14.60) Score of Acute Physiologic system (SAPS II). Also agreed with study done by **(Vosylius, et al, 2005)** where a total of 2,067 patients met the inclusion criteria for this study and 49% of these patients were female. The median SAPS II score was 29 points (27.0 ± 15.0) and the median hospital stay 11 days (6–18 days).

(Haq, et al, 2014) Mention that the overall mortality in the studied group was 15.7% (14 of 89).The mean SAPS II, score (predicted mortality) for patients who died was 57.4 ± 20.0 (55.2% ± 29.7%) compared to 41.7 ± 14.9 for survivors, $p < 0.001$.

Regard the relation between severity of GCS and death, the current study revealed that the more severe decrease conscious level represented by GCS (3-5) more reliable for death as death rate in severe, moderate and mild cases in current study were (84.6, 12.2 and 12.6 respectively). This agreed with study mentioned by **(Tu M. Tran et al, 2015)** who reported that patients with severe TBI at Mulago who measured an initial GCS of 3_5 were less likely to survive than those who measured.

Regard the relation between LOS and death, ICU length of stay is the most important determinant of ICU cost and resource utilization. In the current study showed no relation between length of ICU stay and the statue on discharge (P value 0.126) but the number of patients in death group stay more than 15 days for those in a live group was higher (34 (54.8%) , 28 (25.2%) respectively. Mean ICU stay in the patients who die was (6.65±4. 76 ranging from 1 to 20) days while in those who survived and discharged was (7.34 ±7.01 ranging from 1 to 51) days. This revealed an insignificant difference of mean ICU stay between the die and alive patients ($p < 0.365$)

6. Conclusion and Recommendations:

Based on the findings of the present study, it can be concluded that the primary reasons for admission into the ICU among the studied patients were traumatized, elective post-operative and respiratory illness while postoperative complication, shock mainly septic shock, respiratory failure and trauma were the major contributor to the mortality. The Majority of the patients recovered which indicates an emergency and intensive care management. An effective ICU goes a long way in reducing morbidity and mortality. With the high mortality rate in patients who stayed for long duration, we would say that total quality management of our ICU patients' needs more attention. We conclude that a well-equipped ICU with modern and innovative, intensive care greatly facilitates the care of critically ill patients giving desirable outcome. Those responsible for health system planning needs such data to understand current ICU needs and improve their outcomes.

Based on the study findings, the following recommendations are suggested:

-Use SAPS II as a mortality prediction model among the critically ill patients during ICU stay is strongly recommended.

-Develop strategies that necessitate training the nurses on how to use the scoring systems in the assessment of patients' mortality after admission to ICU.

-Further researches should be conducted in a separated diagnostic group of patients (trauma, cardiology, postoperative patients)

- Utilize the study finding in the provision of care for such group of patient's in the future.

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