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Clinical Intervention for Maternal Near Miss Cases in El Galaa Teaching Hospital

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ABSTRACT

Background: Near miss cases share many characteristics with maternal deaths and can directly inform about obstacles that had to be overcome after the onset of an acute complication, hence providing valuable information on obstetric care. This allows for corrective action to be taken on identified problems to reduce related mortality and long-term morbidity.

Objective: The purpose of this study was to determine the efficacy of possible interventions (in the form of monthly clinical audit for new near miss cases and feedback strategy) in reducing maternal near miss cases in El Galaa Teaching Hospital in Egypt and improving WHO indicators of maternal health.

Methods: The study was conducted over 3 stages: Stage I (Formative Stage): Is a retrospective study of maternal near miss cases over 1 year period, based on WHO criteria from 1/1/2016 to 1/1/2017. Stage II (Intervention stage): This incorporated a monthly clinical audit for new near-miss cases and feedback strategy, using WHO case report forms, as well as engagement of opinion leaders for 1 year from 1/1/2017 to 1/1 2018 with 2 to 3 cases discussed monthly. Stage III (Assessment Stage): Evaluating the clinical performance and frequency of near miss cases after intervention.

Results: In this study, the majority of women with potentially life threatening conditions were referred from private obstetrician clinic, private hospitals and Ministry of Health to El Galaa hospital. The majority of Maternal near miss cases (67.9%) gave birth by Caesarean section, this was because of the severity of these patients' obstetric conditions usually requires urgent action. The main life threatening conditions among women in this study were hypertensive disorders of pregnancy 41% (24% Pre-eclampsia, 15% Eclampsia, 2% chronic hypertension).

Conclusion: Our intervention (near miss clinical audit) helped to improve the performance and quality of care provided to women with complications during pregnancy, as reflected on the maternal health outcome indicators. Therefore we recommend incorporating clinical audit process in all health facilities. The Maternal mortality index and Maternal near miss mortality ratio, two of the indicators recommended by WHO, can be used to monitor and assess the performance and health care level. Health managers and policy makers should use maternal health outcome indicators for allocation of resources and prioritization of investments.

Keywords: Maternal near miss – Maternal mortality – Maternal morbidity.

INTRODUCTION

The global maternal mortality ratio is 210/100,000 births while it is about 240 in developing countries as compared to 14/100,000 in developed countries. Most of the deaths and disabilities attributed to childbirth are avoidable, because the medical solutions are well known. Indeed, 99% of maternal deaths occur in developing countries that have an inadequate transport system, limited access to skilled care-givers and poor emergency obstetric services [1].

A new concept to investigate the cause of this high variation level in different countries was introduced by the World Health Organization as maternal near miss defined as "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy.", based on markers of management and organ dysfunction as an adjunct to investigation of maternal deaths since they represent similar pathological and circumstantial factors leading to severe maternal outcome [2]. Near miss cases share many characteristics with maternal deaths and can directly inform about obstacles that had to be overcome after the onset of an acute complication, hence providing valuable information on obstetric care. This allows for corrective action to be taken on identified problems to reduce related mortality and long-term morbidity [3].

Internationally, there is increasing focus on maternal near-miss case; Women who experienced a near miss event can be interviewed → ability to obtain women's perspectives about the care and the obstacles faced. It is a success story → A woman herself can be a source of data. Assessing the near miss cases → reflects the quality of care [4].

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AIM OF THE WORK

The purpose of this study was to determine the efficacy of possible interventions (via feedback strategy obtained from monthly clinical audit for new near miss cases) in reducing maternal near miss cases in El Galaa Teaching Hospital in Egypt and improving WHO indicators of maternal health.

PATIENTS AND METHODS

(1) *Technical design*

(A) ***Site of the study:*** This study was carried out at El Galaa Teaching Hospital**.**

(B) ***Sample size:*** Depending on (Medical reference) who found the MMI 2.3, and MD 5, MNM 215 among 16000 cases and assuming the α=0.05, and by using PASS 11th release the minimal sample size to detect the ratio with confidence interval width=0.95 is **13236 cases *Fleiss et al. (2003)***.

(C) ***Ethical consideration and administrative regulations:***

Before starting enrollment of the participants, permissions were obtained from concerned authorities including scientific and ethical research committee (SERC) for human research and consent was taken from the patient or one of her first degree relatives, at the time of data collection. The purpose of the study was clearly explained to the study subjects, and they were also assured of the confidentially of the information.

