East African Medical Journal Vol. 97 No. 12 December 2020
SPECIALIZED SUPPORTIVE CARE FOR PATIENTS WITH ROAD TRAFFIC INJURIES AND ASSOCIATED CHALLENGES IN THE CRITICAL CARE UNIT-KENYATTA NATIONAL HOSPITAL, KENYA

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ABSTRACT

Background: **Road Traffic Accidents (RTAs) are a major cause of Severe Head Injuries (SHI) among Kenyan citizens of productive age comprising 14.3% of adult Intensive Care Unit/ High Dependency Unit ICU/HDU admissions. Severe injuries are managed in a Critical Care Unit (CCU) for specialized supportive care.**

Objectives: **To determine the specialized supportive care for patients with road traffic injuries (RTI's) and identify the challenges experienced by health care workers managing the patients in CCU.**

Design: **A one-year retrospective cohort study.**

Setting: **Critical Care Unit at Kenyatta National Hospital- (CCU-KNH)**

Subjects: **Patients admitted to CCU-KNH with Road Traffic Injuries (RTI's) in 2013 and managers for Anaesthesiologists, Nurses, Physiotherapists and Nutritionists.**

Results: **The specialized supportive services offered to RTA patients included radiological services; Computerized Axial Tomography (CT Scan) (95.8 %); X-Ray services (78.9%); Abdominal Ultra-Sound (5.6%); Laboratory services; Full hemogram (FHG) (81.7 %), Grouping and Cross-Matching (GXM)(29.6%), Urea and Electrolytes (77.5%), Coagulation profile (1.4%) and Arterial Blood Gas Analysis (ABGs) (87.3%), Physiotherapy (97.2%), Nursing care and Nutritional support. Challenges were reported as inadequate resources, poor staffing, lack of multidisciplinary teamwork, delayed admission, lack of specialized training, long stay patients and complications among patients. Electrolyte**

imbalances, infections, shock and arrhythmias were significantly associated with mortality among the patients, P<0.05.
Conclusion: **Specialized supportive care for RTA patients was provided though at varied levels. Addressing the challenges of care can improve health outcomes of patients.**

INTRODUCTION

Road traffic injuries (RTI's) are now the leading killer of people aged 5-29 years. The burden is disproportionately borne by pedestrians, cyclists and motorcyclists in developing countries [1]. The number of road traffic accident deaths in low-income countries has not decreased since 2013 despite many preventive measures in place. The RTI's are a major cause of morbidity as well. Severe Head Injuries (SHI) among Kenyan citizens of productive age caused by RTI's comprise 14.3% of adult Intensive Care Unit/ High Dependency Unit ICU/HDU admissions. Severe injuries require specialized care and stabilization in CCU.

Patient health outcomes in CCU are dependent on the efficiency and effectiveness of specialized supportive care provided to patients. Care should be timely, up to date, with need for resources such as advanced monitors, organ support equipment as well as highly skilled staff. Despite the level of care in CCU, morbidity and mortality rate are concerning. Understanding the specialized supportive care required by patients with RTI's admitted in CCU as well as the challenges experienced by health care workers managing the patients is key to planning and improvement of patient health outcomes. Many studies have targeted prevention measures of RTA. There is limited data on the morbidity and care in CCU.

To determine the spectrum of supporting care services and the challenges experienced by health care workers managing RTI's in CCU, we conducted a one-year retrospective study to review data of patients who had been admitted to CCU with RTI's in 2013 and also interviewed the health care workers who provided care during the same period.

METHODS

The study adopted a retrospective cohort design that utilized both qualitative and quantitative methods. The study area was CCU at KNH where patients are managed by anesthesiologists. We included all patients who were admitted with road traffic injuries between January and December 2013. The sample size assumed a prevalence of ICU/HDU admission to be 14.3% and determined using modified fisher's et al formula. In-patient file numbers were identified using the admission and discharge register. The file numbers were randomly selected using a computer generator. A prepared data sheet was used to get quantitative data on demographic characteristics, types and severity of injuries, the specialized care that each patient received and the outcomes of the patient including complications and mortality.

