

Maternal Morbidities and Mortalities: Rates and Indicators at Intensive Care Unit in Woman's Health Hospital

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Abstract:

Background: Maternal mortality & morbidity are key indicators of women's health globally. ICU admission rate represents as indicator of sever maternal morbidity. **The aims** of this study were to assess the hospital based rates of maternal morbidities and mortalities in ICU and to estimate indicators of ICU admission. **Subject and methods:** This study was done in ICU at Woman's Health Hospital, Assiut University. The convenient sample calculated statistically and was 200 women. Three tools were utilized for data collection; Patient socio-demographic data, Indicators for ICU admission and statistical sheet about maternal morbidity and mortality rates for one year. **Results:** This study revealed that ICU admission rate was (6.08%) and maternal mortality rate was (0.18%). The obstetric critically ill women participated in this study were most of them (68%) admitted for obstetric indications, (18.5%) had mixed obstetric with non-obstetric indications and the rest (13.5%) had non-obstetric indications only. **Conclusions:** Obstetric causes particularly hypertensive disorders and obstetric haemorrhages are common causes of ICU admissions and maternal mortality. **Recommendations:** Early diagnosis and proper treatment of high risk obstetric patient to reduce ICU admission rate and maternal mortality.

Keywords: *Morbidities, Mortalities, Obstetric, Maternal & Intensive Care Unit.*

Introduction:

Maternal health defined as the health of women before and during pregnancy, at childbirth and during the postpartum period. (Mulauzi & Daka, 2018) Maternal mortality and morbidity represent key indicators of women's health globally. (USAID, 2019) Maternal mortality has been described as the tip of the iceberg and maternal morbidity as the base. (Kakoty & Das, 2018) For every woman who dies of pregnancy-related complications, 20 or 30 others suffering acute or chronic morbidity. (Greene et al., 2021) (Chikadaya et al., 2018) Also, ICU admission rate may be knowing as an objective indicator of pronounced maternal morbidities. (Yi et al., 2018) **Maternal morbidity** has explained by maternal morbidity group as any health condition attributed to and/or aggravated by pregnancy and child birth that has a negative impact on the well-being of the woman. (Kumari, 2019) Overall reports of maternal morbidity are unbeknown; the causes for this are complex and include a lack of its prioritization in local and international communities, compounded by the difficulties surrounding its definition and measurement. (Lange et al., 2019) But even if we focused only morbidities from the five main direct obstetric causes of maternal death (severe bleeding,

infection preeclampsia, eclampsia and unsafe abortion) about 27 million maternal morbidities were reported to have happened in 2015 based on a systematic review, reflecting "inequities in wealth, rights, and access to care. (WHO, 2017)

Maternal mortality is referred as the "death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. (Resnik et al., 2018) At least 295 000 women died during pregnancy, delivery and puerperium in 2017. 94% of all maternal mortality present in low and lower middle-income countries. (WHO, UNICEF, UNFPA, 2019)

A critically ill obstetric patient is referred to mother who because of abnormal pregnancy, delivery, and puerperium or because of effects of a pre-existing systemic disease, anesthesia or surgery develops life-threatening complications for which intensive monitoring, therapy and/or life support system is required. (Sharma, 2016) ICU admission of obstetric patients in developed countries was reported as less than 2%, but it reach up to higher than 10% in developing countries. (Yi et al., 2018)

Significant of the study:

Maternal mortality is unacceptably high, about 295 000 women died during and following pregnancy and childbirth in 2017. The vast majority of these mortalities (94%) occurred in low-resource settings, and most could have been prevented. (WHO, 2019) In 2017, maternal mortality ratio for Egypt was 37 deaths per 100,000 live births. (Mahmoud & Omar, 2018)

Critically ill obstetric patients have potentially dangerous complications and increase maternal mortality and morbidity. The incidence of critically ill obstetric patients may be various depending on the different underlying diseases and co- morbidities. (Ozelik et al., 2017) Few studies on maternal critically ill have been conducted in the Middle East and North Africa. (Sultan et al., 2017)

Aims of the study:

- To assess the hospital based rate of maternal morbidities and mortalities in Intensive Care Unit (ICU), at Woman's Health Hospital, Assiut University.
- To estimate indicators of ICU admission at Woman's Health Hospital, Assiut University.

Research questions:

1. What is the hospital based rate of maternal morbidities and mortalities in ICU at Woman's Health Hospital?
2. What are obstetrics and non-obstetrics indicators of ICU admission at Woman's Health Hospital?

Patients and Method**Research design:**

Prospective observational study was utilized to fulfill the aims of this study.