(2) Study design

Type of study: In this study, the data of the formative stage of near miss cases have been retrieved from El Galaa hospital records retrospectively. While in the intervention phase data of new near miss cases were collected prospectively.

Stage I (Formative Stage): Is a retrospective study of maternal near miss cases over 1 year period, based on WHO criteria from 1/1/2016 to 1/1/2017.

Stage II: (Intervention stage): This incorporated a monthly clinical audit for new near-miss cases and feedback strategy, using WHO case report forms, as well as engagement of opinion leaders for 1 year from 1/1/2017 to 1/1 2018 with 2 to 3 cases discussed monthly.

Stage III (Assessment Stage): Evaluating the clinical performance and frequency of near miss cases after intervention.

Post Intervention Stage

- **Assessment**
  1. Focus Group discussions
  2. Interviews with providers

1- Focus Group Discussions (FGDs)

- Two discussions were conducted at El-Galaa hospital:
  * With junior staff
  * With senior staff/consultants.
- The aim of the FGDs was to explore their impressions, thoughts and opinions of the intervention and its process

Junior staff discussion

1. Views/impressions:

- They appreciated the intervention due to the no punishment policy of the meeting.
- They liked the detailed discussion of a high risk case (near miss case) with senior staff and to hear their different opinions, suggestions and practices.

2. Impact/influence of performance:

- Established better contact and communication between junior and senior doctors.
- "Management guidelines became updated and accessible" during the clinical audit.
- "Magnesium Sulfate became available in the admission room" (in the ER) to start treatment upon admission.

3. Obstacles:

- Reviewing medical records was tedious and needed time
- It had to be assigned to be done (volunteering was difficult)
- Difficulty to set the date of the meeting due to the busy schedule of junior and seniors.

4. Sustainability:

- They welcomed the idea of sustaining clinical audit meetings. It should be "part of the hospital system" and routinely, once a month.
- Hospital administration should enforce such meetings.
- "A committee should be in charge of the preparation of the meeting" and this committee consisting mainly of junior doctors and one or two seniors.

Senior staff discussion

The discussion with senior staff was interesting and targeting main points:

1. Views:

Clinical audit meetings were important and didn't mind attending them.

- Appreciated the fact of gathering different ranks of providers, seniors & juniors.

2. Impact on performance: They felt that there was improvement in the performance of doctors in maternal care, intra-partum and postpartum care (quality of services).

3. Obstacles: They admitted that each unit had its own protocol and thus their practice was

different. It was said "the administrative system was inefficient due to no follow-ups", neither from technical side nor from the management side → no accountability.

4. **Sustainability:** The only way is through a "Risk Management Team". Such a team would be formulated to deal with morbidity and mortality cases in the hospital. It should discuss the risk cases and act upon it for a better outcome.

2- In-depth Interviews with Health care providers

- Clinical audits were perceived as an evaluation tool
- Continuity and sustainability of clinical audits are considered crucial
- Importance of immediate discussion of near miss case when it happens
- Hospital administrative team involvement in clinical audit sessions ensures success of new hospital initiatives
- Involvement of senior staff in clinic audits enrich discussions
- Reward and punishment encourage compliance and secure provider's accountability
- Clinical audit provides opportunity to learn and share information
- Exposure opportunity to others and different case management scenarios happened when Opinion leaders and experts invited from other hospitals participated.
- The sessions provided information from real life situations, rather than theoretical information from books written in a different context.
- Clinical audits should respect providers confidentiality to ensure transparency (correct recording)
- Positive and safe discussion environment is crucial for sustainability of clinical audits.
- Nurses as member of health team should be involved and participate in each clinical audit
- Availability of flow charts in obstetric wards benefit not only physicians but nurses as well
- Providers who attended clinic audits showed prompt adequate performance due to their anticipation ability for complications that may happen.
- Lessons learned from clinic audits need active implementation process
- Comparing Egypt to elsewhere, 98% of physician time in hospital is in practice while in UK is 30 - 40% only which give time for other activities (clinic audits, mortality meetings, seminars, research, writing, documenting and reading)

(3) Critical interventions:

Interventions to prevent complications included uterotonics (oxytocin, misoprostol and ergotamine) for preventing postpartum hemorrhage and prophylactic antibiotic during caesarean section to prevent caesarean section related infection.

