ANAESTHESIA, PAIN & INTENSIVE CARE
www.apicareonline.com

ORIGINAL ARTICLE

Intensive care unit burden in a tertiary care hospital in Pakistan; a descriptive analysis

Peer Asad Aziz[1], Zeeshan Nasir[2], Ghazala Shahzad[3], Arslan Mahmood[4], Sanaullah Pathan[5], Riaz Ahmed Raja[6]

[1]Registrar; [2]House officer; [5]Consultant; [6]Professor & HoD

Department of Neurosurgery, Liaquat University Hospital, Hyderabad (Pakistan)

[3]Assistant Professor, Department of Radiology, Liaquat University Hospital, Hyderabad (Pakistan)

[4]Postgraduate Resident, Department of Oral Maxillofacial Surgery, Liaquat University Hospital, Hyderabad (Pakistan)

Correspondence: Peer Asad Aziz, Registrar, Neurosurgery Department, Liaquat University Hospital, Hyderabad (Pakistan); Cell: +92 333 2760161; E-mail: pirasadaziz@hotmail.com

Received: 22 Nov 2018
Reviewed: 30 Dec, 31 Dec 2018
Corrected & Accepted: 2 Jan 2018

ABSTRACT

Introduction: Intensive care unit (ICU) acts as a station for critically ill patients referred form different medical disciplines for rigorous observation and intervention for a potentially curable disease. In Pakistan, a previous study showed the mortality to be16.1% in one year. We conducted this study to record the data of patients admitted to our ICU regarding the medical conditions requiring such admission, and the outcome.

Methodology: As a descriptive study, the data were collected from main ICU of Liaquat University Hospital Hyderabad. Every patient referred from different medical disciplines for admission in the ICU, for a period of four months, from July to October 2018,was included in the study. The data were taken from the registration logs of ICU and were entered into a specially prepared datasheet. Statistical analysis was done and the results given as means, percentages or ranges, as appropriate.

Results: A total of 503 patients were admitted, with a female preponderance of 52%; 45% of the patients being younger than 30 years; and a mortality of 55%. Regarding the flow, medicine department seems to have the highest flow. Neurosurgery and gyne & obs disciplines seem to have the highest mortality i.e. 73% and 66% respectively. CVA, hepatobiliary disease, meningitis, lung problems, road traffic accidents (RTA), eclampsia, puerperal sepsis, postpartum hemorrhage and gut perforations were some of the important causes with worst outcome.

Conclusion: The concept of calculating ICU mortality is still obscure. The management of patients needs to be based upon a multidisciplinary approach. Early identification of the most common diseases associated with the highest morbidity and mortality at basic as well as critical level is utterly important. The burden of ICU should be reduced by filtering the patients through a combined approach, and The ICU should not be considered as a lone samurai in the battle of mortality.

Key words: Intensive care; Mortality; Burden

Citation: Aziz PA, Nasir Z, Shahzad G, Mahmood A, Pathan S, Raja RA. Intensive care unit burden in a tertiary care hospital in Pakistan; a descriptive analysis. Anaesth Pain & Intensive Care 2018;22(4):431-437

INTRODUCTION

In early 1900s, some areas of hospitals were delegated for the patients, who were recovering from anesthesia or traumatic injuries; but the post-epidemic disaster of poliomyelitis in 1950s changed the fate of critical medicine for ever and it became the pivotal constituent of hospital care.[1,3] Intensive care unit (ICU) serves as a service agent for those patients, who can be recovered from critical condition with rigorous observation and

invasive treatment, as its perquisites are potential and established organs failure especially lungs.[4]

Over the time, mortality in developed nations seems to be projected downwards as compare to low income countries, where financial constraints are difficult to supervene.[5-7] ICU contributes a large portion of mortality compared to other sections of hospital on the contrary of being an expensive pillar, which is directly related to longer stay and intercession.[8,9] In Pakistan, a recent Islamabad based study showed 16.12% mortality rate among ICU patients with more than 60% deaths related to sepsis.[7]

Senescence seems to have an alluring relationship of higher mortality as compared to young ones and it is getting stronger with time along with the demand of ICU in exponentially increasing population.[10,11] An advancement of critical care also raised the bars of expectations for patients and their family members regarding advanced and difficult to treat illness, although the psychosocial burden, including anxiety, depression and post-traumatic stress disorder (PTSD) also found inroads among survivors.[12]

The primary objective of our study was to gather the data that have much importance in relation to mortality or morbidity and outcome in ICU admissions related to different disciplines of hospital.

