

Burden of Admissions from Referring Departments, Disease Patterns and Outcomes of A Medical Intensive Care Unit.

Bano Saliha¹, Batool Zainab², Ansari Aleena³

ABSTRACT

Background & Objective:

Despite a noticeable evolution in the discipline of Critical care, the pattern of disease, contribution of patient from different sub-specialty and outcomes are not well understood for the ICUs of Low -Middle Income Countries (LMIC). To guide better resource allocation and development of the admission protocols, this study aims to incur a reasonable contribution to this gap of data.

Methodology: This was a retrospective cross-sectional observational study in the Medical ICU, Jinnah Postgraduate Medical Centre, Karachi, Pakistan on 229 patients. Mortalities, frequencies of disease pattern and contribution of referrals by sub-specialties were analyzed.

Results: The highest number of patients were referred from different medical units (42.30%) followed by neurology departments (10%). Amongst disease pattern meningoencephalitis shared the greatest percentage (10.04%). Overall mortality rate was 47.59% (n = 109), out of which 27.07% (n = 62) died within first 48 h, excluding them, the overall survival rate was 69.69% (n = 115).

Conclusion: Our study concluded that in a medical ICU of public sector hospital the greatest burden of referral is shared by the patients with acute medical condition followed by acute neurological conditions. Significant mortalities within first 48 hours re-emphasizes the need of a timely referral generation and resource allocation for such category of patients

Key words: Intensive Care Unit (ICU); Outcome; Mortality; Resource allocation; Disease

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2. Contributed to study design, assisted in data collection and analysis, provided critical feedback on the manuscript draft, and approved the final version for publication.
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Author Affiliation:

Jinnah Postgraduate Medical Center,
Rafiquei Shaheed Road, Karachi, Pakistan
Phone number: +92 (0)21 99201300

Corresponding Author:

Designation: Critical care Consultant and in-charge section MICU, Medical Unit 4, JPMC
Qualifications: MBBS, FCPS (Med), MRCP UK, EDIC

INTRODUCTION

Critical care specialty has remarkably evolved in the last decade and new modalities of improved care and patient management are continuously being incorporated as part of standard care of critically ill patients.¹ Majority of the advancement in the field of monitoring devices, renal² and cardiac³ as well as respiratory⁴ support requires high budgets and trained critical care staff and technicians.⁵ As the majority of these devices are considered to aid in improved outcomes of the patient, modern ICUs of developed countries are equipped with such tools.⁶ However, the ICUs of low-middle income countries (LMIC) especially those operating under public sector are still lacking such necessary resources⁷, despite the fact that they deal with a large numbers of critical patients.

The Jinnah Post Graduate and Medical Centre (JPMC) is one of the largest public sectors, 2200 bedded hospital of the province Sindh in the most populated city Karachi of Pakistan. The Medical Intensive Care Unit (MICU) of JPMC is a 12 bedded limited facility ICU, where to justify the available resources against a huge number of referred acute medical, acute perioperative and acute peripartum conditions, the patients who require a level of care 3 are prioritized. Although allocation of resources remains an ethical dilemma worldwide⁸, and developing a model for optimized admissions can contribute to better ICU outcomes.⁹ Many ethical guidelines were developed when even high-income countries faced shortages of acute beds during the COVID-19 pandemic^{10,11}, a problem that should be recognized as being chronic in LMIC setups.

To identify the better resource allocation and to make the best of available resources in better outcomes to the most deserving patients, there is limited local and international data to identify the pattern of disease, contribution of burden of referral by each specialty and outcomes of patient requiring a level of care 3¹². We decided to conduct a study to determine the frequencies of different referring department of JPMC and outside the hospital along with disease pattern and their outcomes. We aimed for this to assist in defining effective resource allocation to achieve better administrative outcomes at

government and Non-Governmental Organization (NGO), as delayed ICU admission due to a full unit at first referral is associated with increased mortality¹³. Moreover, this study would contribute in determining the admission criteria for medical ICUs of LMIC. Furthermore, it aims to assist referring departments in contributing to better management strategies for their patients by understanding the pattern of burden and outcome of their referred patients to medical ICUs belonging to a LMIC.

