Brief Communication

An Appraisal of Mortality in Intensive Care Unit of a Level III Military Hospital of Bangladesh

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Abstract

Background: Mortalities in Intensive Care Units (ICUs) are high and widely variable. The unpredictability of death rates is attributable to age, sex, nature and severity of illness, comorbidity, well-timed medical attention, quality of the attending staffs, iatrogenic events, total management facilities, and overall grade of the ICU in general. **Materials and Methods:** A total of seventy patients who died in the ICU of a Level III Combined Military Hospital within a period of 2 years were studied in retrospect to review the mortality pattern. **Results:** Overall mortality rate was 3.58%, among which 81.43% were male and 18.57% were female. The mortality rate in geriatric patients was 12.26% and 2.84% in the age group of 12–60 years and 2.56% in below 12 years. The major causes of death were ischemic heart disease (20%), cerebrovascular disease (14.28%), and chronic obstructive pulmonary disease (10%). Highest incidence of death occurred during 1–3 days of ICU stay (34.28%) and the lowest was at 4 days to 1 week (4.28%). **Conclusion:** Ischemic heart disease (IHD) is remaining as the most important cause of mortality in our community although many countries have succeeded in reducing the IHD mortality by a combination of lifestyle modification and improving the health-care delivery systems.

Keywords: Bangladesh, Intensive Care Unit, Level III military hospital, mortality rate

Introduction

Florence Nightingale during Crimean War in the 1850s encouraged that the most critically sick patients should be positioned in beds close to the nursing station so that they could be observed more closely.[1-3] Dr. Walter E Dandy in 1923 opened an exceptional three-bed unit for the more censoriously ill postoperative neurosurgical patients at the Johns Hopkins Hospital in Baltimore, MD, USA, by means of specifically trained nurses for monitoring and management.[4,5] The notion of Intensive Care Unit (ICU) developed during Copenhagen polio epidemic of 1952, resulted in respiratory failure. Over 300 patients required artificial ventilation. This was provided by medical and dental students through hand ventilation through tracheostomies.[6] Henceforth, the issue of acute ill rapidly got the importance, especially polio distastes at Copenhagen, Denmark, for building specific places to deliver the life support system and management for those patients. Thereafter, ICUs were built all around the world including industrialized and emerging countries and became the hot corner of the hospitals.[7] Currently, "the ICU of any hospital deals with patients requiring critical care and involves resuscitation of patients at extremes of physiological deterioration."[8] Amazingly, there is no consensus on what should be an optimal ICU. They are markedly different across countries in design, resources, and in management and care delivery.[9] Thus, unsurprisingly, death rates in the ICUs vary on an average from 8% to 20% around the world. Analyzing the causes of death in ICUs is risky. Basically, patients may die as a direct consequence of the critical illness, as an effect of underlying comorbidities, secondary to iatrogenic events, or because of withholding or withdrawing life-supportive treatments. Intuitively, there are little to do on comorbid conditions or decision to terminate the critical care.[9]

Admission to an ICU is measured as an indicator of severe morbidity.[10] Thereafter, the current study was designed to

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review the data retrieved from the archive on the deaths in ICU. It was carried out by analyzing the fatal case documents of deaths occurred during 2-year duration in a 9-bedded ICU to investigate mainly the mortality rate among the critically ill patients. Other concerned aspects such as percentage of ICU admission with respect to hospital admission, demography of the critically ill patients, basic modalities of management provided, and duration of ICU stay before death and overt causes of deaths were also studied.

Materials and Methods

A total of seventy patients who died out of 1950 patients treated in the ICU of a Level III Combined Military Hospital within 2 years (January 1, 2013–December 31, 2014) were studied and analyzed in retrospect. Combined Military Hospital, Chittagong, is a 499-bedded multidisciplinary, Level-III hospital of Bangladesh Armed Forces Medical Care facilities, situated in the southeastern region of the country where personnel of two larger infantry divisions of Bangladesh Army are deployed in the malaria prone hill tracks area. The patients were divided arbitrarily into three age groups for clarity and simplicity: under 12 years, 13–60 years, and over 60 years. Detail history, physical findings, investigation results, treatment, and responses were obtained after retrieval of case sheets, which were kept preserved in the record section of the hospital. Preexisting critical illnesses, varieties and modalities of managements provided, duration of ICU stay, and known causes of deaths were tabulated and analyzed statistically. The current study obtained necessary approval for utilization and analysis of hospital data for research and publish from the commanding officer of hospital.

