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Eclampsia in Santa Catarina, Brazil:
A Population-based Study**

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Maternal Mortality related to Pre-eclampsia/Eclampsia in Santa Catarina, Brazil: A Population-based Study

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Abstract

Pre-eclampsia/Eclampsia is an unpredictable multi organ pregnancy disorder, associated with significant maternal morbidity and mortality. The aim of this study was to describe the cases of maternal mortality associated with Pre-eclampsia/Eclampsia in the state of Santa Catarina Brazil from 2005 to 2013. The data were extracted from the Mortality Information System of the Ministry of Health, Brazil, through the DATASUS website, and from the State Health Department of Santa Catarina Brazil. Out of 256 maternal deaths in the specified period, 32 deaths were related to Pre-eclampsia/Eclampsia, representing 12.5% of the total maternal deaths. Pre-eclampsia was 37.5% and Eclampsia was 62.5%. The highest number of maternal deaths due to Pre-eclampsia/Eclampsia per year was 21.9% in 2010 and the lowest was 3.13% in 2011 and 2013. Routine nursing assessment of signs and symptoms, patient education, awareness and a supportive care environment are essential in the timely detection, monitoring, and effective management of Pre-eclampsia/Eclampsia.

Keywords: Maternal Mortality, Pre-eclampsia/Eclampsia, Nursing Care, Brazil

Background

Pregnancy is a precious time in every woman's life. It needs continuous care for early detection of difficulties and prompt treatment when the need arises. The ratio of maternal mortality is a sensitive and relevant indicator of the quality of women's health. It indicates the life quality of a population and provides a measure of human and social development (da Consolação 2012).

Pre-eclampsia is a hypertensive disorder of pregnancy, a serious condition that occurs typically after 20 weeks of pregnancy. It is a combination of hypertension (raised blood pressure) and proteinuria (the presence of protein in urine) (Duley et al. 2009). Most women with Pre-eclampsia give birth without problems. However, severe Pre-eclampsia can cause problems such as stroke, kidney failure, liver failure, and blood clotting (Duley et al. 2009).

Eclampsia, which is usually rare but potentially life-threatening, is characterized by the occurrence of a seizure (fit) in association with Pre-eclampsia, headaches, swelling feet, sudden weight gain and changes in vision (Duley et al. 2010). Research has shown that, about 1 in 200 women who had pre-eclampsia, eventually also progress to a dangerous condition known as Eclampsia which is responsible for about 50,000 maternal deaths each year (Khan et al. 2006).

Globally, Pre-eclampsia is a leading cause of maternal morbidity and mortality (Ghulmiyyah and Sibai 2012). Worldwide an estimated 5,00,000 or more women die each year from complications of pregnancy and 95% of these women are in Africa and Asia (Abouzahr and Wardlaw 2004). Pre-eclampsia and Eclampsia together, affect about 10% of all pregnant women around the world (Myles 1993, Ghulmiyyah and Sibai 2012). Hypertensive disorders of pregnancy are responsible for one out of ten maternal deaths in Africa and Asia, and nearly one quarter in Latin America (Campbell and Graham 2006). Among the hypertensive disorders of pregnancy, Pre-eclampsia/Eclampsia are the major causes of maternal mortality and morbidity (Duley 2009). In Australia alone, it is estimated that 4% to 10% of pregnant women develop pre-eclampsia, causing four to five maternal deaths and up to 300 to 500 perinatal deaths per year (Brown 1995). In Afghanistan, Pre-eclampsia/eclampsia is the second leading cause of maternal deaths (Hamajima et al. 2015). Another study conducted in September 2014 in Tanzania found that in 2011 there were 155 maternal deaths and hence the MMR of 1,541 per 100,000 live births. 69.5% of these maternal deaths were analyzed for direct causes. From the direct causes, Pre-eclampsia/Eclampsia were the major cause (19.9% of all deaths) (Pembe et al. 2014).