METHODOLOGY

We conducted a retrospective cross-sectional observational study in the Medical Intensive Care Unit of Ward 23 at Jinnah Postgraduate Medical Centre, Karachi, Pakistan. The study was conducted from 1st August 2022 to 31st October 2022. The total number of patients analyzed were 229. All the patients admitted in MICU within the defined duration of study were enrolled in the study. They included all intubated and mechanically ventilated and non-intubated patients. All those patients who were admitted with a code status of Do Not Resuscitate (DNR) were excluded from the study. Frequency of referred patients by each specialty was considered as burden. The treating diagnosis was taken as pattern of disease. The overall mortality and survival were considered as the outcomes. The overall mortality rate was defined as the total percentage of death within the ICU stay. After excluding those patients who died within 48 h of ICU stay, the percentage of the patients discharged from ICU were taken as survival rate. Files of these patients were obtained from the hospitals data storage and were manually scanned and sorted into their relevant groups. Groups were defined according to the department from which the patient was referred. Furthermore, they were redefined under their relevant referring departments as well as their clinical diagnosis. This data was then entered into MS Excel for analysis. The median was calculated for quantitative data and percentages were calculated for qualitative data.

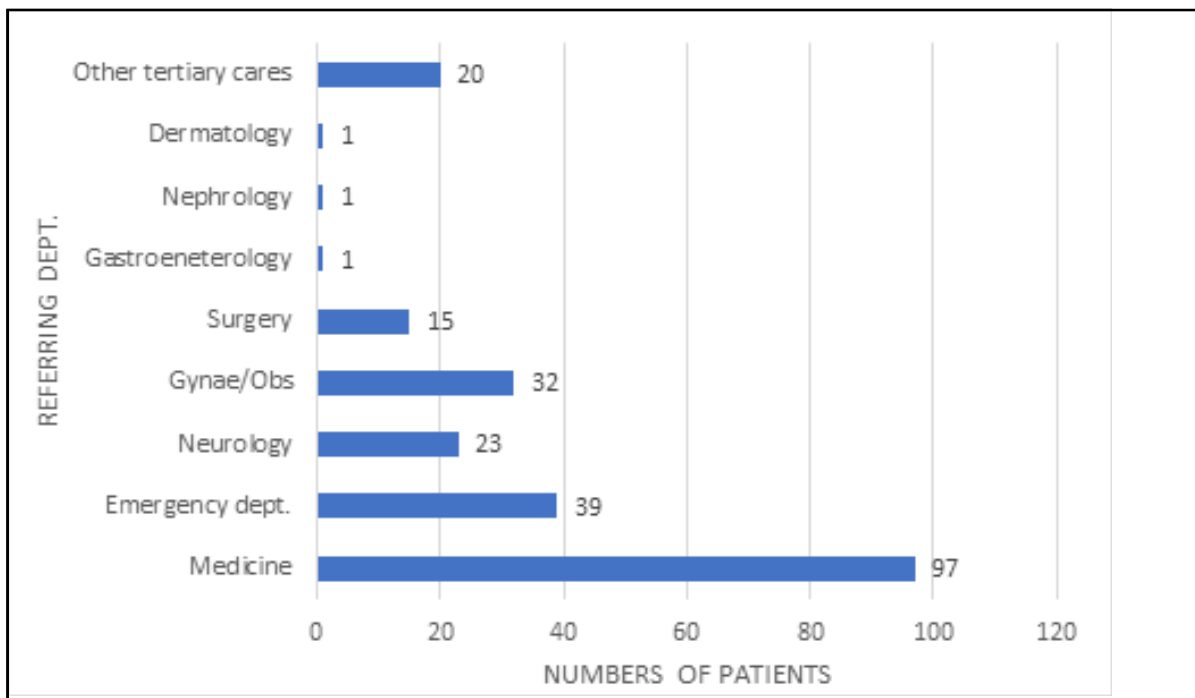
RESULTS

Our data revealed that out of 229 patients, 103(44.97%) were male. The median age of the