Results

Sociodemographic profile of this research is depicted in Table 1. During the period of the study, a total of 1950 patients were treated in the ICU, of which 287 (14.71%) patients were readmitted. Total ICU admission was 2237 which were 11.38% of total hospital admission (19,659). The month-wise number of hospital and ICU admission is shown in Figures 1 and 2. Highest number of admission in ICU was in the months of May (111/month), and the lowest was in January (80.5/month), whereas the highest hospital admission was in the months

Table 1: Statistical summary on patients and Intensive Care Unit of a Level III military hospital (2013-2014)

Different parameter	Number
Hospital	
Number of bed	499
Total admission	19,659
Monthly admission	
Mean	819.12
Highest	962.5
Lowest	652.5
ICU	
Number of bed	9
ICU (hospital bed ratio)	1.8% (55.4:1)
Monthly admission	
Mean	93.21
Highest	111
Lowest	80.5
Patients in ICU	
Total ICU admission	2237
Readmission	287
Shifted toward (%)	1854 (82.87)
Transfer to other ICUs (%)	26 (1.16)
Mortality analysis	
Number of death	70
Number of patients included in the mortality analysis	1950
Cause of death (%)	
Highest	20 (IHD)
Lowest	1.42*
Autopsy (%)	6 (8.57)
Mortality rate (%)	
Medical patients	2.36
Surgical patients	2.58
Terminally ill patients	10.03
Overall mortality rate	3.58

*Renal failure, malaria and septicemia. ICUs: Intensive Care Units; IHD: Ischemic heart diseases

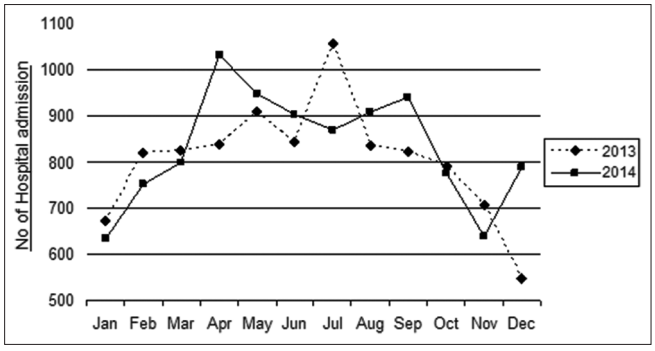

Figure 1: Month-wise hospital admission
Note: Total admission was 19,659. The highest hospital admission was in July (962.5/month) and the lowest was in January (652.5/month)

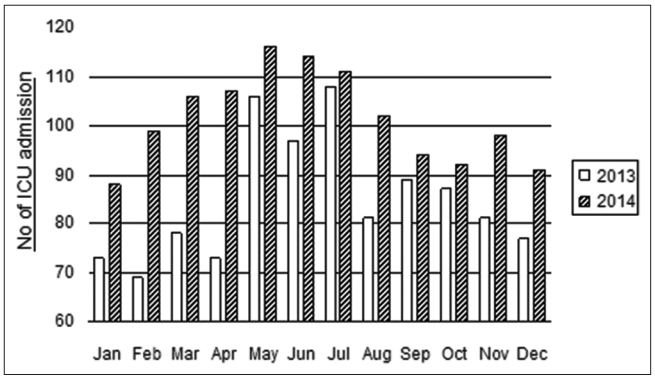

Figure 2: Month-wise ICU admission
Note: Total ICU admission was 2,237 of which 187 (14.71%) was readmission. So, the number of patients was 1,950 and 11.38% of hospital admission was in the ICU. The highest number of ICU admission was in May (111/month) and the lowest was in January (80.5/month)

of July (962.5/month) and the lowest was again in January (652.5/month). Death rates among the different age groups were geriatric (over 60 years) 12.26%, adult (13–60 years) 2.84%, and pediatric (below 12 years) 2.56%, whereas the percentage of different age groups admitted in ICU was 14.46%, 79.53%, and 6.01%, respectively [Table 2]. The male: female ratio among the patients was 2.41:1 and 4.38:1 among the deceased [Table 2].

The highest cause of death was ischemic heart disease (20%) and the lowest (1.42%) causes were renal failure, malaria, and septicemia [Table 3]. Autopsy was done in six (8.57%) cases [Table 2]. The duration of ICU stay of the study population before death is presented in Table 4. The highest incidence of death occurred during 1–3 days of ICU stay (34.28%) and the lowest was during 4 days to 1-week stay (4.28%). Conservative treatment was provided to 41.42% of deceased and 15.71% had surgical management and 42.85% received terminal resuscitation [Table 2]. The death rates were 2.36%, 2.58%, and 10.03%, respectively. After getting management in the ICU and after adequate recovery, 82.87% cases were shifted to nursing wards and 1.16% were evacuated or transferred to other ICUs for improved investigation and management facilities.

