

Health outcomes amongst Patients admitted in Medical Intensive Care Unit (MICU) of Government Medical College and Hospital, Srinagar (Uttarakhand)

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Abstract

Background: India is a large country with huge variations in health indicators across states and districts of the country. The Health Outcomes across India varies significantly as would be expected from the wide health and health determinant disparity spread across length and breadth of India. The intensive care unit (ICU) is a health care delivery service for patients who are critical with potentially recoverable diseases. They can benefit from more detailed observation, monitoring, and treatment than is generally available in the standard lying-in ward or department.

Objective: To know the health outcomes of cases being admitted into the MICU of Government Medical College and Hospital, Srinagar (Uttarakhand).

Material and Methods: A one-year retrospective study from January 2014 to December 2014 reviewed the admissions into the MICU of Government Medical College and Hospital, Srinagar. MICU records of all admissions, referred, discharges, and deaths were utilized for the purpose of this study. Statistical analysis was done using the Statistical Package for Scientific Solutions (SPSS) version 22.0.

Results: A total of 1109 patients (633 males and 476 females) were admitted into the MICU. Maximum Number of Patients (41.8%) admitted was in the age group of ≥ 60 years. The overall Case Fatality Rate was 9.7 per 1000 admissions and Bed Occupancy Rate (BOR) of MICU was 110.9 percent recorded for the whole year (2014).

Conclusions: The leading cause of admissions in MICU was found to be circulatory and respiratory conditions. An effective ICU goes a long way in reducing mortality and morbidity and greatly facilitates the care of critically ill patients giving desirable outcome.

Keywords: CFR, MICU, BOR, Health Outcomes

Introduction

India is a large country with huge variations in health indicators across states and districts of the country.⁽¹⁾ The Health Outcomes across India varies significantly as would be expected from the wide health and health determinant disparity spread across length and breadth of India.⁽²⁾

Care of a sick person outside home was initially linked to religious place which later has taken the shape organized institution like the preset day over the course of hundreds of years.⁽³⁾ However, in early sixties of the past century a definition was suggested by a WHO Expert Committee as 'A hospital is a residential establishment, who provider short term and long term medical care consisting of observational diagnostic therapeutic and rehabilitation'.⁽³⁾

The Bed Occupancy Rate (BOR) and Length of stay in hospital are sensitive indicators to assess the health care utilization of any hospital. These indicators not only reflect changes in the service provided by any hospital but also provide necessary data of seasonal variations. Bed utilization efficiency and hospital resource utilization are of prime importance to remove the "Hospital Bottlenecks" which in turn reduces length of stay of in-patients.⁽⁴⁾

The intensive care unit (ICU) is a health care delivery service for patients who are critical ill with potentially recoverable diseases. They can benefit from

more detailed observation, monitoring, and treatment than is generally available in the standard lying-in ward or department.⁽⁵⁾ The main purpose of the ICU is to prevent mortality by intensively monitoring and treating critically ill patients who are considered at high risk of mortality. This, however, comes at a huge cost to all the parties involved—the hospital, the personnel, and the caregivers of patients.⁽⁶⁾ It is usually only offered to patients whose condition is potentially reversible and who have a good chance of surviving with intensive care support. Since these patients are critically ill, the outcome of intervention is sometimes difficult to predict. Evaluation of the outcomes of medical interventions can assess the efficacy of treatment, making it possible to take better decisions, to further improve quality of care, to standardize conduct, and to ensure effective management of the high-level resources needed to deliver intensive care services thereby optimizing resource utilization.⁽⁷⁾ Although mortality in patients depends on many factors such as demographic and clinical characteristic of population, infrastructure and non-medical factors (management and organization, time taken to reach health care), and admission practice, it is also affected by ICU performance.⁽⁸⁾

This study was, therefore, conducted to know the health outcomes of cases being admitted into MICU of Government Medical College and Hospital, Srinagar (Uttarakhand).

Material and Methods

This retrospective study reviewed the admissions into the MICU of a Government Medical College & Hospital, Srinagar (Uttarakhand) in India from January 2014 to December 2014. This hospital is 500 bedded hospital having a separate well-equipped 10-bedded MICU.