The qualitative aspects of the study were derived from managers of health care workers who were involved in direct patient care. We considered nurses, anesthesiologists, physiotherapists and nutritionists who were directly involved with patient management. A manager for each cadre who had worked for at least one year was selected purposively. We sought to determine the challenges they faced while managing RTI patients through in-depth interviews. The interviews were recorded.

Quantitative data was entered on the Statistical Package for Social Science (SPSS) version 21 for analysis. Descriptive statistics,

Chi square test and logistic regression were carried out. Data was presented in form of text, tables and charts. Qualitative data was analyzed using content and thematic analysis. Results were considered significant if $p<0.05$.

Ethical approval was received from KNH/UON Ethics and Research Committee. Permission to use patient's files was granted by KNH. Informed consent was signed before interviews with managers. Anonymity and confidentiality were maintained.

RESULTS

A total of seventy-one (71) patient files were reviewed and four (4) managers interviewed.

Sociodemographic characteristics

Majority of the patients were aged between 21-40 years (49.3%). The number of male patients (78.87%) was higher than the number of females (21.13%). Majority were single (67.6%). Approximately 49.3 % of the victims had attained primary school education while 38.03%, were unemployed (Table 1).

Table1

Socio-demographic characteristics of patients with RTI's admitted in CCU

Variable	Frequency (n=71)	Percent (%)
Age		
0-20 years	17	23.94
21-40 years	35	49.30
Above 40 years	19	26.76
Gender		
Male	56	21.13
Female	15	78.87
Marital Status		
Single	48	67.61
Married	20	28.17
Divorced	2	2.82
Separated	1	1.41
Level of education		
None	5	7.04
Primary	35	49.30
Secondary	26	36.62
College	4	5.63
University	1	1.41
Occupational Status		
Unemployed	27	38.03
Casual labour	13	18.31
Self Employed	29	40.85
Formally Employed	2	2.82

Type and severity of injuries sustained by the study participants: Out of 71 patients, 39 (54.9%) sustained severe head injury only, whereas 30 patients (42%) sustained moderate to mild head injury with other injuries. Only 2 (2.82%) had fractured femur only. Severity of injuries was based on Glasgow Coma Scale on admission to CCU. Majority of the patients, 58 (81.7%) had a Glasgow Coma Scale (GCS) of 8/15 and below (Table 2)

Table 2

Glasgow Coma Scale of study participants on admission to CCU-KNH

Glasgow Coma Scale	Frequency (n)	Percent (%)
3 – 8	58	81.7
9-12	9	12.7
13-15	4	5.6
Total	71	100

Specialized supportive care provided to RTA patients in CCU

Radiological and laboratory services offered to RTA patients: CT-scan was offered to 95.8 % of the patients, abdominal ultra-sound was offered to 5.6%, full hemogram (FHG) was done for 81.7 % while blood grouping and cross-matching was done for (29.6%) of the patients, (Table 3).

Table 3

Radiological and Laboratory services offered to RTA patients

Specialized services	Frequency	Percent
Computerised Axial Tomography of the Head-CT SCAN	68	95.8
X-Ray	56	78.9
Fulll Hemogram (FHG)	58	81.7
Grouping and Crossmatching (GXM)	21	29.6
Urea and Electrolytes (U/E/CR)	55	77.5
Coagulation profile	1	1.4
Arterial Blood gas analysis (ABG's)	62	87.3
Abdominal Ultrasound	4	5.6

Nursing care: All the patients admitted in the Critical Care Unit required; mechanical ventilation, fluid volume maintenance, vital sign monitoring, electrocardiograph monitoring, feeding, suction, daily bed baths, pressure area care and treatment, dressing, central venous pressure monitoring, medication, psychotherapy and proper documentation.