Discussion

Mortality rate is an insensitive measure for an entire hospital. It is high enough in ICUs to serve as one reliable performance indicator.[11] The mortality pattern of the patients treated in ICUs depends on both patients and ICU-related factors including the age, sex, nature and severity of illness, comorbidity, medical attention at appropriate time, quality of the attending staffs, total management facilities, and finally the overall status/rank of the ICU in general. The English statistician William Farr (1807–1883) once remarked that "Death is a fact, all else is interference." Facts about death are reliable and consistent sources of information about the health status of various populations. The exact cause of death is probably the least reliable piece of information for most death. Even among persons dying in an ICU after being diagnosed with specific diseases, autopsies sometimes show that the antemortem diagnosis was wrong.[12]

ICU is expensive and scarce in worldwide including Bangladesh.[13] It was first introduced in the 1960s and now account for approximately 20%–30% of hospital costs, and 1% of the US gross domestic product.[14] The exact expense from treasury for ICU service in Bangladesh could not be obtained by the authors. However, the economic and institutional consequences have increased the need for outcome evaluation and guidance regarding efficient utilization. In this study, the overall death rate in the ICU was 3.58%, whereas it was found 18.53% in the ICU of a large public hospital in this developing country.[15] On the other hand, in a developed country like France, in a study, the estimated mean ICU mortality was found about 15% and 6%–25% for hospital mortality after ICU discharge, yielding a hospital mortality rate of 20%–30% with substantial variations across the studies.[16] The probable factors of the decreased mortality rate in this center in comparison to the standard hospital ICUs may be the followings: this is a specialized service hospital for armed forces personnel who are adult with vigor and agile, majority of who reside in a cared and healthy environment, come across periodical health check-up, get proper prophylaxis, obtained adequate prehospital management after falling sick, etc. Additional factors may be the flexibility of the ICU admission criteria in certain instances. Many apparently and initially critical cases are treated and observed in the ICU for short duration and often some seriously ill postsurgical patients are also monitored. Hence, the number of admissions was increased and thereby the calculated death rate was declined. This wide variability was also depicted in a large-scale study on ICU deaths in the US In that study, the in-hospital mortality rates for 42 centres varied from 6.4% to 40% and 90% of that variation was attributable to patients' characteristics at admission.[17] However, in another study, the overall hospital mortality rate was 1.45% in 11 New York City's public hospitals. They have identified their continuing successes in reducing mortality rate due to evidence-based treatment, effective infection control measures, implementation of "rapid response team," and

Table 2: Age, sex and management received by the patients in Intensive Care Unit and their death cases

Different sociodemographic profile	Patients in ICU (*n*=1950), *n* (%)	Death (*n*=70), *n* (%)	Death rate (%)	Overall death rate among the critically ill patients (%)
Age group (year)				
Geriatric (>60 years)	282 (14.46)	23 (32.86)	12.26	3.58
Adult (13-60 years)	1551 (79.53)	44 (62.86)	2.84	
Paediatric (<12 years)	117 (6.01)	3 (4.28)	2.56	
Sex				
Male	1378 (70.67)	57 (81.43)	4.14	3.58
Female	572 (29.33)	13 (18.57)	2.27	
ICU management plan				
Conservative	1226 (62.87)	29 (41.42)	2.36	
Surgical	425 (21.79)	11 (15.71)	2.58	
Terminal resuscitation	299 (15.33)	30 (42.85)	10.03	

*Deaths in pediatric ICU are not included. Total patients: 1950; Total death: 70. Male: female ratio patient: 2.41:1; Death: 4.38:1. ICU: Intensive Care Unit

Table 3: Cause of death (*n*=70)

Disease	*n* (%)
Ischaemic heart disease	14 (20)
Cerebrovascular disease	10 (14.28)
Bronchial asthma, COPD	7 (10)
Malignancy	6 (8.57)
Chronic liver disease	6 (8.57)
Metabolic/electrolyte disorder	6 (8.57)
Accident/injury	5 (7.14)
Encephalitis/meningitis	4 (5.71)
Acute respiratory infection	2 (2.85)
Poisoning	2 (2.85)
Tuberculosis	2 (2.85)
Renal failure	1 (1.42)
Malaria	1 (1.42)
Septicemia	1 (1.42)
Miscellaneous	3 (4.28)
Total	70 (100)