MICU records of all admissions, referred, discharges, and deaths were utilized for the purpose of this study. Data extracted from the records included age, sex, diagnosis, duration of stay in the unit, and outcome. Outcome was classified as discharge, refer, left against medical advice (LAMA), discharge on patient request (DOPR) and death. Records of patients with missing information on bio-data and diagnosis were excluded from study. For those with multiple diagnoses, morbidity with the longest duration or the final diagnosis (supported by relevant laboratory investigations) was recorded as primary illness for the patient.

Case fatality rate (CFR) was obtained by:⁽⁹⁾

$CFR = [\text{No. of deaths due to a particular disease} / \text{Total number of cases due to the same disease}] \times 100$

Bed occupancy rate (BOR) of MICU was calculated as following:⁽³⁾

$BOR = [\text{No of in-patients MICU beds occupied} / \text{Total number of MICU beds}] \times 100$

The abstracted data was coded by using manual of International Statistical Classification of Disease and Related Health Problems (10th revision), Volume 2, Second Edition published by the WHO, Geneva.⁽¹⁰⁾ Ethical approval was obtained from Institutional Ethical Committee.

Collected data were entered in Microsoft Excel and were analyzed using software Statistical Package for Social Sciences (SPSS) version 22.0. Descriptive statistical measure such as percentage was applied.

Results

Table 1 shows distribution of patients according to morbidity, mortality and Case Fatality Rate (CFR) by 20 year age groups and gender. A total of 1109 patients were admitted into MICU from 1st January, 2014 to 31st December, 2014. Of these 633 (57.1%) were males and 476 (42.9%) were females resulting in a sex ratio of males 1000 to females 752. The highest number of MICU admissions came from ≥ 60 year old age group in both sexes [male $n= 270$ (42.7%), females $n= 193$ (40.5%)] as compared to other age groups. In both sexes, the highest number of deaths/mortality belonged to ≥ 60 year old age group [male $n= 34$ (50.8%), females $n= 23$ (57.5%)]. Over all CFR was 9.7 per 1000 for both sexes (male – 10.6%, female – 8.4%).

About half (47.7%) of the patients were cured and discharged from MICU. 254 (22.9%) patients were referred to higher centre for further management and 47 (4.2%) left against medical advice (LAMA) [Table 2].

Table 3 provides the distribution of monthly variations in Morbidity, Mortality, CFR and Bed Occupancy Rate (BOR). Out of the total admissions ($n=1109$), the morbidity was observed to be highest in the month of November [$n=65$ (10.3%)] and September [$n=55$ (11.6%)] for male and female respectively while mortality was observed to be highest in the month of January [$n=11$ (16.4%)] for males and in February [$n=7$ (17.5%)] for females. Overall CFR was 9.7 per 1000 population. A high CFR (15.8%) was found in the month of February while low CFR (6.0%) was found in March month for both sexes combined. Overall BOR was 110.9 percent. The month of March (125.5%) saw highest BOR whereas it was lowest for the month of April (99.7%).

The leading causes of Morbidity among both sexes together were diseases of the circulatory system [ICD. 10: I00-I99, $n = 429$ (38.7%)] followed by diseases of the respiratory system [ICD. 10: J00-J99, $n = 168$ (15.1%)]. In both males and females, leading cause of Mortality was diseases of the circulatory system with 40.3% and 42.5% respectively, followed by diseases of the respiratory system (20.9% and 15.0%) [Table 4].

Table 1: Distribution of patients according to number of morbidity, mortality and case fatality rate (CFR) by 20-year age groups and gender

Age Group (in Years)	Male					Female					Total				
	Morbidity		Mortality		CFR	Morbidity		Mortality		CFR	Morbidity		Mortality		CFR
	No. of Cases	%	No. of Deaths	%		No. of Cases	%	No. of Deaths	%		No. of Cases	%	No. of Deaths	%	
< 20	31	4.9	01	1.5	3.2	45	9.5	01	2.5	2.2	76	6.9	02	1.8	2.6
20 – 40	92	14.5	09	13.4	9.8	89	18.7	05	12.5	5.6	181	16.3	14	13.1	7.7
40 - 60	240	37.9	23	34.3	9.6	149	31.3	11	27.5	7.4	389	35.1	34	31.8	8.7
≥ 60	270	42.7	34	50.8	12.6	193	40.5	23	57.5	11.9	463	41.7	57	53.3	12.3
Total	633	57.1	67	62.6	10.6	476	42.9	40	37.4	8.4	1109	100.0	107	100.0	9.7