METHODOLOGY

It was a descriptive study conducted at Liaquat University Hospital, Hyderabad (Pakistan), which is a 1450 beds tertiary care hospital and one of the largest teaching hospital in Pakistan, providing medical care to patients from Sindh and Balochistan provinces. The study was conducted among the patients that were admitted in the ICU, from July 2018 to October 2018 through non-probability i.e. convenience sampling technique with no control over sample size. The inclusion criteria were all patients, except pediatric patients, referred from different disciplines to ICU, regardless of their severity. The data were collected from ICU registration logs and simple evaluation of patient factors through questionnaire based approach and outcome surveillance during the stay of patient in the hospital. The data were spread on the statistical program to perform analytical approach and channeled into tables and graphs.

RESULTS

A total of 503 cases were admitted in the ICU from different disciplines of hospitals from July 2018 to October 2018.Monthly distribution of the admissions is highlighted in Table 1)

Patients were divided into three categories based upon age; <30, 30-50 and >50 years; and according to gender of cases (Table 2)

As noted above, younger age has more flow then middle and older age in the ICU. Patient population is shown according to referring departments of hospital to ICU in relation to age in graphic form (Figure 1).

Table 1: Monthly distribution of the admissions

Gender	July	August	September	October	Total
Male	63	58	61	61	243
Female	61	57	77	65	260
Total	124	115	138	126	503

Table 2: Distribution according to age and gender

Gender	Age categories (years)			Total
	<30	30-50	>50	
Male	112	74	57	243
Female	117	97	46	260
Total	229	171	103	503

Table 3: Monthly distribution in relation to different disciplines

Month	Neuro-surgery	Medicine	Gyne Obs	Surgery	Others	Total
July	23	24	17	1	1	66
August	20	22	19	4	2	67
September	20	29	18	3	5	75
October	21	25	18	3	2	69
Total	84	100	72	11	10	277

Neurosurgery, gynecology & obstetrics and medicine contributed larger share of deaths as compare to other disciplines. Calculation of discipline-wise mortality and overall mortality is shown in Table 4.

Table 4: Discipline-wise distribution of mortality

Discipline	Patients admitted	Deaths	Mortality rate*
Neurosurgery	114	84	0.73 or 73%
Medicine	238	100	0.42 or 42%
Gyne & Obs	109	72	0.66 or 66%
Surgery	25	11	0.44 or 44%
Others	17	10	0.58 or 58%
Total	503	277	0.55 or 55%

**mortality rate calculated by number of deaths per total number of patients admitted in ICU*

The flow of patients from medicine seems to be high as compare to other disciplines, especially the younger patients. No patient older than 50 years of age was admitted from gynecology and obstetrics department during the study period. Other disciplines included orthopedics, urology and nephrology, ENT,

Table 5: Case mortality distribution of medicine discipline

Case diagnosis	Number of patient died	Case mortality*
Meningitis	12	0.12 or 12 %
Hepatobiliary	12	0.12 or 12 %
CVA	17	0.17 or 17 %
Lung problems	11	0.11 or 11 %
DKA & HONK	5	0.05 or 5 %
CKD	9	0.09 or 9 %
Shock	6	0.06 or 6 %
Black stone	8	0.08 or 8 %
Snake bite	5	0.05 or 5 %
AGE	3	0.03 or 3 %
OP poisoning	5	0.05 or 5 %
Alcohol intoxication	1	0.01 or 1 %
SLE	3	0.03 or 3 %
Myxedema coma	1	0.01 or 1 %
Drowning	1	0.01 or 1 %
Epilepsy	1	0.01 or 1 %
Total	100	0.42 or 42%

