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Critical Care in Obstetrics: A One Year Prospective Study In A Tertiary Care Hospital

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Abstract:

Background and Objectives: *Maternal and fetal morbidity and mortality was largely preventable in a vast number of obstetric emergencies. In our study analysis of critically ill obstetric patients admitted in ICU was done in order to characterize the cause of admission, intervention required and observed the maternal and fetal outcome. Utilization of APACHE II score to predict maternal mortality was also assessed.*

Methods: *This is a prospective study conducted in Rajiv Gandhi Medical Sciences (RIMS), Kadapa during the period April 2015-March 2016. A total of 75 obstetric emergencies admitted in ICU (intensive care unit) was enrolled in this study based upon the inclusion and exclusion criteria.*

Results*: In our study the mean age of admission was 22.9 ± 3.46 and mean gestational age was 36.05 weeks. We found more patients with obstetric complications (77.33 %) than medical complications (22.67 %). Mean duration of ICU stay was 1.09 ±0.99 days. The mean APACHE II score was 12.24 among survivors and 21.26 among the non survivors. The mean GCS score was 13.19 among survivors and 11.89 among non survivors.*

Conclusion: *Full adoption of safe motherhood initiative would prevent some of the complications requiring treatment in the ICU. Early recognition, prompt referral, simple interventions, close monitoring and symptomatic treatment are adequate to reduce mortality. Preparation for emergencies and organization of resources, may reduce the threat to maternal health. The full scope of ICU resources should be immediately available to the obstetric patients when the need arises.*

Keywords: *Obstetric emergencies , Booked cases, Intensive care unit, Critical care.*

I. Introduction

Critically ill Obstetric patients represent an interesting group with unique characteristics, whose management poses a challenge by the presence of fetus, an altered maternal physiology and disease specific to pregnancy[1-3]. Pregnant patients account for a small number of ICU admissions in developed countries (<2%) but they can reach up to 10% or more in developing countries[4,5]. Each year throughout the world approximately eight million women are suffering from pregnancy related complications and over half a million will die. In some developing countries one in 11 pregnant women may die of pregnancy related complications compared to one in 5000-10000 in some developed countries[6].

By 2010 AD MMR is 210/1,00,000 live births and perinatal mortality is 50/1000 live births. As per Millenium Developmental Goal , target of MMR by 2015 is 109[7]. 60% of one billion population of India live in villages and unfortunately the scenario of health care provision to this rural sector leaves large deficiencies.75% of maternal deaths are direct obstetric deaths due to obstetric complications such as haemorrhage , hypertension, sepsis and unsafe abortion[8].

1.1 Identifying mothers requiring ICU care:

There are several scoring systems for identifying a critically ill patient and predicting maternal outcome.

The various scoring systems used are:

APACHE II Score : Acute physiology and chronic health evaluation score
SOFA Score : Sequential Organ Functional Assessment Score.
MOEWS : Modified Obstetric Early Warning Score
SAPS : Simplified Acute Physiology Score
MPM : Mortality Prediction Model.

The limitations of these scoring systems is that they over predict the mortality due to their inability to take into account for the physiological changes that occur in pregnancy.

APACHE II Score

APACHE II Score = Acute Physiology Score + Age Points + Chronic Health Points									
	+4	**+3**	**+2**	**+1**	**0**	**+1**	**+2**	**+3**	**+4**
Rectaltemperature (°C)	≥41	39-40.9		38-38.9	36-38.4	34-35.9	32-33.9	30-31.9	<29.9
MAP(mmHg)	>160	130-159	110-129		70-109		50-69		<49
HR(beats/min)	>180	140-179	110-139		70-109		55-69	40-54	<39
RR(beats/min)	>50	35-49		25-34	12-24	10-11	6-9		<5
O_2delivery(mL/min)	>500	350-499	200-349		<200				
PO_2(mmHg)					>70	61-70		55-60	<55
pH	>7.7	7.6-7.69		7.5-7.59	7.3-7.49		7.25-7.3	7.15-7.2	<7.15
Na	>180	160-179	155-159	150-154	130-149		120-129	111-119	<110
K	>7	6-6.9		5.5-5.9	3.5-5.4	3-3.4	2.5-2.9		<2.5
Cr	>3.5	2-3.4	1.5-1.9		0.6-1.4		<0.6		
Hct	>60		50-59.9	46-49.9	30-45.9		20-29.9		<20
WBCcount	>40		20-39.9	15-19.9	3-14.9		1-2.9		<1

Age	**Points**
<44	0
45-54	2
55-64	3
65-74	5
>75	6

History of Severe Organ Insufficiency	**Points**
Nonoperative patients	5
Emergency postoperative patients	5
Electivepostoperative patients	2

1.2 Purpose of the study:

Pregnancy possesses unique consideration for critical care and it is very important that obstetricians and other members of the healthcare team have a working knowledge of these factors. Although patients receiving obstetric care are young and healthy in general, there is a high potential for catastrophic complications related to the pregnancy and the delivery. Obstetrical care has not been able to achieve the same level of peaks in developing countries as in western nations. Numerous factors like clinical, economical have played a major role in widening the gap of quality care delivery in severely ill obstetric patients between the two extreme worlds. The gap can be attributed to lower literacy rates, paucity of research in obstetrical critical care, poverty, lack of awareness and socio-cultural and behavioral factors prevalent in developing nations.

Based on this a one year prospective study of critically ill obstetric patients was done to analyze the causes, clinical course, challenges and obstacles in the treatment which determine the maternal and fetal outcome. Thereby providing a room for improvement and better delivery of critical care obstetrical services.