Table 2: Distribution of status of patients with age group

Age Group (in Years)	Discharge		Referred		DOPR		Death		LAMA		Total	
	No. of Cases	%	No. of Cases	%	No. of Cases	%	No. of Cases	%	No. of Cases	%	No. of Cases	%
< 20	39	7.4	15	5.9	18	10.5	02	1.8	02	4.2	76	6.9
20 – 40	92	17.4	52	20.5	19	11.0	14	13.1	04	8.5	181	16.3
40 - 60	181	34.2	97	38.2	56	32.6	34	31.8	21	44.7	389	35.1
≥ 60	217	41.0	90	35.4	79	45.9	57	53.3	20	42.6	463	41.7
Total	529	100.0	254	100.0	172	100.0	107	100.0	47	100.0	1109	100.0
%	47.7 ¹		22.9 ²		15.5 ³		9.7 ⁴		4.2 ⁵		100.0	

Superscript Fig. (1, 2, 3, 4 & 5) are representing the rank order to condition at discharge

Table 3: Monthwise distribution of morbidity, mortality, case fatality rate and bed occupancy rate (BOR) with gender

Month	Male					Female					Total					BOR%
	Morbidity		Mortality		CFR	Morbidity		Mortality		CFR	Morbidity		Mortality		CFR	
	No. of Cases	%	No. of Cases	%		No. of Cases	%	No. of Cases	%		No. of Cases	%	No. of Cases	%		
Jan	50	7.9	11	16.4	22.0	35	7.3	01	2.5	2.9	85	7.7	12	11.2	14.1	108.1
Feb	37	5.8	05	7.5	13.5	39	8.2	07	17.5	17.9	76	6.9	12	11.2	15.8	112.1
Mar	48	7.6	04	6.0	8.3	36	7.6	01	2.5	2.8	84	7.6	05	4.7	6.0	125.5
Apr	58	9.2	05	7.5	8.6	33	6.9	02	5.0	6.1	91	8.2	07	6.5	7.7	99.7
May	55	8.7	06	8.9	10.9	37	7.8	04	10.0	10.8	92	8.3	10	9.4	10.9	104.5
Jun	54	8.5	05	7.5	9.3	42	8.8	05	12.5	11.9	96	8.6	10	9.4	10.4	122.7
July	56	8.8	05	7.5	8.9	37	7.8	02	5.0	5.4	93	8.4	07	6.5	7.5	107.4
Aug	50	7.9	06	8.9	12.0	40	8.4	05	12.5	12.5	90	8.1	11	10.3	12.2	110.6
Sep	44	7.0	06	8.9	13.6	55	11.6	01	2.5	1.8	99	8.9	07	6.5	7.1	124.7
Oct	57	9.0	06	8.9	10.5	54	11.3	06	15.0	11.1	111	10.0	12	11.2	10.8	108.4
Nov	65	10.3	05	7.5	7.7	30	6.3	03	7.5	10.0	95	8.6	08	7.5	8.4	105.0

Dec	59	9.3	03	4.5	5.1	38	8.0	03	7.5	7.9	97	8.7	06	5.6	6.2	102.9
Total	633	57.1	67	62.6	10.6	476	42.9	40	37.4	8.4	1109	100.0	107	100.0	9.7	110.9