**calculated by number of patient died from case with total number of patient died in ICU with respective discipline. Abbreviations: (CVA: Cerebrovascular Accident, DKA: Diabetic Ketoacidosis, Honk: Hyperosmoler non-ketotic state, CKD: chronic kidney disease, AGE: Acute gastroenteritis, SLE: Systemic lupus erythematosus, OP: Organophosphate)*

able 6: Case mortality distribution of neurosurgical conditions

Case diagnosis	No. of deaths	Case mortality*
RTA	54	0.64 or 64 %
Fall	13	0.15 or 15 %
Assault	12	0.14 or 14 %
SAH	03	0.03 or 3 %
Brain Abscess	02	0.02 or 2 %
Total	84	0.73 or 73 %

**calculated by number of case deaths per total number of patient died in ICU with respective discipline.*

cardiology, dentistry and burns wards. As concerns the mortality, the monthly distribution in relation to different disciplines is shown in Table 3.

The mortality rate of neurosurgery is the highest of all with overall mortality rate greater than 50. On the contrary, despite high flow from medicine, the overall mortality seems to be lower than others. Gynecology and obstetrics falls in the second position in contributing the overall mortality of ICU.

Table7: Case mortality distribution of gynecology & obstetrics disciplines

Case diagnosis	No. of deaths	Case mortality*
Eclampsia	24	0.33 or 33 %
APH	7	0.09 or 9 %
PIH	1	0.01 or 1 %
Ectopic pregnancy	2	0.02 or 2 %
Puerperal sepsis	17	0.23 or 23 %
Labor	2	0.02 or 2 %
Placenta abruption	3	0.04 or 4 %
PPH	16	0.22 or 22 %
Total	72	0.66 or 66 %

**calculated by number of case deaths per total number of death with respect to discipline*

Abbreviations: (RTA: Road traffic accident, SAH: Subarachnoid hemorrhage)

Table 8: Case mortality distribution of general surgery and other disciplines

Discipline	Case diagnosis	No. of deaths	Case mortality *
General surgery	Gut perforation	6	0.54 or 54%
	Gut obstruction	4	0.36 or 36 %
	Hernia	1	0.09 or 9 %
	Total	11	0.44 or 44 %
Other disciplines	Cellulites	4	0.4 or 4 %
	ARF	2	0.2 or 2 %
	Cardiac problems	4	0.4 or 4 %
	Total	10	0.58 or 58 %

**calculated by number of case deaths per total number of deaths in relation to respective disciplines*

Abbreviations: (APH: Ante partum hemorrhage, PIH: Pregnancy induced Hypertension, PPH: Post partum hemorrhage)

Comparison of mortality of patients in relation to age is shown in Figure 2.

Younger patients from medicine disciplines seem to have higher mortality as compared to neurosurgery which shows middle aged population to be effected more. Gynecology and obstetrics shows equal level of age mortality, as no case recorded in older age.

Considering specific disease / condition the mortality is shown in Table 5.

Meningitis, hepatobiliary, CVA and lung problems had higher mortality as compared to others. Hepatobiliary problems included acute liver failure, chronic liver