The causes of deaths are tabulated according to their preponderance. The highest cause of deaths was ischaemic heart disease (20%) and the lowest causes were renal failure, malaria and septicaemia (1.42%). *Autopsy was done in 6 (8.57%) cases. COPD: Chronic obstructive pulmonary disease

Table 4: Duration of Intensive Care Unit stay before death (*n*=70)

Duration	*n* (%)
<24 h	23 (32.85)
1-3 days	24 (34.28)
4 days to 1 week	3 (4.28)
2 weeks	4 (5.71)
>2 weeks	6 (8.57)
Total	70 (100)

Highest incidence of death occurred for 1-3 days ICU stay (34.28%) and the lowest during 4 days to 1-week stay (4.28%). ICU: Intensive Care Unit

finally electronic medication administration systems.[18] Hence, these are the aspects of scopes to develop and improve the health-care service in our perspective. A total number of ICU beds in Bangladesh are about 250 for over 150 million people in government arrangement and another 250 beds are available in private sector. Therefore, there is an immense scarcity of ICU beds is prevailing.[15] In this hospital, the number of ICU beds is 1.8% of total hospital beds, whereas in the USA, it is 7%,[19] which warrants interest to our health-care authority concerned.

The total number of ICU admission was 2237 (11.38% of total hospital admission [19,659]) and among which 287 patients were readmitted, so 1950 cases were included in this mortality analysis. The number of both hospital and ICU admission was highest during the wet summer and lowest in the winter season. It seems that personnel fall sick more in the hot and humid environment than that of in the dry and winter season. The number of civil entitled patients was on the top among the patients treated in ICU because the pediatric and obstetric patients are in that population. Naturally, the death rate among the geriatric patients was high (12.26%), and the male preponderance among the patients (2.41:1) and in the deceased (4.38:1) was comparable to other studies.[15,20,21] However, the death rate in pediatric group (2.39-2.56%) resulted in this study is imperfect, which is quite high in other studies.[22,23] Not including the neonates and infants treated in pediatric ICU was one of the limitations of this study.

Ischemic heart disease (IHD) was the prime cause of death (20%) which is conformed to the findings of other reports.[24] The highest incidence of death occurred during 1–3 days of ICU stay (34.28%) which indicates that the first 72 h in ICU is the most crucial period of intensive care.[22] The number of medical patients treated in ICU was about thrice (62.87% medical vs. 21.79% surgical) of the surgical patients and 41.42% cases received medical treatment and 15.71% had surgical management among the deceased. However, the death rates in the both types of cases were almost similar (2.36% medical vs. 2.58% surgical) because the patients with severe terminal illnesses (10.03% mortality) were calculated in a separate group where most of them were medical cases. Moreover, the higher number of medical cases, variability in admission criteria, and supports from postoperative ward to the surgical patients played the additional roles to yield the similar mortality rates between these two disciplines. However, medical patients are at the higher risk of hospital mortality (23% vs. 14% for operative admission) because of their greater severity of illness in terms of acute physiological derangement and un-optimized comorbidity.[15,17] One multicenter cross-sectional Japanese study also reported similarly that a number of medical cases were much higher (61.1%) and surgery cases admitted ICU and mortality rate in ICU was found 2.5 time higher than hospital morality rate.[25] The current study result may have been affected by the local conditions of the health system and medical treatment, diagnostic system, and many confounding factors.

Retrospective study has its own limitation. Controls are often recruited by convenience sampling and are thus not representative. It has tendency of selection, recall, and misclassification bias. Only determines association but fail to detect cause and need very large sample size.[26-29] Therefore, prospective study is advocated to obtain a better result to implement better policy planning.

Conclusion

Mortality in ICU patients remains high. IHD (20%) was the prime cause of death which is consistent with the findings of other reports. The highest incidence of death occurred during 1–3 days of ICU stay (34.28%) which indicates that the first 72 h in ICU is the most crucial period of intensive care. IHD is remaining as the most important cause of mortality in our community although many countries have achieved reduction in rates of deaths due to IHD through modifying life style and healthcare delivery. Reported factors associated with ICU mortality are partly conflicting. Differences in statistical methods used to estimate the mortality and to identify the

prognostic factors may contribute to these discrepancies. ICU mortality analysis should focus on advances in the managements of critical illness, training of intensive care providers, improvement in healthcare resources, and the prevention of iatrogenic complications.

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Conflicts of interest

There are no conflicts of interest.

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