II. Materials and methods:

A. Source of data:

Obstetric Patients admitted to Intensive care unit of Rims medical college & hospital, Kadapa during April 2015 – March 2016 were enrolled in the study.

B. Inclusion criteria:

All obstetric cases admitted to I.C.U during pregnancy and 6 weeks postpartum are included in the study.

C. Exclusion criteria:

All cases admitted beyond 6 weeks postpartum with any medical or surgical complications are excluded.

D. Method :

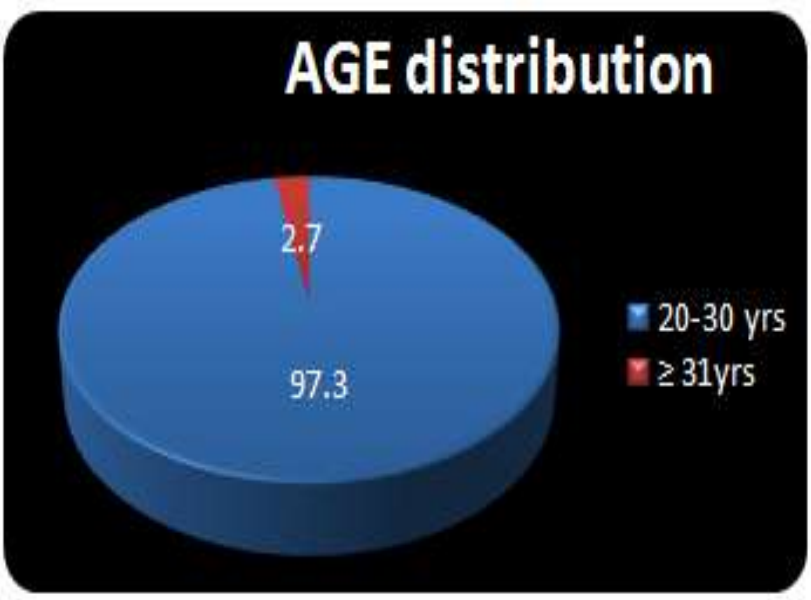
This is a prospective observational study of antepartum and postpartum women who were admitted to ICU. In our institute we have three beds for obstetric patients in an MICU (Medical Intensive Care Unit) which has critical care team consisted of anaesthesiologist, physician, surgeon, obstetrician and paediatrician and their residents and the nursing staff. The major equipment included L and T multi parameter monitors, ECG, NIBP , heart rate, oxygen saturation(SPO_2), respiratory rate, temperature, microprocessor controlled ventilator with weaning modes, defibrillator, suction machine and ECG machine. The patient who required intensive care was assessed by APACHE II score. The general and specific investigations according to the patient's condition was analyzed and course of the disease in hospital, course of treatment and intervention required, mode of delivery, maternal and fetal outcome were also studied and analyzed.

III. Results

In our study, a total of 6536 deliveries took place in Rims medical college & hospital, Kadapa, a tertiary care center during the period of April 2015 to March 2016. Out of these 75 critically ill obstetric cases were shifted to ICU. The incidence of ICU admission is 0.9% during the study period.

Table 1 : Critical care in obstetrics

Age In Years	No.Of Patients	Percentage	Mean ± S.D
20-30 Yrs	73	97.3 %	22.9±3.46
≥ 31yrs	2	2.7 %	

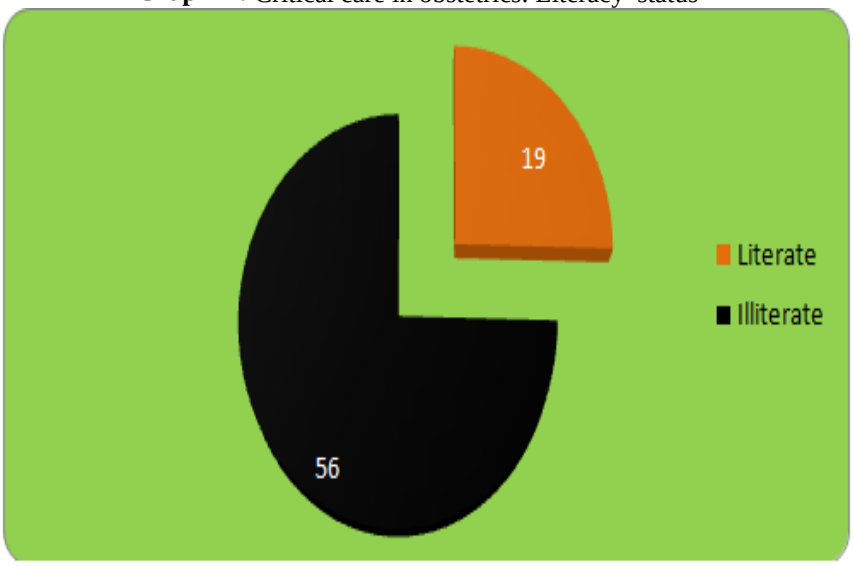


Graph 1 : Critical care in – Age distribution obstetrics –

Age distribution:

97.3 %of the patients belong to the age group between 20-30 years. Mean age of the patients admitted to the ICU is 22.9±3.46 years (as shown in the Table1).