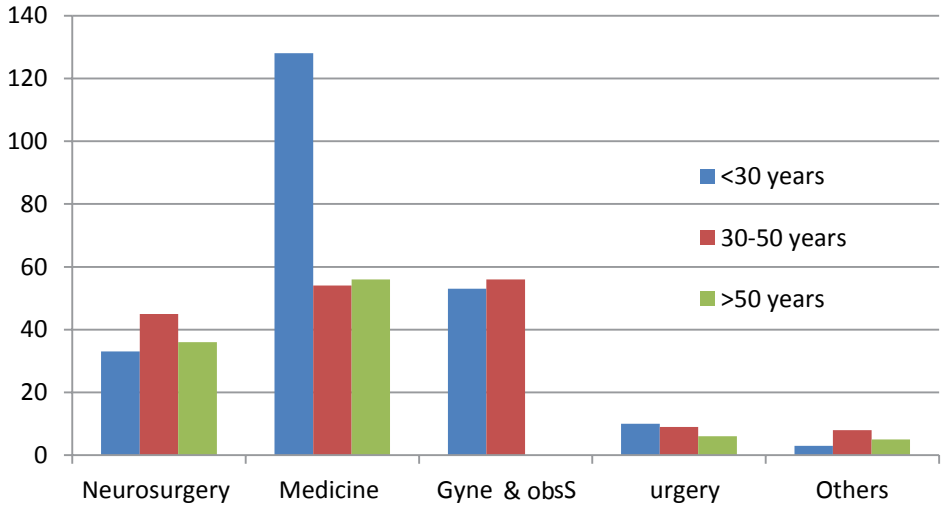

Figure 1: Distribution according to age and referring departments of hospital

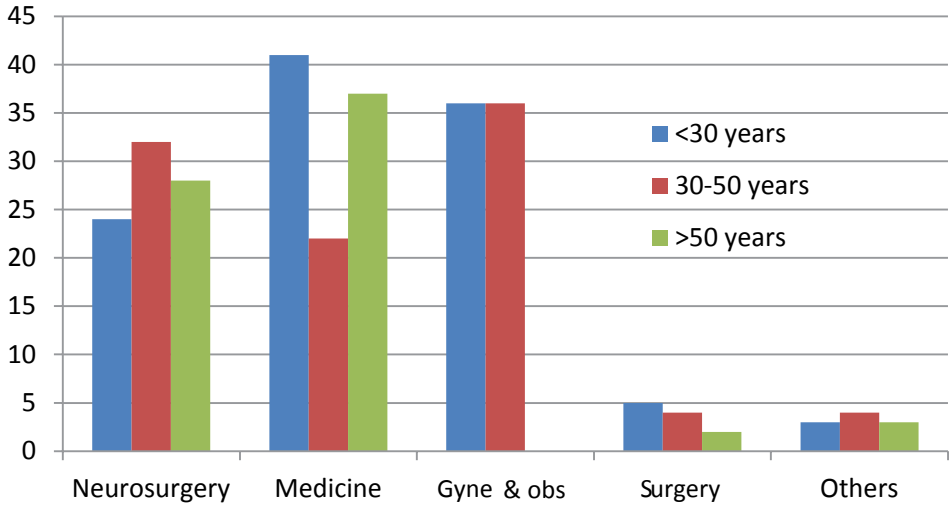

Figure 2: Comparison of mortality of patients in relation to age in different disciplines

failure and hepatic encephalopathy. Lung problems included acute respiratory failure, lung abscess and pneumonia. Shock included hypovolemic shock and electric shock. The overall mortality was calculated from the number of patient deaths to admitted ones in ICU with respect to specific discipline (See Table 4).

Mortality in different neurosurgical conditions, is shown in Table 6.

RTA, fall and assault comprised most of cases and it included diffuse axonal injury, extradural hemorrhage, subdural hemorrhage and traumatic brain contusion. Gynecology and obstetric discipline contributed second largest share in the mortality of ICU. Case distribution is show in Table7.

Eclampsia, puerperal sepsis and PPH contributed more to mortality as compared to others, especially eclampsia. Labor includes obstructive labor and cesarean section. The overall mortality is calculated and given in Table 4. The remaining disciplines are merged into Table 8.

Gut perforation and obstruction had a high mortality. The cardiac problems included ischemic heart disease, heart failure or cardiogenic shock. The most important cases are highlighted above in their respective disciplines and through departmental approach we can readily decrease the mortality of ICU through effective ward management.

