

Identification of factors and outcomes of obstetric patients in the surgical intensive care unit of a tertiary care hospital

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ABSTRACT

Background

Despite of massive development in health sciences, maternal mortality in Pakistan is still highest in Southeast Asia. Derailment of widespread physiological changes or evolution of any high-risk pregnancy induced condition may necessitate admission to an intensive care unit (ICU) during the course of pregnancy or postpartum. The purpose of this study is to identify the factors leading to ICU admissions and outcomes of obstetric patients in surgical ICU of a tertiary care hospital.

Methods

A descriptive study was conducted in Department of Anaesthesiology, the Surgical ICU and Pain Management, Civil Hospital Karachi for 6 months from June to December 2022. A total 138 patients with antepartum and postpartum conditions requiring ICU admission were recruited in this study. All demographic details were recorded in a predesigned proforma. The patient's parturient status as antepartum or postpartum and the comorbidities with which they presented were recorded.

Results

Patients' mean age was 26.68 ± 5.67 years. Hypertensive disorder was the commonest factor (51.45%) leading to ICU admission followed by obstetric hemorrhage 37.86% and sepsis was observed in 10.87%. There were 15.94% (22 of 138) women who were expired and 81.06% (116 of 138) were discharged from surgical ICU. Mortality rate was significantly high in those women whose causes were obstetric hemorrhage and sepsis. ($p=0.0005$).

Conclusion

The most frequent cause of ICU admission was the hypertensive condition of pregnancy, which was followed by obstetric hemorrhage and infection. It is essential to approach these patients meticulously and embark on rapid management protocol with a team approach to save these precious lives.

Keywords

Antepartum; Postpartum; Hypertensive disorder; surgical ICU.

INTRODUCTION

Pregnancy is a unique physiological state that can lead to devastating life-threatening conditions leading to intensive care unit (ICU) admissions. Healthy and young pregnant women might have a quick deterioration of their underlying comorbidity as a result of their pregnancy or suffer serious problems without warning indications, resulting in maternal death^{1,2}. These patients requiring intensive care pose unique challenges for obstetricians and intensivists².

There is a scarcity of such studies addressing the causes of ICU admissions in obstetric patients. Since our hospital is the biggest tertiary care health facility in the Province of Sindh, it receives a huge number of referred cases not merely from the different parts of the city but also outskirts of the province of Sindh and Baluchistan with almost no antenatal care or even visits to a nearby facility available, this study aimed to recognize the causes of ICU admission of these obstetric patients, and to know their outcomes, so that we could have an idea of the burden of diseases we are dealing with. That measure can be taken to improve and facilitate both the mortality and

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morbidity associated with the conditions these patients usually present with. Appropriate statistics will help us arrange and utilize our resources for the well-being and benefit of these patients.

METHODS AND MATERIALS

Study design, setting, and participants

A descriptive study was conducted in surgical ICU (SICU) of the Department of Anaesthesiology, the Surgical ICU and Pain Management, Civil Hospital Karachi (CHK), Dow University of Health Sciences. The duration was 6 months starting from June to December 2022. A non-probability, consecutive sampling technique was applied. A sample size of 138 patients was calculated with an anticipated frequency of 8.3% of total in-hospital mortality². A confidence level of 95% with a 5% margin of error was taken. Pregnant patients requiring ICU care irrespective of indications, antepartum, or postpartum patients with ages between 18 to 45 years were included. Whereas, all obstetric patients seeking admission to ICU due to some non-obstetric cause including Road Traffic Accident, medical illness not associated with pregnancy, or after any general surgical procedure due to some non-obstetric cause based on clinical history were excluded from the study.

Data collection

After approval from the Ethical Review Board of Dow University of Health Sciences, all the patients meeting the inclusion criteria seeking admission to the SICU of CHK were consecutively included in the study after obtaining informed consent from the patient or the attendants. The anesthesia team who brought the patient to the ICU and the primary obstetrical team were thoroughly asked for the obstetric history including gestational age, and parity along with the reason for bringing the patient to the ICU. All these along with the demographic details (name, age, place of residence, education, socioeconomic status, booking status) were recorded in a predesigned Performa. Patient's parturient status as antepartum or postpartum and the comorbidity they are coming with were recorded as well. Data was recorded regarding the discharge of the patients to the

Table 1. Demographics, parturient status, factors leading to ICU admissions and outcome of obstetric patients in SICU