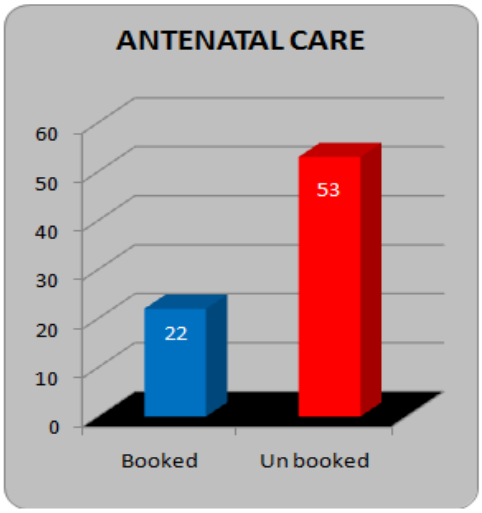
Graph 2 : Critical care in obstetrics: Literacy status



7 4 . 6 7 % patients were illiterate and the rest were literate as shown in (Graph2)

ANTENATAL CARE	NO.OF CASES	PERCENTAGE
UNBOOKED	53	70.67
BOOKED	22	29.33
TOTAL	75	100

Table 3: Critical care in obstetrics: Antenatal care

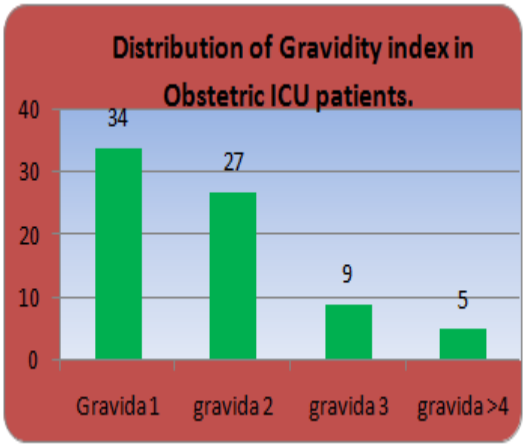


Graph 3: Critical care in obstetrics: Antenatal care

Among the total admissions 53 cases (70.67%) had no antenatal visits, (29.33 %) cases had antenatal care and none of the patients had regular antenatal care (table 3).

GRAVIDA	NUMBER	PERCENTAGE
1	34	45.3
2	27	36.0
3	9	12.0
≥4	5	6.7
total	75	100

Table 4: Critical Care In Obstetrics: Parity



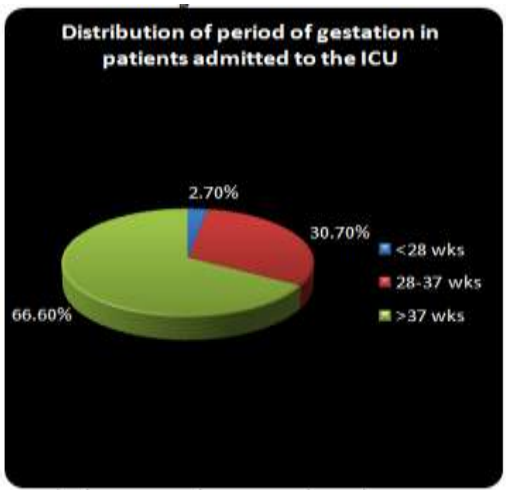
Graph 4: Critical Care In Obstetrics: Parity

Primi gravidae constituted 45.3% of the admissions when compared to multipara 54.7%. Majority of them were multipara.(table 4, graph 4).

TABLE 5: Critical care in obstetrics: Period of gestation

POG	FREQUENCY	PERCENT	MEAN & S.D
<28wks	*2	2.7	36.05 ± 4.565
28-37wks	23	30.7	
>37 wks	50	66.6	
Total	75	100	

*Molar pregnancy – 1; Septic abortion –1



Graph5 : Critical Care In Obstetrics: Period Of Gestation

Majority of the admissions were at term gestation(66.6 %) when compared to preterm (30.7%). Mean gestational age is 36.05 ± 4.565 weeks.(table 5)

ANTECEDENT CAUSE	NO. OF CASES	PERCENTAGE
OBSTETRIC CAUSES	58	77.33
NON - OBSTETRIC CAUSES	17	22.67
TOTAL	75	100

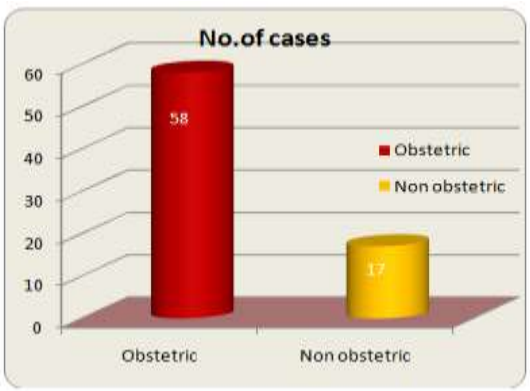


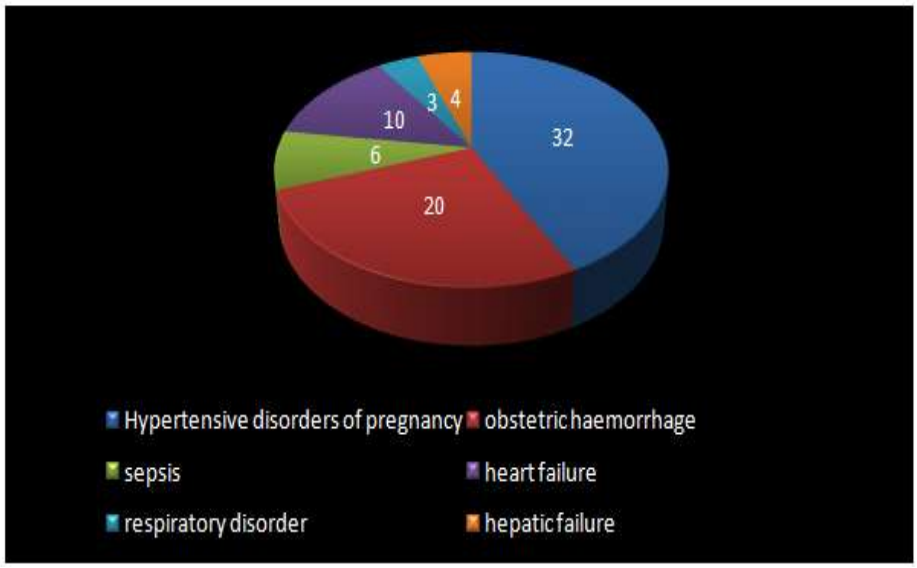
TABLE 6: Critical care in obstetrics: Antecedent causes