DISCUSSION

As the Pakistan is in a developing phase with presence of infectious predominance, financial crisis, increment of man-made disease and poor management, the data presented on mortality associated with causes or diagnoses, do not justify the flow of patients presenting in tertiary care hospitals. On the other hand there is no study on spectral presentation of referrals of cases from different sections of hospital into the ICU. ICU is a pivotal part of hospital and it provides the last station for critically ill patients from different departments of hospital. A database of outcome can significantly help in improvement of performance and resource usage. It can help us determine the burden of disease, treatment and its role in decreasing the hospital mortality.[14,15] In our country ICU functions as a rescuer for younger patients presenting with acutely treatable disease, as compared to high income countries, where flow seems to be high of older patients with

progressively exacerbating chronic diseases.[10,16] Higher nurse:patient ratio, advanced mechanical ventilation and support of multi-organ at same time are some factors that are credited to the difference in mortality between two economic models.[5,6,17,18] The previous data of mortality in Pakistan of 16.1% in one year with male preponderance and old aged population is in contrast to our study, in which the result of four months show the mortality of 55% with female preponderance if we include Gynecology and obstetrics patients.[7]

Two studies on ICU have been done in the past, either on mortality in specific or general prospect, but none of it shows the flow from different disciplines of hospital. As a lack of advancement in our geographical area the burden of ICU is disproportional to the number of beds and increasing population.[3,7,13] None of the studies gives description about hospital factors, e.g. duration of referral, less experienced staff, high flow of patients, poor management in wards or ICU, low standard critical care practice due to lack of proper protocols and guidelines, political influence, lack of follow-up and lack of data auditing.[6,16,19,20] Medicine department seems to have high contribution than others. Infectious and rapidly increasing man-made diseases, cerebrovascular accident, meningitis, acute and chronic liver failure related to viral infection, respiratory failure (maybe due to pneumonia and lungs abscess) are major culprits from medical ward. The preventive directories are being followed neither at basic level, nor on critical care level that contributes to mortality.[20-24] On the other hand, ingestion of poisonous substances, e. g. black stone seems to be poorly managed due to lack of proper management guidelines which has increased in mortality rates..[25]

Neurosurgery is responsible for high mortality then others because of high admission rates of traumatic brain injury, including injury through fall, assault and road traffic accident which constitute 94% mortality of overall discipline.[26-28] Second on the list of mortality is gynecology and obstetrics with eclampsia, puerperal sepsis and postpartum hemorrhage, as literature also pointed out these cases with potential complications that can significantly contribute to the mortality of female patients admitted in ICU. Better understanding of physiological or pathological changes in normal or abnormal pregnancies, health personnel training at basic level and continue medical education for the advancement is knowledge is utterly needed to control the mortality within gynecology and obstetrics patients.[29-32]

Gut perforation seems to be the major cause of surgical patients to be admitted into the ICU, as the past literature showed the infectious component as main culprit of mortality despite the role for early nutritional intervention.[33, 34]

LIMITATIONS

This study helped in the identification of cases with respect to different disciplines except for pediatrics, due to lack of resources in hospital. The study doesn't reflect the disease specified flow to the ICU, rather it shows mortality of specified cases. There is a need to study factors within the hospitals unrelated to patient or disease.

CONCLUSION

The concept of calculating the mortality of ICU as a single unit, doesn't justify the management and outcomes of patients admitted in ICU except if we are assessing the factors related to ICU. As from the search of literature, ICU is connected with every department of hospital and mortality of patients in relation to type of case should be included in the books of respective disciplines. Our study shows a high mortality rate as compared to previous studies, probably due to lack of drawing the data or lack of proper infra structure for auditing procedures and vigilance, shortage of well trained staff and lack of high dependency units, acted upon such highlighted factors might reduce burden as well as mortality in intensive care units and standardize health care. Health care providers and government authorities should come in front to take proper actions in this regard to decrease such disturbing results in future.

Conflict of interest: None

Authors' Contribution:

PAA: Principal author

ZN: Co investigator

GS & AM: Data collector

SP: Statistical analyst

RARM: Study designer

REFERENCES

1. Grenvik A, Pinsky MR. Evolution of the intensive care unit as a clinical center and critical care medicine as a discipline. Crit Care Clin. 2009 Jan;25(1):239-50, x. [PubMed] DOI: 10.1016/j.ccc.2008.11.001
2. Ibsen B. The anaesthetist's viewpoint on the treatment of respiratory complications in poliomyelitis during the epidemic in Copenhagen, 1952. Proc R Soc Med. 1954 Jan;47(1):72-4. [PubMed] [Free Full Text]
3. Adhikari NK, Fowler RA, Bhagwanjee S, Rubenfeld GD. Critical care and the global burden of critical illness in adults. Lancet. 2010;376(9749):1339-46. [PubMed] DOI: 10.1016/S0140-6736(10)60446-1
4. Smith G, Nielsen M. ABC of intensive care. Criteria for admission. BMJ. 1999;318(7197):1544-7. [PubMed] [Free Full Text]
5. Zimmerman JE, Kramer AA, Knaus WA. Changes in hospital mortality for United States intensive care unit admissions from 1988 to 2012. Crit Care. 2013;17(2):R81. [PubMed] DOI: 10.1186/cc12695
6. Murthy S, Leligdowicz A, Adhikari NK. Intensive care unit capacity in low-income countries: a systematic review. PLoS One. 2015;10(1):e0116949. [PubMed] DOI: 10.1371/journal.pone.0116949
7. Ali A, Abbasi AS, Saleem F. Analysis of mortality in patients admitted in medical intensive care unit of Khan Research Laboratories Hospital, Islamabad, Pakistan. KMUJ. 2018;10(1):32-5. [Free Full Text]
8. Molina JA, Seow E, Heng BH, Chong WF, Ho B. Outcomes of direct and indirect medical intensive care unit admissions from the emergency department of an acute care hospital: a retrospective cohort study. BMJ Open. 2014;4(11):e005553. [PubMed] DOI: 10.1136/bmjopen-2014-005553
9. Angus DC, Linde-Zwirble WT, Sirio CA, Rotondi AJ, Chelluri L, Newbold RC, et al. The effect of managed care on ICU length of stay: implications for medicare. JAMA. 1996;276(13):1075-82. [PubMed]
10. Laskou M, Katsiari M, Mainas E, Kotsaimani A, Karampela I, Magina A. ICU patients: does age make any difference? Crit Care. 2008;12(Suppl 2):P496. DOI: 10.1186/cc6717
11. Kelly FE, Fong K, Hirsch N, Nolan JP. Intensive care medicine is 60 years old: the history and future of the intensive care unit. Clin Med (Lond). 2014;14(4):376-9. [PubMed] DOI: 10.7861/clinmedicine.14-4-376
12. van Beusekom I, Bakhshi-Raiez F, de Keizer NF, Dongelmans DA, van der Schaaf M. Reported burden on informal caregivers of ICU survivors: a literature review. Crit Care. 2016;20(1):16. [PubMed] DOI: 10.1186/s13054-016-1185-9
13. Ullah AR, Hussain A, Ali I, Samad A, Ali Shah ST, Yousef M, et al. A prospective observational study assessing the outcome of Sepsis in intensive care unit of a tertiary care hospital, Peshawar. Pak J Med Sci. 2016;32(3):688-93. [PubMed] DOI: 10.12669/pjms.323.9978
14. Siddiqui S. Mortality profile across our Intensive Care Units: A 5-year database report from a Singapore restructured hospital. Indian J Crit Care Med. 2015;19(12):726-7. [PubMed] [Free Full Text]
15. Ghassemi M, Celi LA, Stone DJ. State of the art review: the data revolution in critical care. Crit Care. 2015;19(1):118. [PubMed] DOI: 10.1186/s13054-015-0801-4
16. Firth P, Ttendo S. Intensive Care in Low-Income Countries — A Critical Need. N Engl J Med. 2012;367(21):1974-6. [PubMed] DOI: 10.1056/NEJMp1204957
17. Vincent J-L, Rello J, Marshall J, Silva E, Anzueto A, Martin CD, et al. International study of the prevalence and outcomes of infection in intensive care units. JAMA. 2009;302(21):2323-9. [PubMed] DOI: 10.1001/jama.2009.1754
18. Wunsch H, Angus DC, Harrison DA, Collange O, Fowler R, Hoste EA, et al. Variation in critical care services across North America and Western Europe. Crit Care Med. 2008;36(10):2787-93. [PubMed] DOI: 10.1097/CCM.0b013e318186aec8
19. Silvestri S, Toma L, Forfori F, Mosca C, Giunta F. Intensive care infections: risk factors and mortality. Crit Care. 2008;12(2):P3. DOI: 10.1186/cc6224
20. Li G, Cook DJ, Thabane L, Friedrich JO, Crozier TM, Muscedere J, et al. Risk factors for mortality in patients admitted to intensive care units with pneumonia. Respir Res. 2016;17(1):80. [PubMed] DOI: 10.1186/s12931-016-0397-5
21. Raka L. Prevention and control of hospital-related infections in low and middle income countries. Open Infect Dis J. 2010;4:125-31. DOI: 10.2174/1874279301004010125
22. Bernal W, Wendon J. Acute liver failure. N Engl J Med. 2013;369(26):2525-34. [PubMed] DOI: 10.1056/NEJMra1208937
23. Auburtin M, Porcher R, Bruneel F, Scanvic A, Trouillet JL, Bédos JP, et al. Pneumococcal Meningitis in the Intensive Care Unit: prognostic factors of clinical outcome in a series of 80 cases. Am J Respir Crit Care Med. 2002;165(5):713-7. [PubMed] DOI: 10.1164/ajrccm.165.5.2105110
24. Singh V, Edwards NJ. Advances in the critical care management of ischemic stroke. Stroke Res Treat. 2013;2013:510481. [PubMed] DOI: 10.1155/2013/510481
25. Muhammad A, Hina I, Farida K, Usama K. Black stone poisoning: a case report. J Clin Toxicol. 2017;7:353. DOI: 10.4172/2161-0495.1000353
26. Haddad SH, Arabi YM. Critical care management of severe traumatic brain injury in adults. Scand J Trauma Resusc Emerg Med. 2012;20:12. [PubMed] DOI: 10.1186/1757-7241-20-12