Setting:

This study was carried out in Intensive Care Unit through 1 year from 1st of January 2020 to 31th of December 2020. ICU involved three rooms: 2 intensive care rooms (5 beds, 5nurses for each room) and intermediate care room (2 beds, 2nurses) at Woman's Health Hospital in Assiut University which represent the major hospital in Upper Egypt.

The total number of admissions to Woman's Health Hospital at the year 2020 was (14919). The total number of deliveries was (10152). The total number of the ICU admissions was (668). The total obstetric admissions were (617). (599) of them were survived, while maternal deaths in ICU were (18) women.

Sample:

The sample size was calculated using the EPI info 2000 statistical package. The calculation was done using the expected frequency of maternal ICU admission from previous studies using 95% confidence interval, 80% power of the study, 7.3 % prevalence of maternal ICU admission and worst

acceptable result 5%. The sample size calculated according to the above criteria was 190 women. However, 200 women were attempted in this research work to avoid non- response rate.

Inclusion criteria:

- Women who was admitted to the ICU, at Woman's Health Hospital during pregnancy, labor or within postpartum period.
- Admission was at the year of 2020.

Tools of the study

Three tools were used in this study which was developed by the researcher based on reviewing of the relevant literatures.

First Tool: Patient socio-demographic and health relevant data:-

This tool was developed by the researcher after reviewing the relevant literatures. It included the patient's name, age, marital status, residence, level of education, working status, gravidity, parity, previous cesarean delivery, type-place & responsible person of delivery / abortion and others.

Second Tool: Indicators for ICU admission assessment tool

It was specifically designed by the researcher after review of literature. It divided with respect to obstetric and non-obstetric causes for patients' admission in ICU. Obstetric causes were such as hyperemesis gravidarum, ectopic pregnancy, abortion, antepartum hemorrhage, postpartum hemorrhage, preeclampsia & eclampsia and other problems. Non-obstetric causes were such as hypertension, diabetes mellitus, heart disease, renal disease, gastrointestinal disease, anesthetic complications and other problems.

Third Tool: Statistical sheet about maternal morbidity and mortality rates for one year

This tool was developed by the researcher after reviewing the relevant literatures to assess rates of maternal morbidities and mortalities. It consisted of the following parts:

Part (1): Maternal morbidities assessment sheet.

It were calculated every month for one year from the hospital based records.

Part (2): Maternal mortalities assessment sheet.

It were calculated every month for one year from the hospital based records.

Content validity:

The face validity was done by three experts from Gynecological and Obstetrics specialists who reviewed the study tools for clarity, relevance, comprehensiveness, applicability and easiness. The reliability was carried out using the Cronbach alpha test to observational checklist of patient assessment and indicators for ICU admission assessment. It was found to be ($r= 0.84$).

Procedure

- An official approval for data collection was obtained from administrators of the selected hospital. Patient interview & Observational checklist was carried out while the critically ill obstetric women were on ICU during morning and afternoon shifts throughout their admission period. At initial interview the researcher introduced herself to initiate a line of communication.
- The time interval which involved in individual interview with each woman took from about half an hour to more than hour in some times. This affected by the severity of status of the women and their educational level. The rest of check list were collected from the patients records throughout the period of admission in the ICU until the day of the patient’s discharge. If the woman was comatose or unable to response, the data were collected from accompanying person coming with her.
- The researcher obtained the personal data from the critically ill obstetric women using Tool 1. Assessment of indicators of the critically ill obstetric women using observational checklist Tool 2 which filled by the researcher. Maternal morbidities and mortalities calculated by the researcher every month for one year from the hospital based records using Tool 3.

Pilot study:

The pilot study carried out to test the feasibility and applicability of the study tools. It was conducted on 10% of the sample to estimate the time needed to fill

out the tools. The data obtained from the pilot study were analyzed and some changes were done, so the sample of the pilot study was not involved in the main study.

Ethical considerations:

1. Research proposal was approved from Ethical Committee in the Faculty of Nursing.
2. There was no risk for study subjects during application of research.
3. The study followed common ethical principles in clinical research.
4. Oral consent was obtained from critically ill obstetric women that were willing to participate in study, after explaining the nature and purpose the study.
5. Confidentiality and anonymity were assured.
6. Study subjects had the right to refuse to participate and or withdraw from the study without any rational any time.
7. Study subjects privacy was considered during collection of data.

Statistical analysis:

Data analysis was performed using SPSS 20 statistical software. The qualitative variables were described using frequency and percentages, and quantitative variables were described using range, mean, and standard deviation. Chi-square test was used. P value <0.05 was considered significant.