A multicenter, cross-sectional study (Giordano et al. 2014) including 27 centers from all geographic regions of Brazil, carried out in 2014, found that eclampsia is the major cause of maternal morbidity and mortality in Brazil, particularly in low income areas. The study points out that obstetric health care for women with eclampsia, has worse performance in lower income areas in Brazil. Improving the quality of maternal health care and increasing access to obstetric emergency care are essential actions to minimize morbidity and mortality associated with eclampsia.

The researchers defined the main objective of this study to describe the cases of maternal mortality associated with Pre-eclampsia/Eclampsia using a time series, covering the period between 2005- 2013, in the state of Santa Catarina Brazil.

Method

This is a population-based study including a time series covering the period of 2005 to 2013 in the State of Santa Catarina, Brazil. The research population included all women whose death occurred by Pre-eclampsia/Eclampsia across 295 cities of the State of Santa Catarina.

The data were extracted from the Mortality Information System (SIM) of the Ministry of Health, Brazil, through the DATASUS Website (Ministério da Saúde, Brasil 2011), and from the State Health Department of SC. Deaths were identified from information contained in the death certificate, such as: year and region of occurrence and underlying cause. Codes conforming to the ICD 10th revision (Organização Mundial da Saúde 2000) in which diagnoses related to Pre-eclampsia/Eclampsia are defined. Therefore, we included deaths whose cause by category, were classified as:

- 014.0 Moderate pre-eclampsia,
- 014.1 Severe pre-eclampsia,
- 015.0 Eclampsia in pregnancy,
- 015.1 Eclampsia in labor,
- 015.2 Eclampsia in the puerperium,
- 015.9 Eclampsia NE as the period.

The variables included in the study were identified through researches in the literature about the theme. The study variables included:

- **Age:** Number of years lived by each woman, grouped as 15-19 years, 20-29 years and 30-34 years of age, as a basis for comparison.
- **Marital Status:** Categorized as with a partner (described by common-law marriage or co-habiting partner) or without a partner (single, widowed, separated or divorced).
- **Education:** Number of years of attendance at an educational institution, grouped as 1-3; 4-7; 8-11; 12 or more education years.
- **Period of the Death:** Pregnancy, Labour, Abortion and puerperium
- **Location of Occurrence:** Hospital, Home, Public Street and others.
- **Health Regions:** Regional Divisions, defined by the Health Department of the State of SC, contains the health regions that refer to a group of locations that has a similar epidemiological profile and are self-sufficient in all levels of complexity in health. The 16 health regions of SC analysed were: Xanxerê, West, High Uruguai Region, Middle West, Rio do Peixe Valley, Itajai River Mouth, High Itajai Valley, Middle Itajai Valley, Greater Florianópolis, Laguna, Coal Region, Extreme

South, Nordeste, North Plateau, Mountain Range Catarinense, Extreme West.

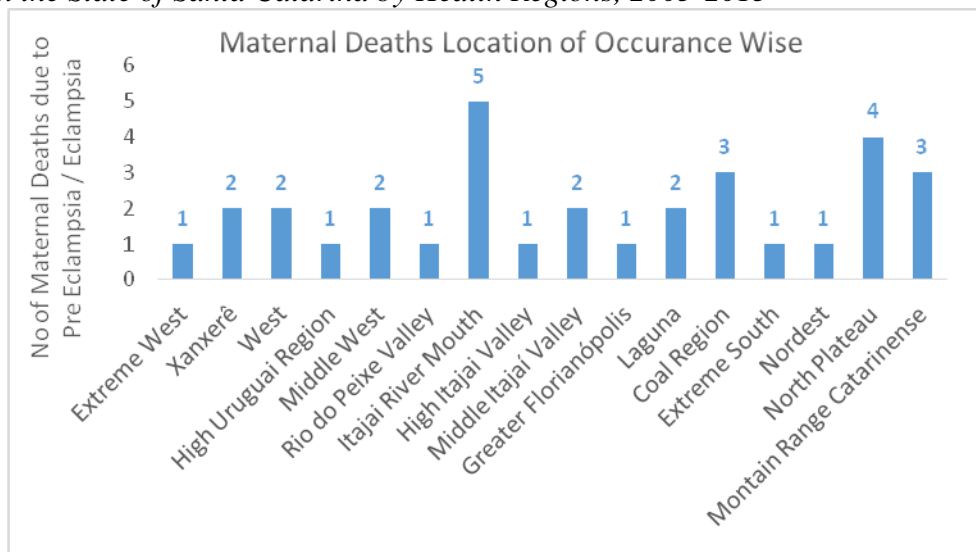
- **Ethical consideration:** The study received ethical approval from the Ethics Committee of the Federal University of Santa Catarina, Brazil in 2013; approval number 120,343.
- **Software Used:** We used *Action 2.8* and *Microsoft Excel* for descriptive statistical analysis.