Interventions to treat complications included:

1. Treatment of postpartum haemorrhage; Use of any type of uterotonics (oxytocin , misoprostol, ergotamine), artery ligation, hysterectomy and giving blood products.
2. Anticonvulsants for eclampsia ; Magnesium sulphate.
3. Treatment for sepsis; Therapeutic IV antibiotics.
4. Treatment for ruptured uterus complications; Laparotomy, blood products and Hysterectomy.

Statistical methods

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 22.0, IBM Corp., Chicago, USA, 2013.

RESULTS

Table (1): Organ dysfunction in Near-Miss Women (N=128)

		Number	Percent
Organ dysfunction*	Cardiovascular dysfunction	76	59.4%
	Respiratory dysfunction	8	6.3%
	Renal dysfunction	4	3.1%
	Coagulation/haematologic dysfunction	96	75.0%
	Hepatic dysfunction	16	12.5%
	Neurologic dysfunction	8	6.3%
	Uterine hysterectomy	28	21.9%

Table (2): Status of Near Miss Women at Arrival (N=128)

		Number	Percent
Status at arrival to hospital	Near miss identified at hospital arrival or during first 24 hours of stay	100	78%
Referral status	Women referred to any other health facility	4	3%

Table (3): Characteristics of Women

(N=559)	Percent/ Mean
All women are Egyptians and married	100%
Walk-in patients (history unknown)	99.8%
Mean age, years (range)	27.5 (17-44)
Mean number of pregnancies (range)	2.8 (1-12)
Mean number of previous CS (range)	1.5 (0-9)

Table (4): Mode of Delivery/Abortion "intervention stage"

(N=559)	Percent
Vaginal delivery	15.5%
Caeserean section	67.9%
Laparotomy for ectopic pregnancy	15.9%
Abortion not requiring medical or surgical procedures	0.0%
Medical methods for uterine evacuation	0.2% (1 case)
Curettage	0.3% (2 case)
Vacuum aspiration	0.2% (1 cases)

Table (5): Interventions to Prevent Complications

	Percent
Prevention of postpartum haemorrhage	
Target population: women giving birth in health-care facilities	585
Oxytocin use	77.8%
Misoprostol use	27.7%
Ergotamine use	8.7%
Prevention of caesarean section related infection	
Target population: women who had caesarean deliveries	397
Prophylactic antibiotic during caesarean section	99%

Table (6): Interventions to Treat Complications and Near Miss Cases

	Number	Percent
1. Treatment of postpartum haemorrhage		
Target population: women with PPH complications	24	
Use of any type of uterotonics	24	100%
Oxytocin	24	100%
Misoprostol	23	95.8%
Ergotamine	16	66.7%
Artery ligation	4	16.7%
Hysterectomy	2	8.3%
Given blood products	22	91.7%
Treatment of Near Miss with postpartum haemorrhage		
Target population: near miss women with PPH	14	
Massive transfusion of blood	14	100%
Hysterectomy	2	14.3%
2. Anticonvulsants for eclampsia		
Target population: women with eclampsia	83	
Magnesium Sulfate (MgSo4) (MgSo4 was unavailable on 2 occasions)	81	97.6%
3. Treatment for sepsis		
Target population: women with sepsis	43	
Therapeutic IV antibiotics	43	100%
4. Treatment for ruptured uterus		
Target population: women with ruptured uterus complications	14	
Laparotomy	14	100%
Blood products	14	100%
Treatment for near miss ruptured uterus		
Target population: near miss women with ruptured uterus	12	
Hysterectomy	3	25%
Massive transfusion of blood	12	100%

Table (7): Types of complications (N=559)

Abortion related haemorrhage	1%
Ectopic pregnancy	17%
Placenta praevia	15%
Accreta/increta/percepta placenta	1%
abruptio placenta	16%
Ruptured uterus	2%
Postpartum Haemorrhage	4%
Other Obstetric haemorrhage	1%
Abortion related infection	0%
Puerperal endometritis	1%
Pyelonephritis	1%
Other Systemic infection/sepsis	8%
Chronic hypertension	2%
Pre-eclampsia	24%
Eclampsia	15%
Anaemia	2%
Malaria/dengue	0%
Heart disease	0%
Coincidental conditions	0%

Table (8): Maternal near miss cases

Near miss cases	**215**
Had complication on arrival	33%
Developed into near miss during the first 24 hou	42.60%
Survived and discharged in good condition	91.80%
Were discharged with morbidity	6%
Referred to a higher specialized facility	3.70%
Referred to a different/specialized department in same hospital	7.40%
Deaths	**5**