This was also confirmed by the CCU managers who agreed that:

"All the patients admitted in the Critical Care Unit were offered nursing services. The nurse-to-patient ratio was 1: 2."

Physiotherapy, Surgery and medical review: Most patients, 69 (97.2%) received physiotherapy services while 50 patients (70.4 %) underwent surgery. All the patients were reviewed daily by the anaesthesiologist.

Nutritional Services: Most patients, 44 (62.9%) were on nasogastric tube feeding, 13(18.57%) were on combined nasogastric and intravenous feeding, 9 (12.86%) were on intravenous feeding. Only 2 (2.9%) were fed orally and by gastrostomy feeding.

Services Scheduled but not rendered to RTA patients in CCU: At least 21 patients (29.6%) did not receive all prescribed medications, 9 patients (12.7%) missed/delayed scheduled Surgery or a radiological service (Figure 1).

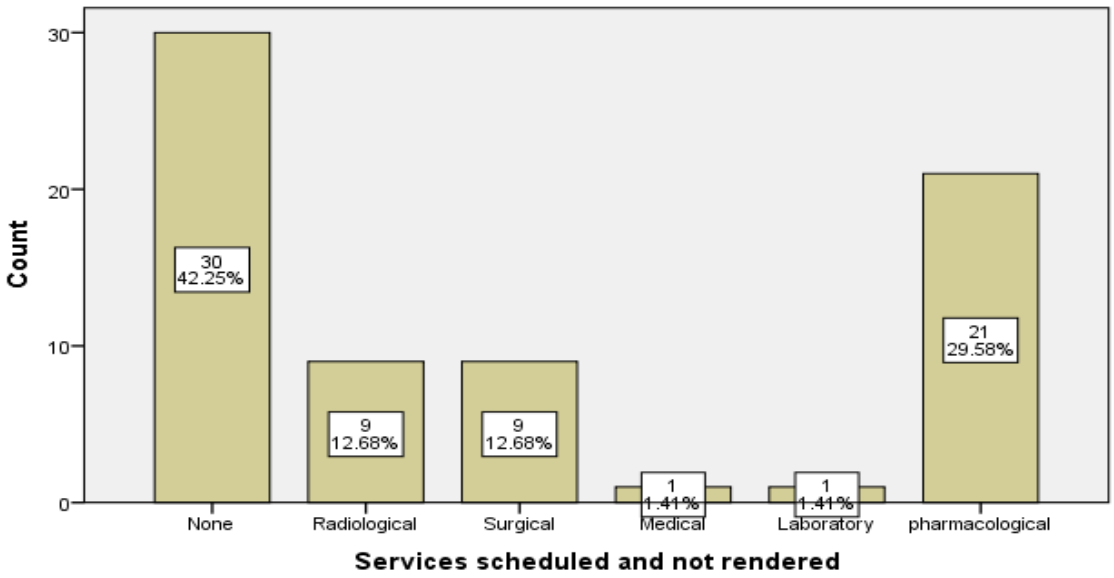

Figure 1: Services scheduled and not rendered to RTA patients managed in CCU-KNH

Consultant Services ordered for RTA Patients in CCU: Most patients n=41 (57.7%) required neuro surgical consultation, while 22 (31%) required orthopaedic review (Table 4).

Table 4

Consultative services ordered for RTA patients during CCU admission

Consultative services ordered during CCU admission	Frequency (n)	Percent (%)
None	11	15.5
General surgery	1	1.4
Neuro surgery	41	57.74
Urologist	2	2.8
ENT	3	4.2
Orthopaedic surgery	22	30.98
Cardiothoracic surgery	7	9.9
Medical	2	2.8
Paediatric	1	1.4
Haematology	2	2.8
Total	71	100.0

Complications associated with RTA patients managed in CCU-KNH: The commonest complications were sepsis and electrolyte imbalance accounting for 25 patients (35.2%) each while 16 patients (22.5%) developed anaemia (Table 5).