Graph 6: Antecedent causes

The antecedent causes for admission to ICU are grouped into two - Obstetric and non obstetric causes. The Obstetric causes accounted for 77.3% of the admissions in ICU and non obstetric causes was 22.67%. Obstetric causes seen due to hypertensive disorder (preeclampsia with hypertensive crisis, eclampsia, HELLP syndrome), Obstetric hemorrhage and sepsis. The non obstetric causes were due to anemia and heart disease complicating pregnancies, hepatic failure , respiratory failure.(table 6, graph 6).

Table 7 : Critical care in obstetrics: Analysis of Antecedent causes

Antecedent Cause		**Diagnosis**	**Frequency**	**Total**	**Percentage**
Obstetric Causes	Hypertensivedisorders Of Pregnancy	Severe Preeclampsia With Hypertensive Crisis	9	32	42.67 %
		Eclampsia	20		
		Hellp	3		
	Obstetric Haemorrhage	Antepartum Haemorrhage	9	20	26.67 %
		Postpartum Haemorrhage	11		
	Sepsis	Sepsis	6	6	8 %
Medical Causes	Heart Failure	Anaemia	5	10	13.33 %
		Rhd	3		
		Cardiomyo -Pathy	2		
	Respiratory Disorder	Pulmonary Embolism	2	3	4 %
		Ards	1		
	Hepatic Disorder	Jaundice	3	4	5.33 %
		Cirrhosis	1		



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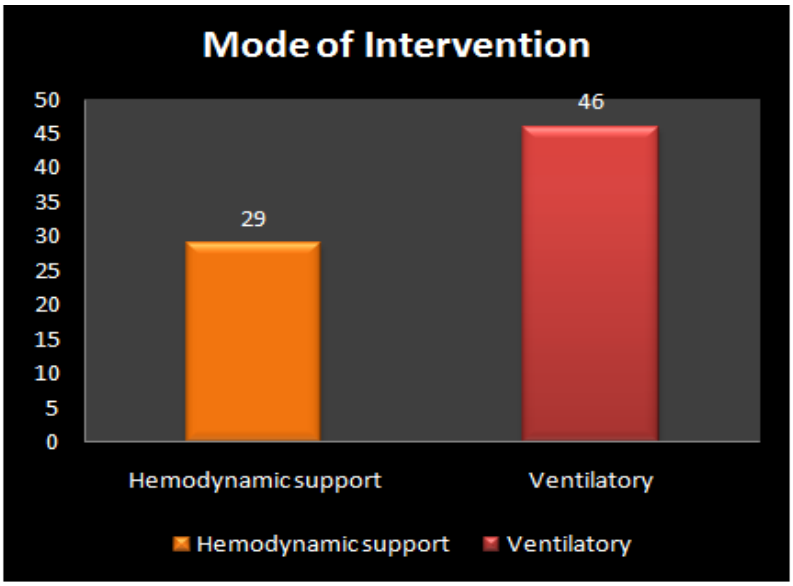
Graph 7 : Analysis of Antecedent causes

Of the 75 patients admitted to ICU, Hypertensive disorder of pregnancy was the major obstetric cause (42.67%) followed by Obstetric haemorrhage (26.67%) and sepsis (8%). Among the non obstetric causes, Heart failure cases accounted for maximum admissions followed by respiratory and hepatic failure cases.

Table 8 : Critical Care In Obstetrics: Mode Of Intervention

Mode Of Intervention		**Frequency**	**Total**
Haemodynamic Support	Haemodynamic Support	29	29
Ventilatory Support	Ventilator	13	46
	Ventilator & Inotrope	22	
	Both	11	
Dialysis	Dialysis*	4	4
Surgical	Surgical*	2	2

Graph 8: Critical care in obstetrics:
Mode of Intervention:



* along with ventilator and haemodynamic support

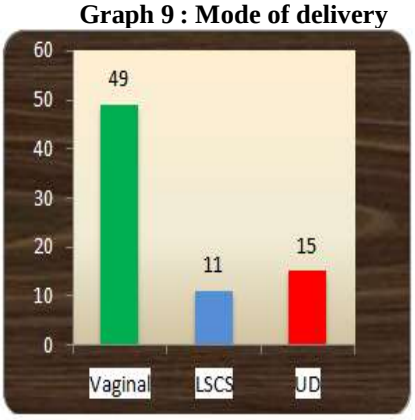
Among 75 cases, 29 patients required hemodynamic support while 46 required ventilator

support. Majority of them required ventilator support. All the three were employed in 11 cases. Dialysis(4) and surgical(2) interventions were done in conjunction with hemodynamic and ventilator support (table 8).