Demographic variables	Values
Age, mean (S.D) years	26.68 (\pm 5.671)
Gestational Age, mean (S.D) weeks	34.01 (\pm 5.27)
	Total frequency: 138
Residential status	Frequency (percentage)
Rural	12 (15.22%)
Urban	117 (84.78%)
Education status	
Illiterate	69 (50%)
Primary	28 (20.29%)
Secondary	23 (16.67%)
Higher Secondary	18 (13.04%)
Socio economic status	
Satisfactory	43 (31.16%)
Poor	95 (68.84%)
Comorbidities	
GDM	1 (0.7%)
PIH	66 (47.8%)
Parturient status	
Postpartum	46 (33.33%)
Antepartum	92 (66.67%)
Parity	
< 2	49 (35.51%)
\geq 2	89 (64.49%)
Factors leading to ICU admissions	
Hypertensive disorder	71 (51.45%)
Obstetric haemorrhage	52 (37.68%)
Sepsis	15 (10.87%)
Obstetric patients' outcome in surgical ICU	
Expired	22 (15.94%)
Discharged	116 (84.06%)
GDM: gestational diabetes mellitus; PIH: Pregnancy-induced hypertension	

ward or if they expire.

Data analysis

SPSS version 23 was used to enter and analyze all the data recorded. Mean and standard deviation or median (IQR) was calculated for quantitative variables including age, and gestational age. In contrast, frequency and percentage were calculated for qualitative variables like parity, parturient status, comorbidities (DM, HTN), booking status, residence, indications (hypertensive disorders of pregnancy, obstetric hemorrhage, and sepsis), and outcomes (discharged or expired). Effect modifiers like age, comorbidities, booking status, and gestational age were controlled through stratification, after stratification chi-square or Fischer exact test was applied keeping p value ≤ 0.05 as significant.

RESULTS

A total of 138 patients with antepartum and postpartum indications for ICU admission were recruited in this study. The average age of the patients was 26.68 ± 5.67 years and the mean gestational age was 34.01 ± 5.27 weeks (Table 1). Almost 85% of the patients had urban residences. The educational status of the patients showed that 50% of the patients were illiterate. Regarding socioeconomic status, about 69% of the patients belonged to the poor class. PIH was the commonest comorbid of the patients that was observed in 47.8% of cases. Out of 138 ICU patients, 92 (66.67%) were antepartum and 46 (33.33%) were postpartum. Most of the women had more than 2 parities (64.49%). The hypertensive disorder was the commonest factor (51.45%) leading to ICU admission followed by obstetric hemorrhage (37.86%) and sepsis was observed in 10.87%. There were 15.94% (22 of 138) women who were expired and 81.06% (116 of 138) were discharged from the surgical ICU.

The Mortality rate was significantly high in those women whose causes of admission were obstetric hemorrhage and sepsis ($p=0.0005$) as shown in Table 2.

A Comparison of factors leading to ICU admission among the demographic factors, parity, parturient status, and

comorbid are presented in Table 3. The rate of obstetric hemorrhage and sepsis were significantly associated with women who had multiparity (parity ≥ 2) as compared to primiparity, however, factors leading to ICU were not statistically associated with age and gestational age. These factors were also not associated with residence, education, and socioeconomic status (SES). These factors were significantly associated with comorbid PIH and parturient antepartum and postpartum status.

Similarly, the rate of mortality was not statistically significant between age groups, gestational age groups and parity while the rate of mortality was significantly high in un-booked cases (Table 4).

Multivariate analyses were performed by logistic regression analysis and observed that rate of mortality was also significantly high in women who were admitted to the ICU due to obstetric hemorrhage and sepsis after controlling the effect of confounding factors like age, gestational age, parity, residence, booking status, education, SES, PIH, and parturient status as presented in Table 5.