Table:1 Frequencies of various disease patterns, Days in ICU and Survival percentage after excluding first 48 hours mortalities

No.	Diagnosis	Number of patients = n (%)	ICU stay in days= Median (IQR)	Survival %
1	Meningoencephalitis	23(10.04)	2(1-5)	63.15
2	Septic shock	20(8.73)	1.5(1-3)	20
3	Dengue shock syndrome with Multiorgan Dysfunction	19(8.29)	1.5(1-3)	0
4	Diabetic ketoacidosis	17(7.42)	1(1-5)	86.66
5	Poisoning	16(6.98)	3(1-8)	100
6	Exploratory laparotomy	16(6.98)	1(1-2)	100
7	Eclampsia	15(6.55)	1(1-2)	92.3
8	Complicated Malaria	13(5.67)	2(1-4)	66.66
9	Guillain barre syndrome	9(3.93)	3(1-9)	75
19	Autoimmune disorder	9(3.93)	4(2-11)	50
20	Pneumonia	8(3.49)	4(2-7)	75
21	Acute liver failure	7(3.05)	1(1-1.5)	16.66
22	Status epilepticus	7(3.05)	1(1-3)	80
23	Tetanus	6(2.62)	3.5(3-5)	66.66
24	Cerebrovascular accident with aspiration pneumonia	6(2.62)	4(3-10)	33.33
25	Renal failure	4(1.74)	2(1-3)	100
26	Hematological disorders	4(1.74)	1(1-1)	50
27	Other infections	3(1.31)	1(1-4)	50
28	Polytrauma/ Gunshot injuries	3(1.31)	1(1-1)	100
29	Post-partum hemorrhage	3(1.31)	2(1-3)	50
30	Anemic failure	2(0.87)	2(1-4)	50
31	Human Immunodeficiency virus/acquired immunodeficiency syndrome with complications	2(0.87)	2(1-4)	50
32	Hyperosmolar hyperglycemic state	1(0.43)	2(1-3)	75
33	Anaphylactic shock	1(0.43)	2(1-3)	100
34	Miscellaneous disorders	15(6.55)	4(3-6)	43.75

Figure 1: Numbers of patients from different referring departments



patients was 27 years (Inter-quartile range 22-36 years), maximum 66 y. On further stratification of age, it was found that 202(88.20%) patients were less than the age of 40 years.

The median ICU stay was 1 day (Interquartile range 1-4 days) and maximum were 19 days. Overall mortality rate was 47.59% (n = 109), out of which 56.73% (n = 62) died within first 48 h. After excluding mortality of first 48 h, overall survival rate was 69.69% (n = 115).

The maximum number of admissions to medical ICU were found to be primarily from different medical wards and medical High-Dependency Unit 97(42.30%), followed by emergency department 39(17%) admitting a variable spectrum of diseases.

Amongst sub-specialty units, neurology patients added the most burden to ICU 23(10%). Patients referred from private sector tertiary care hospitals of the Karachi contributed 20(8.73%) with department of gynaecology and obstetrics adding on 32(13.9%) patients.

The medical ICU also catered 15(6.5%) patients that

were either pre-op or post-op from surgery departments.

1(0.43%) patient each was catered to from nephrology, gastroenterology and dermatology specialty units. The above data is depicted in Figure 1.

Highest numbers (n = 23), were admitted with a diagnosis of meningoencephalitis and related complications followed by septic shock (n = 20). A high prevalence of dengue shock syndrome (n = 19) and diabetic ketoacidosis (n = 17) was also observed. Patient with various poisoning and drug overdose were also received in a significant number (n = 16), from national poisoning control centre.