Table 9 : Critical care in obstetrics:

MODE OF DELIVERY	FREQUENCY	PERCENT
Vaginal	49	65.3
LSCS	11	14.6
Un Delivered	15	20.1
Total	75	100

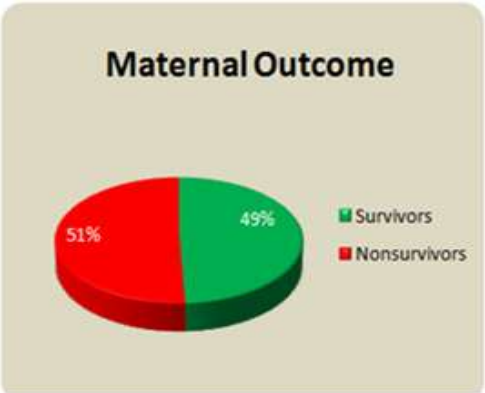
Graph 9 : Mode of delivery



Among the 75 cases 60 cases delivered. Majority of them delivered vaginally (65.3 %) and the rest (14.6 %) delivered by caesarean section. The indications of LSCS were Severe Pre eclampsia (3), CPD (5), malposition (2), eclampsia(1).15 cases admitted in ICU were undelivered (20.1%) and all of them were non survivors (table 9, graph 9).

OUTCOME	FREQUENCY	PERCENTAGE
Survivors	37	49.3 %
Non Survivors	38	50.7 %
Total	75	100 %

Table 10 :Critical care in obstetrics: Maternal Outcome

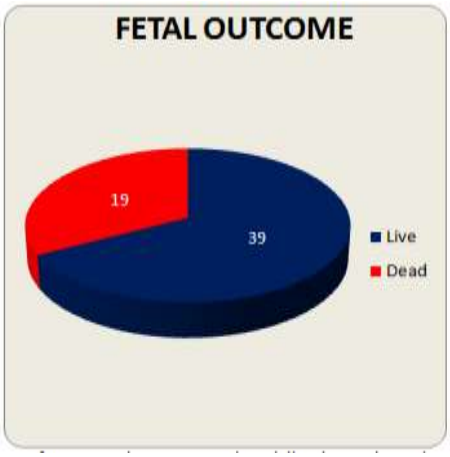


GRAPH 10: Critical care in obstetrics: Maternal Outcome

Among the total patients 49.3 % had survived (as shown in table 10, graph 10).

Table 11 : Critical care in obstetrics: Fetal outcome

Fetal Outcome	Frequency	Percentage
Live	39	67.3 %
Dead	19	32.7 %
Total	58	100 %

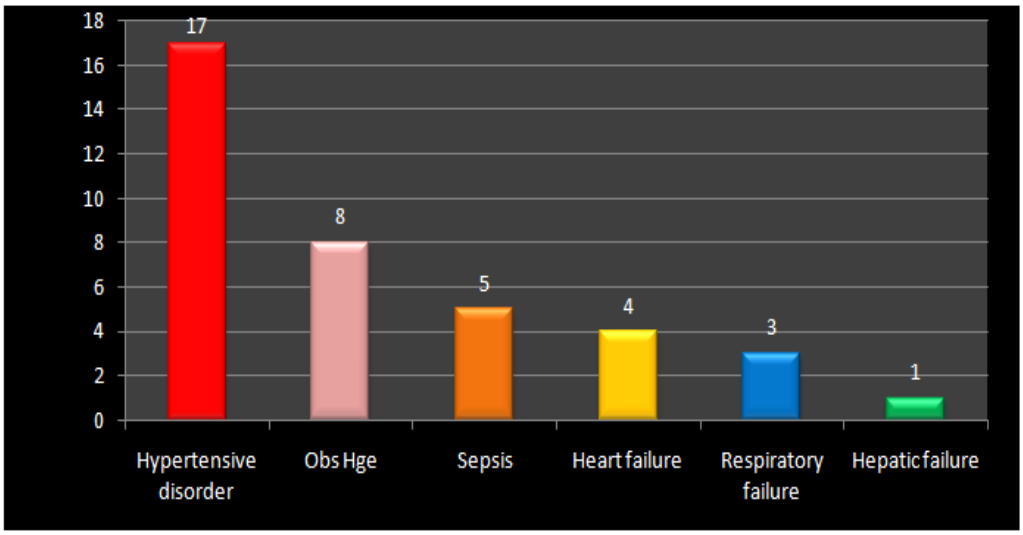


Graph 11 Critical care in obstetrics: Fetal outcome

Out of 75 cases there were total 58 deliveries as shown in table11 and graph 11.

Table 12 : Critical Care In Obstetrics: Maternal Mortality Analysis

ANTECEDENT CAUSE		Death	Total	Percentage	% of obstetric causes
HYPERTENSIVE DISORDERS OF PREGNANCY (n=32)	Eclampsia	9	17	53.13 %	56.67 %
	Severe PreEclampsia With hypertensive crisis	6			
	HELLP	2			
OBSTETRIC HEMORRHAGE (n=20)	Antepartum hemorrhage	4	8	40 %	26.66 %
	Post Partum hemorrhage	4			
SEPSIS (n=6)	Sepsis	5	5	83.33 %	16.67 %
			30		% of non obstetric causes
HEART FAILURE (n=10)	Anaemia	2	4	40 %	50 %
	RHD	0			
	Cardiomyopathy	2			
RESPIRATORY DISORDER (n=3)	Pulmonary Embolism	2	3	100 %	37.5 %
	ARDS	1			
HEPATIC DISORDER (n=4)	Jaundice	1	1	25 %	12.5 %
	Cirrhosis	0			