CCU managers unanimously agreed on the main complications and stated that:

"*Infections, renal failure, bedsores, trachea-oesophageal fistula, Mechanical Ventilation complications and permanent disability*" were the main complications.

Table 5

Complications associated with RTA patients managed in CCU-KNH

Complications	Frequency (n)	Percent (%)
Anaemia	16	22.5
Trachea oesophageal Fistula	3	4.2
Trauma to the bladder	1	1.4
Electrolyte imbalance	25	35.2
Sepsis	25	35.2
Shock	8	11.3
Pneumothorax	2	2.8
Haemothorax	2	2.8
Contractures	3	4.2
Bedsores	7	9.9
Ventilator Acquired Pneumonia	10	14.1
Arrythmias	6	8.5
Acute Renal Failure	2	2.8
Deep Venous Thrombosis	2	2.8
Thrombo embolism	1	1.4
Laryngeal Edema	2	2.8

Mortality rate among RTA Patients managed in CCU-KNH: Most patients 45(63.38%) recovered and were transferred to the general ward. Mortality rate in CCU was 36.6%, n=26

Association between complications and mortality among RTA patients in CCU: Electrolyte imbalances were associated with higher mortality $p<0.047$; Infections were associated with higher mortality, $p<0.038$. Shock and arrhythmias were also associated with higher mortality $p<0.017$ and $p<0.013$ respectively (Table 6).

Table 6

Association between mortality among RTA patients and complications

	Fate of the patient			Total	Odds Ratio	P-value	95% C. I	
	Improved		Died				Lower	Upper
Anemia	No	33	22	55	.500	.273	0.143	1.751
	Yes	12	4	16				
Trachea esophageal Fistula	No	44	24	68	3.667	.270	0.316	42.552
	Yes	1	2	3				
Trauma to the bladder	No	44	26	70	.629	.444	0.525	0.753
	Yes	1	0	1				
Electrolyte Imbalance	No	33	13	46	2.750	.047	0.998	7.578
	Yes	12	13	25				
Sepsis	No	34	12	46	-	.038	-	-
	Yes	11	14	25				
Shock	No	43	20	63	6.450	.017	1.195	34.814
	Yes	2	6	8				
Pneumothorax	No	43	26	69	.623	.276	0.519	0.749
	Yes	2	0	2				
Haemothorax	No	43	26	69	.623	.276	0.519	0.749
	Yes	2	0	2				
Contractures	No	42	26	68	.618	.179	0.512	0.745
	Yes	3	0	3				
Bedsores	No	41	23	64	1.337	.718	0.275	6.501
	Yes	4	3	7				
Ventilator Acquired Pneumonia	No	40	21	61	1.905	.343	0.495	7.329
	Yes	5	5	10				
Arrythmias	No	44	21	65	10.476	.013	1.150	95.409
	Yes	1	5	6				
Acute Renal Failure	No	45	24	69	.348	.059	0.252	0.480
	Yes	0	2	2				
Deep Venous Thrombosis	No	43	26	69	.623	.276	0.519	0.749
	Yes	2	0	2				
Thrombo embolism	No	45	25	70	.357	.185	0.261	0.489
	Yes	0	1	1				
Laryngeal Edema	No	43	26	69	.623	.276	0.519	0.749
	Yes	2	0	2				
Total	45		26	71				

Challenges experienced by health care workers as reported through in depth interview: The challenges were reported as follows;

"One CCU manager stated that "Various disease processes in CCU cause changes in substrate metabolism which leads Catabolic depletion of the protein reserves, changes in body composition and ultimately relative deficiencies of some important nutrients. Patients also do not receive their target intake because of intolerance, interruptions and inadequate stock of food."

Another CCU manager stated that "there is lack of multidisciplinary team support in the CCU and health care personnel take too long to review the patients."