Table 4: Distribution of morbidity and mortality pattern of diseases

ICD 10 Codes	Disease Category Group	Leading sub category of disease (ICD 10)	Male				Female				Total			
			Morbidity		Mortality		Morbidity		Mortality		Morbidity		Mortality	
			No. of Cases	%	No. of Death	%	No. of Cases	%	No. of Death	%	No. of Cases	%	No. of Death	%
A00-B99	Certain infectious and parasitic diseases		32	5.1	1	1.5	27	5.7	0	0.0	59	5.3	1	0.9
		A01	14	2.2	0	0.0	15	3.2	0	0.0	29	2.6	0	0.0
		A05	04	0.6	0	0.0	04	0.8	0	0.0	08	0.7	0	0.0
D50-D89	Diseases of the blood & blood forming organ and certain disorders involving the immune mechanism		18	2.8	2	3.0	23	4.8	2	5.0	41	3.7	4	3.7
E00-E99	Endocrine, nutritional and metabolic diseases		35	5.5	2	3.0	39	8.2	5	12.5	74	6.7	7	6.5
		E11	18	2.9	1	1.5	16	3.4	2	5.0	34	3.1	3	2.8
		E86	12	1.9	0	0.0	10	2.1	3	7.5	22	2.0	3	2.8
G00-G99	Diseases of the nervous system		35	5.5	3	4.5	42	8.8	4	10.0	77	6.9	7	6.5
		G40	26	4.1	2	3.0	22	4.6	4	10.0	48	4.3	6	5.6
		G01	03	0.5	0	0.0	07	1.5	0	0.0	10	0.9	0	0.0
I00-I99	Diseases of the circulatory system		274	43.3	27	40.3	155	32.6	17	42.5	429	38.7	44	41.1
		I21	119	18.8	13	19.4	35	7.4	4	10.0	154	13.9	17	15.9
		I64	30	4.7	5	7.5	21	4.4	2	5.0	51	4.6	7	6.5
J00-J99	Diseases of the respiratory system		99	15.6	14	20.9	69	14.5	6	15.0	168	15.1	20	18.7
		J44.1	62	9.8	7	10.4	33	6.9	3	7.5	95	8.6	10	9.3
		J15.9	10	1.6	0	0.0	12	2.5	0	0.0	22	2.0	0	0.0
K00-K93	Diseases of the digestive system		22	3.5	2	3.0	11	2.3	0	0.0	33	3.0	2	1.9
		K28	05	0.8	0	0.0	07	1.5	0	0.0	12	1.1	0	0.0
		K70	11	1.7	1	1.5	00	0.0	0	0.0	11	1.0	1	0.9
N00-N99	Diseases of the genitourinary system		54	8.5	8	11.9	52	10.9	3	7.5	106	9.6	11	10.3
		N39.0	19	3.0	1	1.5	17	3.6	0	0.0	36	3.2	1	0.9
		N18	14	2.2	2	3.0	11	2.3	1	2.5	25	2.3	3	2.8

R00- R99	Symptoms, signs & abnormal clinical & laboratory findings, not elsewhere class.	21	3.3	2	3.0	15	3.1	0	0.0	36	3.2	2	1.9
	R07	07	1.1	0	0.0	06	1.3	0	0.0	13	1.2	0	0.0
	R57.2	04	0.6	1	1.5	04	0.8	0	0.0	8	0.7	1	0.9
V01- Y98	External causes of morbidity and mortality	34	5.4	5	7.4	37	7.8	3	7.5	71	6.4	8	7.6
	X49	16	2.5	1	1.5	12	2.5	1	2.5	28	2.5	2	1.9
	X20	11	1.7	4	6.0	12	2.5	2	5.0	23	2.1	6	5.6
Other		09	1.4	1	1.5	06	1.3	0	0.0	15	1.4	1	0.9
Total		633	57.1	67	62.6	476	42.9	40	37.4	1109	100.0	107	100.0

Discussion

Intensive care unit requires a vast use of up to date equipment and highly skilled staff. Intensive care also demands a tremendous amount of time and effort on behalf of the medical and nursing staff to treat and improve survival of the critically ill patients.⁽¹¹⁾ The outcome of patients admitted into the ICU will also depend on the level of training and experience acquired by staff. In developing countries like India where financial resources are limited and training and re-training of staff may not be adequate, MICU play a very crucial role in saving the lives of patients.

A significant proportion (47.7%) of the patients were cured and a small proportion of patients left the health facility against medical advice (4.2%) in our study. The probable reason would be either non-satisfaction with the medical care available or inability to continue the treatment at the facility.