Results

Table (1): Hospital based rates of maternal mortality and morbidity in ICU at 2020:

Rate	Method Of Measurement	Value
Maternal ICU admission rate	Maternal ICU admission rate 2020 = maternal Cases admitted to ICU at 2020 / Total number of deliveries x 100 = 617/10152×100	6.08%
Maternal morbidity rate	Maternal morbidity rate 2020 = maternal morbid cases admitted to ICU at 2020 / Total number of deliveries x 100= 599/10152×100	5.90%
Maternal mortality rate	Maternal mortality rate 2020 = maternal death cases in ICU at 2020 / Total number of deliveries x 100 = 18/10152×100	0.18%

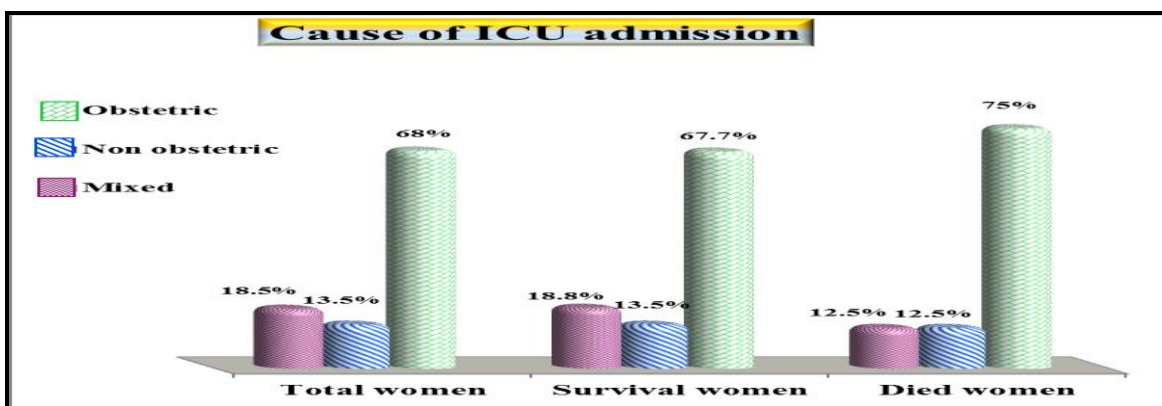


Figure (1): Causes of ICU admission

Table (2): Distribution of studied women according to obstetric indications for ICU admission:

Obstetric indications of ICU admission	All patient		Survivor		Deaths		p-value
	N.(200)	%	N.(192)	%	N.(8)	%	
yes (173)							
Hyperemesis gravidarum	8	4.0	8	4.2	0	0.0	0.556
Pulmonary embolism	4	2.0	3	1.6	1	12.5	0.030*
Gestational diabetes	6	3.0	6	3.11	0	0.0	0.879
Pregnancy related Hypertensive disorder	97	48.5	93	48.4	4	50.0	0.644
Gestational HTN	5	2.5	5	2.6	0	0.0	
Sever preeclampsia	52	26.0	50	26.0	2	25.0	
Antepartum eclampsia	28	14.0	26	13.5	2	25.0	
Postpartum eclampsia	14	7.0	14	7.3	0	0.0	
HELLP	16	8.0	15	7.8	1	12.5	0.632
Bleed Abortion	15	7.5	13	6.8	2	25.0	0.055*
Septic abortion	1	0.5	0	0.0	1	12.5	0.001**
Vesicular mole	3	1.5	3	1.6	0	0.0	0.722
Ectopic pregnancy	2	1.0	2	1.0	0	0.0	0.772
Antepartum hemorrhage	35	17.5	34	17.7	1	12.5	0.336
Placenta Previa	20	10.0	20	10.4	0	0.0	
Placenta abruption	4	2.0	4	2.1	0	0.0	
Placenta accrete	15	7.5	14	7.3	1	12.5	
Rupture uterus	1	0.5	1	0.5	0	0.0	
Postpartum hemorrhage	24	12.0	24	12.5	0	0.0	
Puerperal sepsis	1	0.5	1	0.5	0	0.0	0.838
No (27)							

(*) Statistical significant difference

(**) highly statistical significant difference

Note: percentages add to more than 100% as some patients had more than one obstetric indication for ICU admission

Table (3): Distribution of studied women according to non-obstetric indications for ICU admission:

Non-obstetric indications of ICU admission	All patient		Survivor		Deaths		p-value
	N.(200)	%	N.(192)	%	N.(8)	%	
yes (64)							
Cardiovascular disease							
Rheumatic heart disease	18	9.0	18	9.4	0	0.0	0.905
Other heart disease	4	2	4	2.1	0	0.0	
Chronic HTN	12	6.0	12	6.2	0	0.0	0.466
Diabetic ketoacidosis	9	4.5	9	4.7	0	0.0	0.822
Renal disease	4	2.0	4	2.0	0	0.0	0.918
Pulmonary edema	2	1.0	2	1.0	0	0.0	0.772
Liver / Gall bladder disease	4	2.0	4	2.0	0	0.0	0.772
Epilepsy	1	0.5	1	0.5	0	0.0	0.838
C/S related complications							
Anesthetic complication	3	1.5	2	1.0	1	12.5	0.009**
After C/s Bladder injury	3	1.5	3	1.6	0	0.0	
Severe anemia	5	2.5	5	2.6	0	0.0	0.899
Cancer	2	1.0	2	1.0	0	0.0	
Others	9	4.5	9	4.7	0	0.0	0.247
No (136)							

(*) Statistical significant difference

(**) highly statistical significant difference

Note: percentages add to more than 100% as some patients had more than one non-obstetric indication for ICU admission

Table (1): The based hospital rates reported as maternal ICU admission rate was (6.08%), maternal morbidity rate was (5.90%) and maternal mortality rate was (0.18%).

Figure (1): The major causes for the maternal I.C.U admission were the obstetric ones (86.5%). The obstetric cause was alone in (68%) of women and was mixed with the non-obstetric cause in (18.5%) of them. While the non-obstetric ones were represented just (13.5%) of all maternal causes for ICU admissions.

Table (2): Among the obstetric indications for maternal I.C.U. admission, the first common indication was pregnancy related hypertensive disorders (48.5%) especially sever preeclampsia (26.0%) and ante-partum eclampsia (14.0%). The hemorrhage which include the ante-partum (17.5%) and postpartum (12.0%) collectively (29.5%) represent the second indication for admission.

Table (3): The rheumatic heart disease (9.0%) represented the most common non-obstetric indication for maternal I.C.U. admission; followed by the chronic hypertension (6.0%) then the diabetes mellitus (4.5%).

Discussion:

Pregnancy and childbirth are considered physiological processes; however the potential for dangerous complications is possible and may be develop within minutes. Early admission and proper management in the ICU are better for obstetric patients with these complications. In developing countries maternal mortality is still a concern despite planned efforts to eliminating it.(UNFPA et al., 2021) The aims of this study were to assess the hospital based rate of maternal morbidities and mortalities in Intensive Care Unit (ICU), and to estimate indicators of ICU admission at Woman's Health Hospital, Assiut University.

Maternal mortality & morbidity are measures of the quality of health-care in any given country and obstetric admission into the ICU represents an indicator of complicated maternal morbidity. Obstetric admissions represent a small proportion of admissions into ICUs, but the death from such admissions is very high.(Ozumba et al., 2018)

Chikadaya et al., (2018) in his a prospective descriptive study about incidence of maternal near miss in the public health sector of Harare, Zimbabwe reported that the ICU admission rate was (7.3%). This is slightly higher than our report (6.08%). While another study report it lower than our rate (0.21%) by **Ozcelik et al., (2017)** in his turkey an 8-year review entitled outcomes of antepartum and postpartum obstetric admissions to the intensive care unit of a tertiary university hospital. The differences in

obstetric ICU admission rates in many hospitals and institutions may be due to the different based criteria for ICU admissions between those institutions or hospitals, the number of the ICU available beds in that facility and also according to the country where the study conducted even developed or developing community.

An earlier maternal admission to ICU leads to decrease in rate of maternal mortality.(**El-Agwany, 2019**) Maternal mortality among our studied critically ill women was (0.18%). This is result is lower than (8.3%),(13.5%), (5%) which reported by **Sodhi et al., (2018), Ozumba et al., (2018) & Shrestha et al., (2018)** in their studies about predictors of mortality in critically ill obstetric patients in a tertiary care intensive care unit which was done in India, pattern and outcome of obstetric admissions into the ICU which was done at a southeast Nigerian hospital and a case control study about evaluation of clinical characteristics and outcomes of obstetric patients admitted to intensive care unit, Nepal respectively. This decrease in rate of our study may be due to the convenient of a lot of services, specialists and the adequate number of beds that required for the management for these groups of critically ill obstetric patients.