27. Tobi KU, Azeez AL, Agbedia SO. Outcome of traumatic brain injury in the intensive care unit: a five-year review. S Afr J Anesth Analg. 2016;22(5):135-9. DOI: 10.1080/22201181.2016.1206293
28. Carney N, Totten AM, O'Reilly C, Ullman JS, Hawryluk GWJ, Bell MJ, et al. Guidelines for the management of severe traumatic brain injury, fourth edition. Neurosurgery. 2017;80(1):6-15. [PubMed] DOI: 10.1227/NEU.0000000000001432
29. Platteau P, Engelhardt T, Moodley J, Muckart DJ. Obstetric and gynaecological patients in an intensive care unit: a 1 year review. Trop Doct. 1997;27(4):202-6. [PubMed] DOI: 10.1177/004947559702700406
30. Vasquez DN, Estenssoro E, Canales HS, Reina R, Saenz MG, Das Neves AV, et al. Clinical characteristics and outcomes of obstetric patients requiring ICU admission. Chest. 2007;131(3):718-24. [PubMed] DOI: 10.1378/chest.06-2388
31. Karpati MD, Rossignol M, Pirot M, Cholley B, Vicaut E, Henry P, et al. High incidence of myocardial ischemia during postpartum hemorrhage. Anesthesiology. 2004;100(1):30-6. [PubMed]
32. Bhagwanjee S, Paruk F, Moodley J, Muckart DJ. Intensive care unit morbidity and mortality from eclampsia: an evaluation of the Acute Physiology And Chronic Health Evaluation II score and the Glasgow Coma Scale score. Crit Care Med. 2000;28(1):120-4. [PubMed]
33. Doig GS, Heighes PT, Simpson F, Sweetman EA, Davies AR. Early enteral nutrition, provided within 24 h of injury or intensive care unit admission, significantly reduces mortality in critically ill patients: a meta-analysis of randomised controlled trials. Intensive Care Med. 2009;35(12):2018-27. [PubMed] DOI: 10.1007/s00134-009-1664-4
34. Marshall JC, Innes M. Intensive care unit management of intra-abdominal infection. Crit Care Med. 2003;31(8):2228-37. [PubMed] DOI: 10.1097/01.CCM.0000087326.59341.51

★★★★★