One CCU manager also stated that "the ratio of nurses to patients was 1:2, Anaesthesiologist 1:10, Physiotherapists 1:10, Nutritionists 1:21. The ratios were below the recommended WHO

standards. Lack of adequate beds, suction machines, skin care equipment and ripple mattresses in CCU affects the care of patients. Long stay of the patients in the CCU also consumes a lot of resources and of the patients are unable to pay for services rendered"

"The length of stay is affected by the duration taken before the CCU admission and the pre hospital care given to the patients." (CCU,1)

"Generally severe head injury takes over 1 month for the patients to recover if admitted within 72 hours from the time of injury." (CCU, 2)

"If there is no development of second-degree injuries within 72 hours the patient will recover within 2 to 4 weeks." (CCU,3)

"Spinal cord injuries take more than a month to recover. C- Spine injuries take less than 2 weeks to recover or deteriorate." (CCU,4).

"The length of stay was associated with complications that arise during patient hospitalization e. g infections." (CCU, 1)

DISCUSSION

Our study found that patients with RTI's were mainly young males with low education level and with +no formal employment. Specialized supportive care offered to RTA patients in CCU were at varied levels. CT scan, X-ray, FHG, GXM, ABG's and U/E/CR were the most common radiological and laboratory investigations done. Nursing care included mechanical ventilation, monitoring vital signs, fluid volume maintenance, feeding, suction, daily bed baths, pressure area care and treatment, dressing, central venous pressure monitoring, medication, psychotherapy prevention and control of infections and documentation. Physiotherapy, nutritional support and specialized consultative services were also provided. The health care workers experience many challenges that included Poor staffing, supply/equipment/drug shortages, lack of multidisciplinary team approach long stay of patients, inadequate training and development of secondary complications among patients. Mortality rate was found to be high.

Studies have reported that some of the nursing care services provided to patients in CCU include Hemodynamic and fluid volume monitoring; Temperature control to reduce oxygen demand; Respiratory care through mechanical ventilation to prevent hypoxia commonly caused by inadequate airway clearance; Blood sugar control and monitoring; Sedation to control environmental stimulation of patients; and positioning patients depending on the diagnosis [2].

Optimal service provision requires well trained and qualified personnel who are equipped with adequate resources to perform their tasks. Studies have shown that morning shifts, male patients, medical treatment and referred patients increased workload for nurses [3]. However, some studies have indicated that there were gaps in monitoring and management of alarms in CCU [4] and that exposing critically ill patients to high workload/staffing ratios is associated with a substantial reduction in the odds of survival [5]. This study found a low nurse to patient ratio of 1:2 which is below the recommended ratio of 1:1. Health care providers have a role of monitoring patients closely and to prevent complications that can affect outcomes of patients.

Physiotherapy is important in restoration and rehabilitation of the patient's functional performance after multiple traumatic injuries and hospitalization. The routine in CCU encourages daily discussion with medical teams to establish therapeutic goals and design rehabilitation programs [6].

Nutrition plays a vital role in patients' recovery. Nasogastric feeding (NG) was the most common mode. Our qualitative data reports that Various disease processes in CCU cause changes in substrate metabolism

which leads to changes in body composition and ultimately relative deficiencies of impo rtant nutrients. Studies have recommended that patients should be fed within 24 to 48 hours of admission preferably by enteral route unless it is contraindicated. Enteral feeding helps in: maintaining gut integrity, modulating stress, systemic immune responses and attenuating disease severity and is effective for stress ulcer prophylaxis [7]. Reports from qualitative data agree with studies indicating that head injured patients were significantly underfed and that greater energy and protein deficits were associated with longer ICU stay [8]. Optimal energy and protein targets after head injury are unknown and further, the extent of hypermetabolism and catabolism are dependent on ventilation status, sedation and severity of head injuries making it difficult to estimate energy expenditure and protein needs [8].

Most of the patients required neurosurgical and orthopaedic review especially because of the many cases of head injuries.