The maternal mean age of the 200 studied women was (29.50±6.30) years and most of them were aged between the years (20-30). A study conducted with magnitude and pattern of maternal near-miss cases admitted to Women's Health Hospital, Assiut University by **Abdel-Raheem et al., (2016)** reported that the mean ages of patients was (28.4 ± 8.5) years. This finding also supported by a prospective descriptive study entitled incidence of maternal near miss in the public health sector of Harare, Zimbabwe conducted by **Chikadaya et al., (2018)** who reported in their study that the most of the women were married, educated up to secondary level and were house-wives. The same result congruent with the current study which also report that most of the sample was married had secondary education and house wives. From the research point the low level of education plays an important role in increase severity of morbidity and the occurrence of death among these groups of patients.

However, the present study was in disagreement with **Khashab et al., (2018)** in their comparative study about maternal morbidity and mortality in Elshatby and Dar Ismail maternity hospitals which was done in Alexandria, in about the residence of the women they mentioned that most of them from urban area. While our finding reported that most of the women were from rural area were the poor or the absence of health facilities. This may be due to our study hospital represents the major tertiary hospital in the

Upper Egypt where the all hospitals and health centers in rural area refer the severe maternal illness to it.

Our observation is that most of the admitted women were multigravida, delivered by caesarian section at the hospital where study conducted. This is in line with **Qureshi et al., (2016) & Yi et al., (2018)** in their perspective analyses of obstetric patients in intensive care unit, at a teaching hospital which done in Pakistan and indications and characteristics of obstetric patients admitted to the intensive care unit: a 22-year review in a tertiary care center, respectively. They found that most of their studied women were also multigravida and delivered by the caesarian section. The cesarean sections always are higher rates among the ICU obstetric admissions as a management to decrease the complication for both the mothers and fetus among these groups of patients. In addition we observed that increases the parity represent a positive risk factor maternal morbidities and mortalities.

The present study was in contrast with a five year review entitled obstetric admissions to the intensive care unit done by **Pattnaik et al., (2015)** who reported that majority of patients were admitted during postpartum period. While a another study entitled model of obstetric attention based on critical care which done in Latin America by **Escobar et al., (2018)** was in line with current study which reported that most of the women were admitted during the pregnancy. This differs between studies we can relate it to the difference in type and time arising of the morbidity and to the awareness of importance of early admission to ICU to decrease the severity of complication and maternal mortality.

Generally, the present studies clarified that the most common causes of maternal ICU admissions are the obstetric complications. In addition, most of these obstetric causes were pregnancy related hypertensive disorders, including preeclampsia and eclampsia followed by obstetric hemorrhage, including antepartum, post-partum. International epidemiology findings over numerous years had consistently presented that obstetric patients are often admitted to intensive care unit due to obstetric hemorrhage or hypertensive diseases during pregnancy. (**Qureshi et al., 2016**)

This results in agreement with large group of studies and clarified that the most of maternal ICU admission were due to hypertensive disorder (eclampsia & preeclampsia). These studies which in agreement with our study are a case-control prospective study about magnitude and pattern of maternal near-miss cases admitted to Women's Health Hospital, Assiut University by **Abdel-Raheem et al., (2016)**, the retrospective review about evaluation of admission indications, clinical characteristics and outcomes of

obstetric patients admitted to the intensive care unit of a teaching hospital center in Iran by **Farzi et al., (2017)**, a case control study evaluation of clinical characteristics and outcomes of obstetric patients admitted to intensive care unit in Nepal by **Shrestha et al., (2018)** and Indian a prospective study about contributory factors for obstetric ICU admission by **Srivastava et al., (2019)**. While this study in disagreement with an Indian study about outcome of obstetric emergencies admitted to intensive care unit by **Bahadur et al., (2018)** which showed that hemorrhage related complications were the most frequent conditions among maternal disease that need to be admitted to ICU.

In addition, the present study showed that the cardiovascular diseases were the most prevalent non obstetric cause for maternal ICU admissions. This result in agreement with a case-control prospective study about Magnitude and pattern of maternal near-miss cases admitted to Women's Health Hospital, Assiut University by **Abdel-Raheem et al., (2016)** which also reported that the heart complications are the common cause of non-obstetric morbidity that in need to ICU care.

Conclusion

Based on the results of the present study, it can be concluded that:

The ICU admission rate was (6.08%), the maternal morbidity rate was (5.90%), and the maternal mortality rate was (0.18%). Obstetric causes particularly hypertensive disorders and obstetric haemorrhages are the common causes of ICU admissions and maternal mortality.

Recommendations

Based on the findings of present study, the following recommendations were derived:

- Provide proper antenatal care to reduce obstetric ICU admission rate.
- Proper referral system should be obtained to prevent the unnecessary delay in receive proper management and treatment and to reduce maternal mortality rate.
- Further studies on large sample from different geographic areas in Egypt to generalize the results.

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