Results

In the period from 2005 to 2013, in the State of Santa Catarina, 32 out of 256 total maternal deaths related to Pre-eclampsia/Eclampsia were identified, representing 12.5% of the total maternal deaths. In these Pre-eclampsia represent 37.5% and eclampsia represent 62.5%.

The deaths related to Pre-eclampsia/Eclampsia by region in the State of Santa Catarina, in the period of 2005 to 2013, are shown in Figure 1. The highest number of deaths related to Pre-eclampsia/Eclampsia, by region, were found in the Foz do Rio Itajaí, with a value of 15.7% deaths and the lowest were in the northeast region, West, Extreme West, Middle West, Greater Florianópolis and Extreme South, with 3.2% deaths.

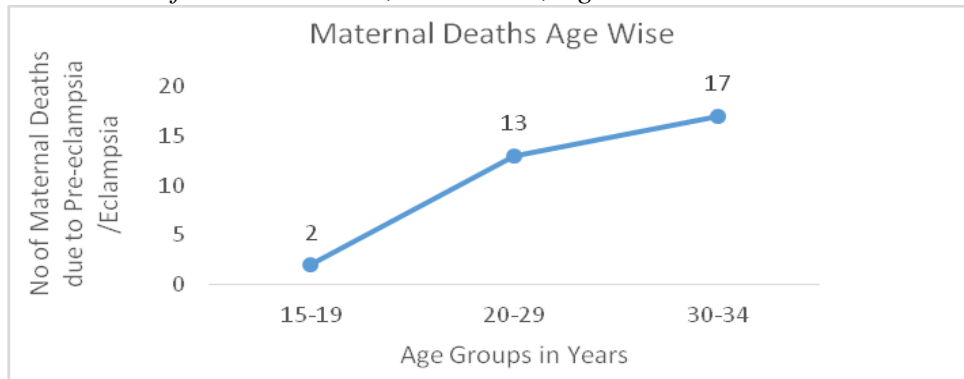
Figure 1. Maternal Mortality specific to Pre-Eclampsia/Eclampsia, Occurring in the State of Santa Catarina by Health Regions, 2005-2013



Source: Authors' estimations.

The majority of deaths related to Pre-eclampsia/Eclampsia were in the age group of 30-34 years, with a value of 53.13% deaths and the lowest percentage was in the age group of 15-19 years, with 6.25% deaths as shown in Figure 2. This indicates that the risk of Pre-eclampsia/Eclampsia increased exponentially with increasing age.

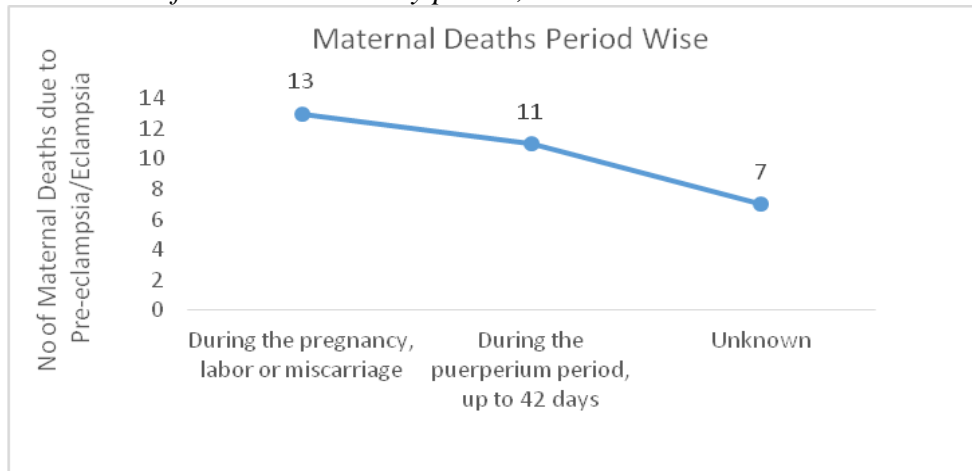
Figure 2. *Maternal Mortality specific to Pre-Eclampsia/Eclampsia, Occurring in the State of Santa Catarina, 2005-2013, Age Wise*