Table (9): Types of Organ Dysfunctions (N=215)

Shock	15%
Cardiac arrest	1%
Severe hypoperfusion	1%
Severe acidosis	0%
Continuous vasoactive drugs	0%
Cardio-pulmonary resuscitation	0%
Acute cyanosis	0%
Gasping	0%
Severe hypoxemia	0%
Intubation and ventilation	0%
Oliguria non responsive to fluids	8%
Severe actue azotemia	10%
Dialysis for acute renal failure	7%
Failure to form clots	9%
severe acute thrombocytopenia	35%
Massive transfusion of blood	88%
Jaundice with pre-eclampsia	3%
Severe acute hyperbirliubinemia	1%
Prolonged unconsciousness or	0%
Uncrotllable fit/satus epilepticus	16%
uterine infection/hysteretomy	8%

Table (10): Maternal Health Outcome Indicators

Outcome indicator	**Baseline**	**Intervention**
Data collection period	12 months	12 months
Live births **(LB)**	11876	16000
Maternal near miss (**MNM**)	128	215
Maternal Death (**MD)**	12	5
Maternal near miss mortality ratio (**MNM mortality ratio : 1 MD**) MNM-MR=(MNM/MD))	10.7 :1 MD	43:1 MD
Maternal Mortality Index **(MMI)** (the number of maternal deaths divided by the number of women with life-threatening conditions expressed as a percentage (MMI = MD/MNM+MD))	8.6	2.3

DISCUSSION

For many years, evaluation of maternal health care services aimed at improving the quality of obstetric care has traditionally relied on inquiries into maternal deaths [5]. So, maternal mortality has been the target of studies in the area of public health since the beginning of the last century, particularly in the developed world where investigations have been carried out in this field over a longer period of time. The findings of these studies have led to changes that resulted in a significant reduction in the maternal mortality ratio (MMR) in these countries. It is difficult to measure the impact of changes in routine obstetrical care on maternal mortality because it is a rare event in absolute terms [6].

A new concept to investigate the cause of this high variation level in different countries was introduced by the ***World Health Organization*** [2] as maternal near miss defined as "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy.", based on markers of management and organ dysfunction as an adjunct to investigation of maternal deaths since they represent similar pathological and circumstantial factors leading to severe maternal outcome.

This study was conducted over two years in El Galaa Teaching hospital between 1st of January 2016 and 1st of January 2018.

Total number of live births in 2016 was 11876 cases. Maternal near miss cases were 128 and maternal deaths were 12. Of the 128 near miss cases 100 (78%) were identified at hospital arrival or during first 24 hours of stay and 4 cases (3%) were referred to another health facility.

In 2017, total number of live births was 16000 cases. Maternal near miss cases were 215 and 5 maternal deaths. 75.6 % of near miss cases had complication on arrival or developed into near miss during first 24 hours and 3.7 % referred to higher specialized facility.

It showed a Maternal near miss mortality ratio (MNMR) of 10.7:1 in 2016, which improved to 43:1 in 2017. It also revealed an improvement in Maternal mortality index (MMI) from 8.6 in 2016 to reach 2.3 in 2017.

In this study, the majority of women with potentially life threatening conditions were referred from private obstetrician clinic, private hospitals and Ministry of Health to El Galaa hospital. The high referrals is supported by a study carried in Iraq ***Jabir et al.*** [7] and Syria ***Almerie et al.*** [8], as the private system used to transfer the complicated cases to the tertiary level hospitals for emergencies and critical care.

The majority of Maternal near miss cases (67.9%) gave birth by Caesarean section, this was because of the severity of these patients' obstetric conditions usually requires urgent action. This finding runs in agreement with study of ***Almerie et al.*** [8] in which Caesarean section was the main delivery method among Maternal near miss and severe maternal outcome, (54.3%) of maternal near miss women gave birth by CS and (66.7%) of maternal deaths gave birth by CS.

The main life threatening conditions among women in this study were hypertensive disorders of pregnancy 41% (24% Pre-eclampsia, 15% Eclampsia, 2% chronic hypertension). This conclusion agrees with that of a Brazilian study which reported hypertensive disorders as the most commonly associated causes with severe maternal morbidity . Near miss, as much as 57% was reported in the study of ***Souza et al.*** [6] and ***Adisasmita et al.*** [9]. In Indonesia, it was found that 57.3% of women had hypertension disorders as a primary cause of maternal near miss, while results of ***Goldenberg et al.*** [10] indicated that the main cause of near miss event was obstetric hemorrhage followed by hypertensive disorders of pregnancy.