Case fatality rate of 9.7% (107 patients) was observed, and 62.6% were males and 37.4% were females. The mortality rate and sex distribution observed in our study is contrary to previous studies by Parikh et al⁽¹²⁾ in Mumbai, Bolaji et al⁽¹³⁾ in Nigeria, Isamade et al⁽¹¹⁾ in Nigeria and Chyla et al⁽⁶⁾ in Tanzania.

The bed occupancy rate we have observed (110.9%) was much higher than that of Rahman et al⁽³⁾ and Tyagi et al⁽¹⁾ in their respective studies.

This difference may be due to clinical events that occurred, the quality of care provided prior to stay in MICU and the length of stay in MICU are all factors that inter-relates in determining the outcome of patients.

Conclusions and Recommendations

The present study highlights circulatory and respiratory to be the leading cause of admissions in MICU, thus indicating these conditions to occupy a large chunk for causing Mortality. We suggest that there is a need for well-planned, systematic and large-scale studies by using standardized methodologies to estimate the leading cause of admission in the MICU with the representation of the different regions of India so that an effective ICU goes a long way in reducing mortality and morbidity and greatly facilitates the care of critically ill patients giving desirable outcome. We also recommend a prospective study for determining other factors responsible for outcome in MICU.

Limitations of the Study

The limitations of the study include the retrospective design, the available data only supported categorization of patient by primary diagnosis and relied on the clinical soundness of the attending physician in patients' diagnoses which may vary from individual to individual based on experience, qualifications and other factors.

References

1. Tyagi BB, Aswal RS, Haroon AS. Morbidity Patterns Amongst Hospitalized Patients in a Secondary Care Hospital of Dehradun, Uttarakhand State, India. *J Gen Pract Med Diagn*. 2015;2:1.
2. International Institute for Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-3), 2005–06: India: Volume I. Mumbai: IIPS;2007.
3. Rahman H, Haque SME, Hafiz MA. Percent Bed Occupancy rate in a selected specialized tertiary care hospital in Dhaka City. *BJMS*. 2012;11(1):18-24.
4. Saha JB, Mitra J, Mondal A. Length of stay of in-patients of a gynaecological ward in a sub-divisional hospital in West Bengal. *Indian J Public Health*. 1991;35(3):71-4.
5. Oke DA. Medical admission into the intensive care unit (ICU) of the Lagos University Teaching Hospital. *Niger Postgrad Med J*. 2001;8(4):179–182.
6. King Edwards Hospital Fund. Intensive care in the United Kingdom: report from the king's fund panel. *Anaesthesia*. 1989;44:428–431.
7. Fiser DH. Outcome evaluations as measures of quality in pediatric intensive care. *Pediatr Clin North Am*. 1994;41:1423–1438.
8. Bertolini G, Donata RAC, Apolone G. PRISM—an assessment of its performance in a sample of 26 Italian ICU'S. *Crit Care Med*. 1988;26:1427–1432.
9. Park K. *Park's Textbook of Preventive and Social Medicine*. 23rd ed. Jabalpur: Banarsidas Bhanot;2015. p. 58.
10. WHO. *International Statistical Classification of Diseases and Related Health Problems (10th Revision) Volume II*. Geneva: WHO;2010.
11. Chalya PL, Gilyoma JM, Dass RM, Mchembe MD, Matasha M, Mabula JB, et al. Trauma admissions to the Intensive Care Unit at a reference hospital in Northwestern Tanzania. *Scand J Trauma Resusc Emerg Med*. 2011;19:61.
12. Parikh CR, Karnad DR. Quality, cost and outcome of intensive care in a public hospital in Bombay, India. *Crit Care Med*. 1999;27:1754-9.
13. Bolaji BO, Kolawale IK. The Intensive Care Unit of the University of Ilorin teaching hospital, Ilorin, Nigeria: A 10 year review. *South Afr J Anaesth Analg*. 2005;11:146-50.
14. Isamade ES, Yiltok SJ, Uba AF, Isamade EI, Daru PH. Intensive Care Unit admissions in the Jos University Teaching Hospital. *Niger J Clin Pract*. 2007;10:156-61.