Our study found that a number of services were not provided as scheduled including pharmacological, surgical and radiological tests. This may suggest inadequacy in the needed service

We identified a number of complications among the patients that included; electrolyte imbalance, Infections, anaemia, bedsores and ventilator acquired pneumonia. Studies have reported that fluids and electrolyte imbalances among critically ill patients can lead to fatal consequences. Knowledge on fluids and electrolyte homeostasis and pathophysiology and attention to administered fluids and medications potentially associated with fluids and electrolyte imbalances are important for optimal management [8]. Anaemia has been reported as almost inevitable in patients in ICU due to many factors including bleeding, phlebotomy and can be prevented by limiting the amounts of blood drawn for investigations, early initiation for stress ulcers, early nutritional support, with supplemental vitamins, trace elements and iron. Anaemia has been associated with worse outcomes [9].

Our study found a prevalence rate of bedsores to be 9.9%. This rate is lower compared to other areas. Studies have reported higher bedsore prevalence rates [10,11]. Bedsores have been associated with malnutrition, incontinence, longer stay, limited mobility, duration and number of operations, severe instability, age, spinal cord injuries and renal insufficiency [10]. Electrolyte disturbance have been associated with bad outcome [12].

Our study found that electrolyte imbalance, infections, shock and arrhythmias were significantly associated with mortality among RTA patients.

Though the mortality rate was high, it is comparable to other countries in the region. A study in Mulago hospital found an overall mortality rate in ICU to be 40.1% which was higher than that in high income regions [13,14]. Mortality rate in a Surgical ICU in Addis Ababa was 31.5% with RTA patients constituting 48% of the deaths [15]. A local study in Tenwek hospital Kenya and Argentina reported a lower overall mortality in ICU [16,17]. High mortality rate is attributed to inadequate medical and technical equipment in most CCU's in low resource economies [18].

Health care workers reported challenges that included: Inadequate number of trained staff, low staff to patient ratios, lack of multidisciplinary team support in the CCU and health care personnel taking too long to review the patients, lack of skin care equipment and ripple mattresses. Patients also do not receive their target intake because of intolerance, interruptions and inadequate stock of food. Catabolic depletion of the protein reserves was also another challenge. Other challenges included development of nosocomial

infections and other complications. Long stay of the patients in the CCU also consumes a lot of resources and majority of the patients were unable to pay the hospital bills.

Studies have reported that the bed capacity of ICUs in Kenya was 130 in 2015. Further, availability and serviceability of ICU equipment, availability of essential drugs and diagnostic support services used in care of critically ill patients ranged from > 95% in private and mission hospitals to 60-80% in the other hospitals. There were 414 nurses working in the ICUs of which 204 had specialized training. Anaesthesiologists were the most common primary care clinicians in 47% of ICUs surveyed [19].

CONCLUSION

Morbidity and mortality from RTI's remain a concern in our public health facilities.

The specialized supportive care offered included radiological, laboratory services, nursing care, physiotherapy, surgery and nutritional services among others. However, some of the services are offered at varied levels with reported deficiencies. Poor services can contribute to development of complications that increases mortality rates. Electrolyte imbalance, Infections, anaemia, bedsores and ventilator acquired pneumonia affect the length of CCU stay, cost of management and were significantly associated with mortality.

Challenges experienced by health care providers included: poor staffing, lack of adequate specialized training, hospital acquired infections, lack of multidisciplinary team support, lack of skin care equipment and inadequate nutritional feeds.

Optimization of these specialized supportive care should target prevention of complications to improve patient outcome.