Table 2 Association of factors leading to ICU and outcome

Factors leading to ICU admissions	Outcome		Total	P-Value
	Expired	Discharged		
Hypertensive Disorder	1(4.5%)	70(60.3%)	71	0.0005
Obstetric Hemorrhage*	15(68.2%)	37(31.9%)	52	
Sepsis†	6(27.3%)	9(7.8%)	15	

Row-wise percentages were computed

Multiple testing

* $p < 0.05$ for obstetric hemorrhage (mortality more likely)

† $p < 0.05$ for sepsis (mortality more likely)

$P < 0.05$ for hypertensive disorder (mortality less likely)

Table 3 Comparison of factors leading to ICU admission among the demographic factors, parity, parturient status and comorbid

Variables		Factors leading to ICU admissions			p-value
		Hypertensive disorder	Obstetric hemorrhage	Sepsis	
		n (%)	n (%)	n (%)	
Age (Years)	≤30	60 (53.1%)	41 (36.3%)	12 (10.6%)	0.709
	>30	11 (44%)	11 (44%)	3 (12%)	
G. Age (Weeks)	≤37	60 (50.8%)	44 (37.3%)	14 (11.9%)	0.660
	>37	11 (55%)	8 (40%)	1 (5%)	
Parity	<2	33 (67.3%)	13 (26.5%)	3 (6.1%)	0.020*
	≥2	38 (42.7%)	39 (43.8%)	12 (13.5%)	
Residence	Urban	60 (51.3%)	47 (40.2%)	10 (8.5%)	0.079
	Rural	11 (52.4%)	5 (23.8%)	5 (23.8%)	
Education	Illiterate	35 (50.7%)	24 (34.8%)	10 (14.5%)	0.633
	Primary	14 (50%)	12 (42.9%)	2 (7.1%)	
	Secondary	10 (43.5%)	11 (47.8%)	2 (8.7%)	
	Higher Secondary	12 (66.7%)	5 (27.8%)	1 (5.6%)	
Socioeconomic status	Poor	45 (47.4%)	37 (38.9%)	13 (13.7%)	0.188
	Satisfactory	26 (60.5%)	15 (34.9%)	2 (4.7%)	
Parturient status	Antepartum	55 (59.8%)	35 (38%)	2 (2.2%)	0.0005*
	Postpartum	16 (34.8%)	17 (37%)	13 (28.3%)	
Comorbid	PIH	54 (81.8%)	7 (10.6%)	5 (7.6%)	0.0005*
PIH: Pregnancy-induced hypertension					

Table 4 Comparison of outcome among demographic variables, parity, comorbid and parturient status

Variables		Outcome		p-value
		Expired	Discharged	
		n (%)	n (%)	
Age (Years)	≤30	19 (16.8%)	94 (83.2%)	0.552
	>30	3 (12%)	22 (88%)	
Gestational Age (Weeks)	≤37	20 (16.9%)	98 (83.1%)	0.432
	>37	2 (10%)	18 (90%)	
Parity	<2	7 (14.3%)	42 (85.7%)	0.693
	≥2	15 (16.9%)	74 (83.1%)	
PIH	Yes	4 (6.1%)	62 (93.9%)	0.002
	No	18 (25%)	54 (75%)	
Parturient status	Antepartum	11 (12%)	81 (88%)	0.070
	Postpartum	11 (23.9%)	35 (76.1%)	
Booking status	Un-booked	15 (23.1%)	50 (76.9%)	0.031*
	Booked	7 (9.6%)	66 (90.4%)	

Table 5 Association between the factors leading to ICU admission and mortality after controlling the confounders

Factors	Sig.	OR	95% CI for odd ratio	
			Lower	Upper
Leading factors of ICU Adm.				
Obstetric haemorrhage	0.003	38.99	3.49	435.68
Sepsis	0.002	71.09	4.78	1055.87
Hypertensive Disorder		Ref		
Age (Years)				
≤30	0.967	Ref 1.035	0.20	5.35
>30				
Gestational Age				
≤37	0.842	Ref 1.201	0.19	7.25
>37				

Factors	Sig.	OR	95% CI for odd ratio	
			Lower	Upper
Parity <2 ≥2	0.184	Ref 0.38	0.09	1.58
Residence Urban Rural	0.68	1.42 Ref	0.27	7.43
Booking Status Un-booked Booked	0.16	2.70 Ref	0.65	11.13
Education				
Illiterate	.693	.554	.030	10.388
Primary	.329	.239	.014	4.224
Secondary	.473	.395	.031	5.004
Higher Secondary	0.63	Ref		
SES Poor Satisfactory	0.52	1.97 Ref	0.24	15.92
PIH (Yes)	0.897	.903	.193	4.219
Parturient Status Antepartum Postpartum	0.47	1.67 Ref	0.41	6.77