The prevalence of other medically complicated patients was lower than the patients of eclampsia (n = 15) and post-operative patients of exploratory laparotomy (n = 16), for various reason referred from different surgical units.

DISCUSSION

In our study we found that the majority of patients fell in the category of young age, contrib-

uted to by the preferential admission of younger age group to the ICU compared with middle and older age. The average ICU stay appears comparable to other studies.^{14,15,16} Notably, the highest mortality was observed within first 48 h. The survival rate after excluding first 48 h mortality is comparable with some studies^{17,18}. It is pertinent to note here, that the ICU in discussion is a level of care 3 setup and caters to almost all intubated and ventilated patients, which contributes to the mortality numbers on the higher side.

As for the trends of patient admission, we found that the medical units within the hospital shared the most burden of admissions into medical ICU. These units are able to provide maximum level 2 care to patients and frequently lack trained doctors and staff to provide more intensive medical support to patients who qualify so.

Patients referred from neurology department are frequently those that require airway protection, e.g. Guillain-Barre syndrome, myasthenia gravis and epilepsy¹⁹. It is deemed necessary that such patients are received initially in the neurology department due to availability of plasmapheresis, and holding up one of the largest epilepsy centres of the province.

Nephrology department, running its own dialysis unit, is likely to refer patients requiring intermittent haemodialysis but at high risk and requiring initial stabilization of airway breathing and circulation.

Referrals from gastroenterology were found to be highly limited as primary medical units in this hospital also deal with gastroenterology related cases. Along with this, the hospital does not provide a transplant facility and so, patients of acute liver failure who very frequently require intubation and ventilation are referred out to transplant equipped units in anticipation of improved prognosis.

Dermatology referrals involved patients already admitted for extensive skin pathologies and who went on to develop severe organ involvement.

Added on the medical patients, the ICU also catered

to patients from gynecology and obstetrics department, as well as surgical patients, further increasing its burden²⁰. Gynaecology and obstetrics department tends to refer post-operative emergency cases as well as unbooked patients which further adds on to the mortality and prolonged ICU stays.

In our study, we found that majority of the patients who were referred from surgical department were those who required emergency laparotomy due to acute abdomen but some percentage is contributed to by cases of polytrauma and gunshot injuries as well.

When analysis was done more specific to pathologies, the greatest burden incurred was of patients of meningoencephalitis who required intubation due to a low score on Glasgow Coma Scale or seizures. Epilepsy patients were received for airway support and ongoing seizures/ status epilepticus and Guillain-Barre syndrome patients due to airway involvement. Tetanus patients were received to secure airways due to lock jaw as well as for deep sedation.

Sepsis stands as the most common of admission to our ICU.

During the months that this study was performed, dengue shock syndrome was prevalent and many cases with multi organ involvement and liver failure were referred.

Most cases of diabetic ketoacidosis in this hospital are managed in level 2 care units, however those who develop diabetic ketoacidosis as a presentation of a more serious underlying cause or developed life threatening complications were received in ICU. Patients with cerebral malaria were referred with multi organ involvement. Poisoning cases were primarily of organophosphate and were intubated due to high secretions, hemodynamic instability and need for airway protection.

Patient who were admitted pre/post exploratory laparotomy, mostly done as an acute emergency, were referred to Medical ICU in our study.

Most cases admitted from gynae were of post/prepar-

tum eclampsia, post lower segment C-section, or post-partum haemorrhage with shock.

Lastly, patients with autoimmune pathologies also contributed significantly in our study and mostly were received with multiorgan involvement.

CONCLUSIONS

Our study concluded that in a medical ICU of public sector hospital the greatest burden of referral is shared by the patients with acute medical condition followed by acute neurological conditions.

The patient with diagnosis of meningoencephalitis contributed the greatest percentage followed by sepsis.

Significant mortalities within first 48 hours reemphasizes the need of a timely referral generation and resource allocation for such category of patients.

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