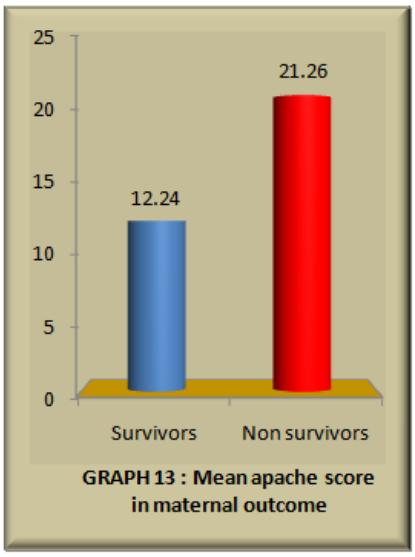


Graph 12 : Critical care in obstetrics: MaternalMortality Analysis

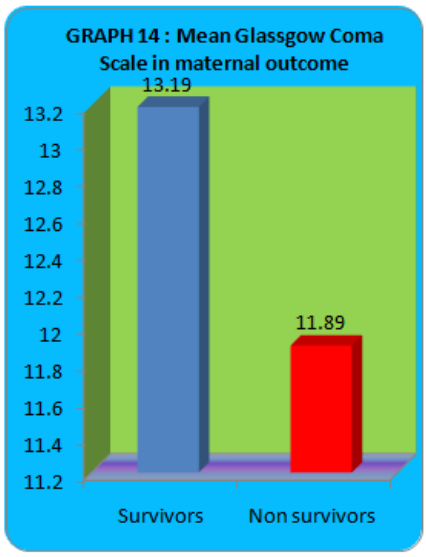
In the obstetric cases, majority of deaths occurred due to hypertensive disorders of pregnancy (n=17) followed by obstetric hemorrhage(8) and sepsis(5). The mortality seen in hypertensive disorders was (53.3 %), obstetric hemorrhage(40%). The mortality was more in hypertensive disorder of pregnancy(56.67%) when compared to hemorrhage(26.66%) and sepsis(16.67%) among deaths due to obstetric causes. Among the non obstetric causes the respiratory disorders had cent percent mortality. 40% of deaths occurred due to heart failure (table 12, graph 12).

Table 13: Critical care in obstetrics: Mean APACHE and GCS score

		Mean ± S.D	Min	Max	'CHI' Square	'P' Value
APACHE SCORE	SURVIVORS	12.24 ± 5.01	4	14	6.61	<0.0001
	NON	21.26 ± 6.66	6	30		
GCS	Survivors	13.19 ± 2.504	8	15	2.038	0.0451
	Non Survivors	11.89 ± 2.994	5	15		



GRAPH 13 : Mean apache score in maternal outcome



The P value was less than 0.05 and hence it was statistically significant. Thus we indicate that the both scoring systems are good in predicting maternal outcome.

IV. Discussion

Clinical recognition of unique needs of the critically ill obstetric patients have received much attention in an attempt to assess the need for dedicated critical care facilities. Most obstetric patients recover rapidly following correction of the acute insult. Scarpinato et al[9] in 1998 observed that the knowledge of obstetrical critical care is lacking, and there should be systematic reporting of obstetrical critical care data. Monitoring obstetric Intensive Care Unit admissions would enable us to know about serious maternal morbidity and will help us to evaluate anesthetic obstetrical practice.

Incidence*:*

During this one year prospective study period, amongst 6536 deliveries, 75 patients were admitted to the obstetric intensive care unit.
The incidence is 0.92%.

Table 14 : Comparative studies of incidence :

S.No:	Study	Incidence %
1	Gupta et al[10]	0.14
2	Mahutte et al[11]	0.3
3	Bhatt et al[12]	0.39
4	Togan et al[13]	1
5	Present study	0.92

In the present study the incidence is higher than Gupta et al and Bhatt et al and correlates well with Togan et al.

Age:

Among the total 75 cases admitted to ICU, 97.3 % belongs to age group between 20-30 yrs and the mean age incidence is 22.9±3.46 years.

Table 15 : Comparative Studies Of Maternal Age

S.No:	Study	Maternal Age
1	Suleiman et al[14]	29.6
2	Bhatt et al[12]	28±5.7
3	Karnad et al[15]	25.5±4.6
4	GuptaSetal[10]	25.21±4.075
5	Present study	22.9±3.46

The present study correlates Gupta et al and Karnad et al study where the rest of the studies reported higher age.

Literacy:

A total of 19 patients were literate (25.3%) and the rest were illiterate. Only Gupta S et al study mentioned about literacy status which is little higher.

Table 16: Comparative Study Of Literacy

S.No:	Study	Literacy in %
1	Gupta et al[10]	45.8
2	Present study	25.3

Booking of the antenatal cases:

In this study unbooked cases comprised 70.7% and booked cases 29.3% of the total admissions and our study correlates well with Karnad et al study .

Table 17: Comparative studies of antenatal care :

S.No:	Study	Booking
1	Gupta et al[10]	79.16%
2	Suleiman et al[14]	60.9%
3	Karnad et al[15]	30 %
4	Present study	29.3%

Due to regular antenatal checkups the booked cases would be sensitized to various complications associated with the obstetric or non obstetric disorders that they develop. As a result we were able to identify such complications, and report earlier in the hospital in comparison to unbooked cases who are quite frequently admitted when the condition is quite severe.

Parity:

Primi gravidae constituted about 45.3% of the admissions and multipara constituted 54.7%. As the parity increases the complications are more common. But the complications are unpredictable and can occur in any parity.