DISCUSSION

In the literature, there have been varying reports of maternal age in the obstetric ICU population. In our research, patients had an average age of 26.68 ± 5.67 years and a mean gestational age of 34.01 ± 5.27 weeks. In contrast Bhadade et al who found that advanced maternal age did not increase the probability of maternal mortality in the current study cohort³. The study group's mean age, with 23% in advanced maternal age (35 years or beyond), was consistent with prior investigations^{2, 4, 5}. Most of our study participants were primiparous (69.2%). Gombar et al. (54.3%) and Dasgupta et al. (58.3%) reported similar findings^{6, 7}. Sodhi and colleagues found that the average age of patients was 29.27 ± 5.910 years, while discharge patients were 28.95 ± 5.34 years old².

PIH was the commonest comorbid of the patients that was observed in 47.8% of cases in this study. Approximately 66.67% were admitted with antepartum and 33.33% postpartum. In the present analysis, hypertensive disorders followed by obstetric hemorrhage were the most common causes of ICU transfer, as in prior national and international studies^{2, 3-6, 8}. In the studies, the incidence of sepsis attributable to obstetric or non-

obstetric causes increased by 12.5%, 27.15%, 13.17%, and 11.4% respectively^{4, 6, 7, 9}. In our study hypertensive disorder was the commonest factor (51.45%) leading to ICU admission followed by obstetric hemorrhage (37.86%) and sepsis was observed in 10.87%. Similar reasons for ICU admission were noticed in Australia, India, and Turkey¹⁰⁻¹². In America, pregnancy-related hypertension disorders, sepsis, and bleeding were the most frequently reported diagnoses upon admission¹³. The range of mean mortality was 0.2% to 9.7%¹³. In a Canadian nationwide study, postpartum hemorrhage and sepsis were repeatedly seen as the reason for maternal morbidity events¹⁴.

Between high-income countries and low and middle-income countries, there were significant differences in the rate of maternal mortality. Maternal mortality varied from low or absent in the former^{4, 15} to as high as 41.67% in the latter¹⁶. In the present study, 15.94% of women expired while 81.06% were discharged from the surgical ICU. The mortality rate was significantly high in those women whose causes were obstetric hemorrhage and sepsis. The Sailaja and Renuka study population had a mortality rate of 9.9%¹. The mortality rate of 27% was found in research conducted in Addis Ababa¹⁷. In a Canadian nationwide study, postpartum

hemorrhage and sepsis were repeatedly seen as the reason for maternal morbidity events¹⁴.

One of the key prognostic variables is age. Although age has been linked to mortality in many studies, we could not uncover any correlation between age and death. In Africa, women with age ≥ 35 years had a mortality rate four times higher than those who were < 35 years of age¹⁷. Similar results were observed in an Indonesian study¹⁸. While age over thirty has been linked to death in most research, the mean age of both patients who died and were discharged from our study was not high.

The key strength of our research was that there are a handful of studies done in Pakistan to understand the reason behind the leading factors of ICU admission and its outcomes for obstetric patients. There is a definitive weakness in terms of the study design and small sample size but this research is still a valuable asset for future trainees and doctors. It is challenging to handle severely ill obstetric patients which need an in-depth understanding of the pathology as well as the physiological changes associated with pregnancy.

CONCLUSION

This study provides awareness regarding the attributes of obstetric patients seeking intensive care admission. The crippled health system of Pakistan along with the delays in reaching the health care facility and initiation of services required by the patient is a big contributory factor to maternal mortality. Hypertensive disorder of pregnancy was the commonest factor followed by

obstetric hemorrhage and sepsis for intensive care admission found in this study. However, the diversity of health systems in public and private health sectors and different parts of nations facilitates the need for further studies in this area.

List of abbreviations:

ICU - Intensive Care Unit

PIH - Pregnancy-induced Hypertension

SICU - Surgical ICU

CHK - Civil Hospital Karachi

GDM - Gestational Diabetes Mellitus

Authors contribution:

- The corresponding author is the main author of this paper, from idea to implementation, from data collection to writing the manuscript.
- And the second and third author was my companion in data collecting and writing the research.
- The last author was my supervisor overall in this research from editing to approval of final draft.

Competing interest

There are no competing interests for any author.

Funding

Not Applicable, N/A

Research ethics approval

Proposal comes under exemption category IRB-DUHS, Ref: IRB-1756/DUHS/Approval/2020/277

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