REFERENCES

1. World health Organization (2018) global status report on road safety 2018
2. Hughes R. (2002). Care of patients with brain injuries in the critical care environment. Nursing Times.net
3. Moghadam, K.N., Cherhzad, M.M., Shademan, R. M., Mardani, A., Akhlaghi, E., & Harding, C. (2020). Nursing workload in intensive care units and the influence of patient and nurse characteristics. https://doi.org/10.1111/nicc.12548
4. Meng'anyi, L. W., Omondi, L. A., & Muiva, M. N. (2017). Assessment of nurses' interventions in the Management of Clinical Alarms in the critical care unit, Kenyatta National Hospital, a cross sectional study. *BMC nursing*, *16*, 41. https://doi.org/10.1186/s12912-017-0235-1
5. Lee, A., Cheung, Y., Joynt, G. M., Leung, C., Wong, W. T., & Gomersall, C. D. (2017). Are high nurse workload/staffing ratios associated with decreased survival in critically ill patients? A cohort study. *Annals of intensive care*, *7*(1), 46. https://doi.org/10.1186/s13613-017-0269-2
6. Padovani, C., Silva, J., & Tanaka, C. (2017). Physiotherapy in severe polytrauma patients: a therapeutic care model. Acta Fisiátrica. 24. 10.5935/0104-7795.20170007
7. Schalwyk, V. F., Nutritional management of a critically injured patient. S Afr J Clin Nutr 2013;26(1):43-46
8. Chapple Lee-anne, Deane A.M., Heyland, D.K., Lange, K., Kranz, A.J.,Williams, L.T., Chapman, M.J., (2016). Energy and protein deficits throughout hospitalization in patients admitted with a traumatic brain injury, Clinical nutrition vol 35(pg1315-1322)
9. Hegde A. Approach to an Anemic Critically Ill Patient. Indian J Crit Care Med 2019;23(Suppl 3): S178–S180.
10. Akbari Sari, A., Doshmanghir, L., Neghahban, Z., Ghiasipour, M., & Beheshtizavareh, Z. (2014). Rate of Pressure Ulcers in Intensive Units and General Wards of Iranian Hospitals and Methods for Their Detection. Iranian journal of public health, 43(6), 787–792.

11. Eleni A, Athanasios T, Konstantinos T, et al., Pressure ulcer incidence and risk factors in ventilated intensive care patients. Health Science Journal. 2014; 8(3):333-342.
12. Taha MM, Ammar MG. Electrolyte and Acid Base Disturbances in patients with Severe Closed Traumatic Brain Injury. Internet journal of neurosurgery.2015; 11(1). Doi 10:5580/uns.32774
13. Kwizera A, Dunsen M, Nakibuuka J. National intensive care unit bed capacity and ICU Patient characteristics in a low-income country. (2012) BMC research notes. Doi10:1186/1756-0500-5-475.
14. Adeneka AT, Faponle AF. Trauma Admissions to the ICU of a tertiary hospital in a low resource setting. African Journal of Anesthesia and Intensive Care. 2002;9(2):5-9
15. Alferid F. Patterns of admission and mortality of patients admitted to surgical intensive care in Tikur Anbessa specialized teaching hospital. 2014; Available from http://etd.aau.edu.et/bitstream/123456789/8370/1/Fetiya.pdf
16. Ong'ongi M, Mwachiro M, Ranketi S. Predictors of mortality in a critical care unit in south western Kenya. The Annals of African surgery. 2016; 13(1):3-6
17. Rondina C, Videtta W, Petroni G, Lujan S, Schoon P, Mori LB et al. Mortality and Morbidity from moderate to severe traumatic brain injury in Argentina. J Head Trauma Rehabil. 2005;20(4):368-76
18. Luis CM, Redson RS. Sepsis in Intensive care unit patients with traumatic brain injury: factors associated with higher mortality. Rev Bras Ter intensiva.2014;26(2):148-154. doi-10.5935/0113-507x20140022
19. Oketch, U.K., Chokwe, T., & Mung'ayi, V., (2015) DOI:10.4314/EAMJ.V92I2. The operational setup of intensive care units in a low income country in East Africa: a cross sectional survey. East African Medical Journal Vol. 92 No. 2.