Table 18 :Comparative study of Parity :

S.No:	Study	Primigravidae	Multiparae
1	Suleiman et al[14]	26.6%	40.6%
2	Present	45.3%	54.7%

In both studies multipara are more common.

Period of gestation:

Obstetric patients are usually young but gestational age of critically ill parturient show a variance in different studies.

Table 19 : Comparative studies of mean gestational age :

S.No:	Study	Gestational age in wks
1	DaneilaNVasquez et al[16]	29 ± 9
2	Karnad et al[15]	31
3	Suleiman et al[14]	34
4	Togal et al[13]	35 ± 1
5	Gupta et al[10]	36.04 ± 3.82
6	Present study	36.05 ± 4.565

It was observed that 66.6% of the antenatal women admitted to the ICU were $\geq$ 37 weeks period of gestation. Present study compared well with Gupta et al and Togal et al and is closer to Suleiman et al. Rest of the studies reported lesser gestational age of $\leq$ 31 weeks.

Antepartum Vs. Postpartum admissions:

Most of the authors have reported a high incidence of postpartum admissions in the obstetric ICU 100%[17,18], 91%[1], 78%[11], 66%, our study shows 56% were postpartum and 44% of the admissions were ante partum. Almost equal distribution among ante partum and postpartum was observed and is closer to the study of Daneila et al.

Table 20: Comparative studies of admissions :

S.No:	Study	Admissions
1	Suleiman et al[14]	84.4%
2	Gupta et al[10]	83.3%
3	Mahutte et al[11]	78 %
4	Bhatt et al[12]	70.8%
5	Daneila N Vasquez et al[16]	63 %
6	Present study	56 %

Antecedent Cause Admitted to the Intensive Care Unit:

Among 75 cases, 77.33 % (58) of the women admitted to the ICU because of obstetric disorders and the remaining 22.67% (17) due to medical reasons. This study is compared with other studies.

Table 21 :Comparative studies of antecedent causes :

S.No:	Study	% of obstetric admissions	% of medical admissions
1	Gupta et al[10]	91.66	8.34
2	Mahutte et al[11]	62	38
3	Bhatt et al[12]	62	38
4	Karnad et al[15]	69	31
5	Present study	77.33	22.67

Gupta et al reported higher incidence of obstetric admissions and lesser incidence noted in Mahutte and Bhatt et al studies.

Table 22 : Comparative studies of Common obstetric admission :

S.no	Study	Common cause	Percentage
1	Suleiman et al[14]	Obstetric Haemorrhage	32.8
2	Gupta et al[10]	Obstetric Haemorrhage	62.5
3	Daneila N Vasquez et al[16]	Hypertensive disorder of pregnancy	40
4	JoseOlarraetal	Hypertensive disorder of pregnancy	50.4
5	Present study	Hypertensive disorder of pregnancy	42.67

In the present study we found that hypertensive disorders in 42.67 % patients and is similar to the study conducted by Daneila N Vasquezet al. Among the medical disorders, anemia, rheumatic heart disease, jaundice, pulmonary embolism, were important diagnoses.

Mode of Intervention:

The need for mechanical ventilation remains the major indication for antenatal or postnatal ICU transfer. In our study 61.33 %o f the cases required ventilator support. The most common indications for Ventilator support were hemodynamic failure and acute respiratory failure. It was noted that among the total admissions, 61.33% of the patients required ventilator support and 38.67 % required hemodynamic support.

The percentage of the patients who required ventilation was relatively high in comparison to the studies reported 35 % by Olarra and less than 45% described by Afeesa et al and is similar to study of Tripathi et al 64 %.

Table 23: Comparative studies of mode of intervention :

Sno	Study	Ventilatory support
1	Afeesa et al[19]	45 %
2	Cohen et al[22]	41 %
3	Olarra et al[26]	35 %
4	SeloOjeme et al[23]	19 %
5	Tripathi et al[24]	64 %
6	Present study	61.33 %

Maternal And Fetal Mortality:

The observed rate of maternal mortality is 50.7% and neonatal mortality is 32.7%.
The mortality rates in various studies are

Table 24 : Comparative studies of maternal mortality :

S.no:	Study	Maternal mortality%
1	Daneila N Vasquez et al[16]	11
2	Togan et al[13]	12
3	Karnad et al[15]	21.6
4	Okafor V et al[30]	28
5	Bhatt et al[12]	33.8
6	Present study	50.7

Duration of ICU stay:

The mean duration of ICU in this study is 1.09 ± 0.998 days.

Table 25: Comparative studies of duration of ICU stay :

S.No:	Study	ICU stay in days
1	Karnad et al[15]	4
2	Jose Orsini et al	3.5
3	Gupta et al[10]	1.64±1.4
4	Crozier et al	1.45
5	Present study	1.09±0.998

The Present study correlates with the Gupta et al study.

I. The APACHE II scoring system:

The APACHE II scoring system has been known for the past two decades to predict adverse outcomes based on data available in the first 24hours. The mean APACHE II score in this study in survivors is 12.24 and 21.26 in nonsurvivors. However the median APACHE II score in the study done by D. R Karnad et al was found to be16 with a predicted mortality rate of 26.7%. The APACHE II scores in most other studies ranged from12-14. The observed mortality rate was much higher than the predicted mortality rate in the study. This can be explained by two factors. One is that the patients are referred in adverse conditions. Secondly the scoring system is based on ICUs in the western world, where the facilities are more.

V. Conclusion

Obstetric unit will have to deal with predictable complications at unpredictable times.