The high percentage of maternal near miss and maternal mortality due to hypertensive disorders of pregnancy may be explained by:

- Lack of proper antenatal care with absence of screening and early detection of preeclampsia.
- Delayed notification for medical advice by the mother after development of symptoms as headache or blurring of vision.
- Poor management of severe preeclampsia or eclampsia in the primary and secondary health care units due to absence of experience or qualified personnel with more liability to the occurrence of the complications.
- Delayed referral of the cases of severe preeclampsia or eclampsia to El Galaa hospital due to poor means of transport or lack of experience about early detection of the complications.
- Delayed decision from the staff about rapid termination of the preeclamptic patient that exposes her to the serious complications as cerebral hemorrhage or sub-capsular hematoma of the liver.

The 2nd most common cause of maternal near miss and maternal deaths after hypertensive disorders of pregnancy was obstetric hemorrhage (40%) may be explained by:

- Poor antenatal care with high rate of anemia and placenta previa with pregnancy.
- Absence of monitoring of progress of labour at home or private clinic delivery.
- Lack of blood supply in the general hospitals and absence of efficient equipped life support teams and procedures.
- Delay of referral of the cases from the primary place of delivery to El Galaa hospital.
- Delay in decision regarding atonic postpartum hemorrhage with delayed surgical interference.

It was noted that the majority of life threatening conditions were at arrival (33%) or developed within 24 hours of arrival (42.6%). The study result is similar to that reported in the study done in Iraq by ***Jabir et al.*** [7] and in Syria by ***Almerie et al.*** [8], this is because the other healthcare facilities were referring cases with life threatening conditions to El Galaa hospital for better emergency and critical care.

All maternal near miss cases in this study developed organ dysfunction, 88% of near miss cases had coagulation / hematologic dysfunction. These results are consistent with those reported by ***Tuncalp et al.*** [11] 63.8% and in ***Goldenberg et al.*** [10] 38.3 % because postpartum hemorrhage was the main cause of maternal near miss in these studies, while cardiovascular dysfunction was the most

frequently identified problem among near miss cases (55.8%) in ***Jabir et al.*** [7].

According to the WHO process and outcome indicators related with specific conditions among maternal near miss and maternal deaths. The effective interventions were adequately applied for the target populations, uterotonics were used for the prevention of postpartum hemorrhage, oxytocin 77%, misoprostol 27.7% and ergotamine 8.7 %. In treatment of postpartum hemorrhage 100% of cases were given uterotonics, oxytocin 100%, Misoprostol 95.8 %, ergotamine 66.7%. Other treatment modalities included artery ligation 16.7%, hysterectomy 8.3% and blood products 91.7%. In treatment of near miss cases with postpartum hemorrhage, 100 % massive blood transfusion and 14.3 % hysterectomy. Magnesium sulphate for eclampsia 97.6%, and not 100%, due to unavailability of magnesium sulphate on a couple of occasions. Prophylactic antibiotics during caesarean section 99% and in 100% of cases treated for sepsis. Our study findings are in agreement with other study carried out by ***Tuncalp et al.*** [11], where oxytocin was used for the management of postpartum hemorrhage in (96.6) and in (62%) of cases for prevention of postpartum hemorrhage, magnesium sulphate for the treatment of eclampsia in (97.1%), prophylactic antibiotics during Caesarean section (96.6%). In the study of ***Jabir et al.*** [7], oxytocin was used for the prevention of postpartum hemorrhage in (83.36%) and in (67.86%) for treatment, magnesium sulphate for the treatment of eclampsia in (67.44%), prophylactic antibiotics during Caesarean section in (60.75%) and (100%) of cases in treatment of sepsis.

CONCLUSION

Our intervention (near miss clinical audit) supported and improved the performance and quality of care provided to women with complications during pregnancy, as reflected on the maternal health outcome indicators. Therefore we recommend incorporating clinical audit process in all health facilities. The Severe Maternal outcome (SMO), one of the indicators recommended by WHO, can be used to monitor and assess the performance and health care level. Health managers and policy makers should use maternal health outcome indicators for allocation of resources and prioritization of investments.

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