To bring the quality of critical care in obstetric patients at par with developed nations, a coordinated multi disciplinary approach is needed at various levels, so as to render optimal critical care delivery to the obstetric population and thus saving precious lives. The health infrastructure has to be strengthened at the gross root levels to ensure an early admission of critically ill obstetric patients to ICU. Whatever the level of critical care an obstetric patient needs, the underlying fact is that simple interventions, close monitoring and symptomatic treatment is necessary to reduce mortality. Lack of education and poor antenatal care have been found to have a considerable effect in obstetrical complications and outcome.

We conclude that hypertensive disorders in pregnancy and associated complications was the leading cause of admission in the intensive care unit followed by obstetric hemorrhage and sepsis. The judicious use of ventilator, hemodynamic and dialysis support have been indispensable in saving lives of critically ill obstetric patients. The observed mortality rate was higher than the predicted mortality rate in our study. By using APACHE II score were found to under-predict the mortality highlighting the importance of a continued search for better scoring system in critically ill obstetric patient. Transportation of critically ill obstetric patient to ICU is responsible clinical task. The full scope of ICU resources should be immediately available to the obstetric patients when the need arises.

References

[1]. LapinskySE ,Kruezynski K AS. Critical CareinThe Pregnant Patient. Am J Respir CritCareMedicine1995;152;427- 455.
[2]. RizkNW,KalassianK,CilliganT,etal.Obstetric complications in pulmonary and critical care medicine,chest1996;110:791 – 809.
[3]. Soubra SH, Guntupalli KK. Critical illness in pregnancy: An overview. Crit Care Med. 2005;33(10 Suppl):248–55. [PubMed: 16215344]

[4]. Karnad DR, Guntupalli KK. Critical illness and pregnancy: Review of a global problem.(vii).CritCareClin. 2004;20:555–76. [PubMed: 15388189]
[5]. Gatt S. Pregnancy, delivery and the intensive care unit: need, outcome and management. CurrOpinAnaesthesiol 2003;16:263-7.
[6]. WHO. Maternal mortality in 1995, estimates developed by WHO, unicef and UNFPA 2001; 56.
[7]. Maternal & Child Mortality and Total Fertility Rates Sample Registration System (SRS) Office of Registrar General, India7th July 2011.
[8]. Neeru Gupta. Maternal mortality : magnitude, causes and concerns. J of Obst& Gynae 2004; 1X: 9, 555-558.
[9]. Scarpinato L: Obstetric critical care. Crit Care Med 1998; 26: 433
[10]. Gupta s, Naithani U, Doshi V, Bhargava VS. Obstetric critical care: prospective study of clinical characteristics, predictibility, and fetomaternal outcome in a new dedicated obstetric intensive care unit. Indian Janaesth2011;55:146-53.
[11]. MahutteNG,MurphyK.L,LeQ,SolomonJ,BenjaminA,BoydME.Obs admission to the ICU. Obstetgynecol 1999 aug;94(2):263-66.
[12]. PoornimaB.Ramachandra Bhat et al: Evaluation of Obstetric admissions to ICU of a tertiary referral center in coastal india. Indian J Crit Care Med.2013 Jan- Feb:17(1):34-37.
[13]. TurkanTogal,NeslihanYucel,etal Obstetric admissions to ICU in a tertiary referral hospital J of Critical care (2010)25,628 – 633.
[14]. Al-Suleiman SA, Qutub HO, Rahman J, Rahman MS. Obstetric admissions to the intensive care unit: a 12-year review. Arch Gynecol Obstet. 2006;274(1):4–8.
[15]. KarnadDR,LapsiaV,KrishnanV,SalviVS.Prognosticfactorsinobstetric patients admitted to an Indian intensive care unit. Critic care med 2004;32(6):1294-1299.
[16]. Vasquez DN, Estenssoro E, Canales HS, et al. Clinical characteristics and outcomes of obstetric patients requiring ICU admission. Chest 2007;131:718-24.
[17]. OsanaikeB, Amanor-BoaduS, SanusiA. obstetric intensive care : Adevelopingcountry experience. Internet J Anesthesiol 2006.Vol 10.
[18]. OkaforUV,EfetieER.Criticalcareobstetricsinadevelopingcountry.J Turkish-German gynecolAssoc 2008;9:9-13
[19]. Mabie WC, Sibai BM. Treatment in an obstetric intensive care unit.Am J ObstetGynecol 1990;162:1-4.
[20]. Afessa B, Green B, Delke I, Koch K. Systemic inflammatory response syndrome, organ failure, and outcome in critically ill obstetric patients treated in an ICU. Chest. 2001;120:1271–7.
[21]. Zeeman GG, Wendel GD, Cunningham FG: A blueprint for obstetric care.Am J ObstetGynecol2003; 188:532–536
[22]. Cohen J, Singer P, Kogan A, et al: Course and outcome of obstetric patients in a general intensive care unit. ActaObstetGynecolScand2000; 79:846–850
[23]. Selo-OjemeDO, Omosaiye M, Battacharjee P, Kadir RA. Risk factors for obstetric admissions to the intensive care unit in a tertiary hospital: a case-control study. Arch Gynecol Obstet. 2005;272(3):207–210.
[24]. Tripathi R, Rathore AM, Saran S. Intensive care for critically ill obstetric patients.
[25]. Zeeman GG, Wendel GD, Cunningham FG: A blueprint for obstetric care.Am J ObstetGynecol2003; 188:532–536
[26]. Kilpatrick SJ, Matthay MA. Obstetric patients requiring critical care: A fiveyear review. Chest 1992; 101:1407-12

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