Source: Authors' estimations.

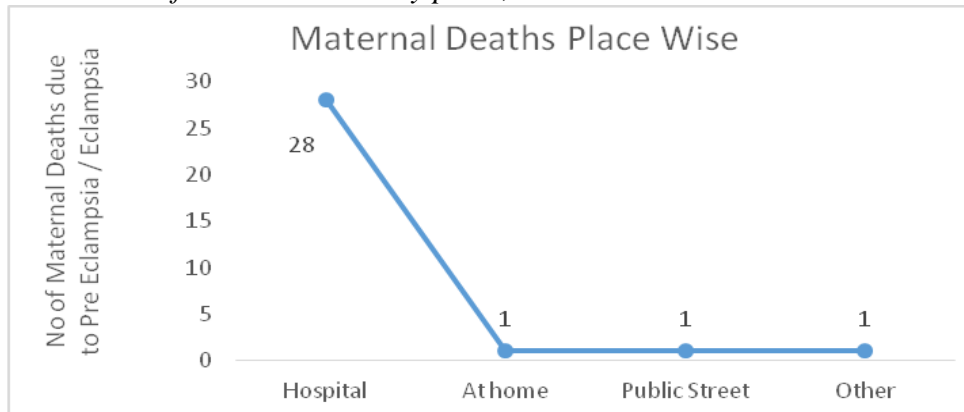
The data presented in Figure 3 shows that the highest number, 40.6%, of maternal deaths occurred during pregnancy, labor or abortion. This indicates the delicacy and complexity of this stage, which requires more attention of nursing care. Figure 4 shows the highest number of maternal deaths, 87.5%, that takes place in hospitals. Figure 5 presents the maternal deaths per year, where the highest value of 21.9% deaths were in 2010 and lowest value of 3.13% deaths were in 2011 and 2013.

Figure 3. *Maternal Mortality specific to Pre-eclampsia/Eclampsia, Occurring in the State of Santa Catarina by period, 2005-2013*



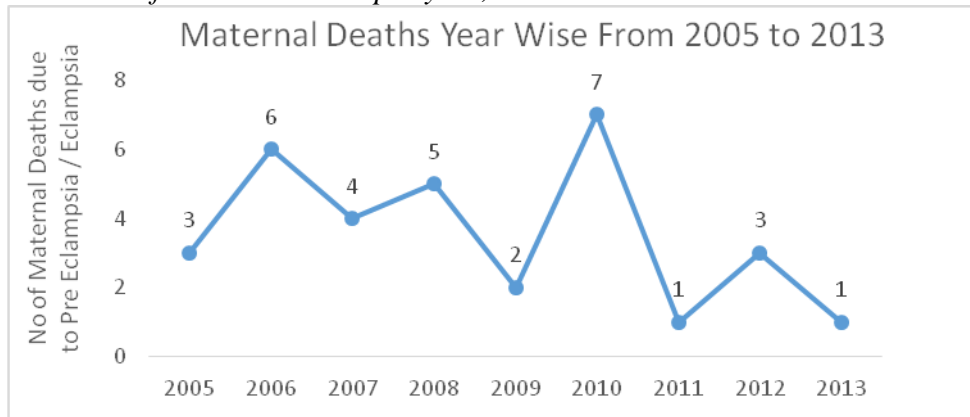
Source: Authors' estimations.

Figure 4. *Maternal Mortality specific to Pre-eclampsia/eclampsia, Occurring in the State of Santa Catarina by place, 2005-2013*



Source: Authors' estimations.

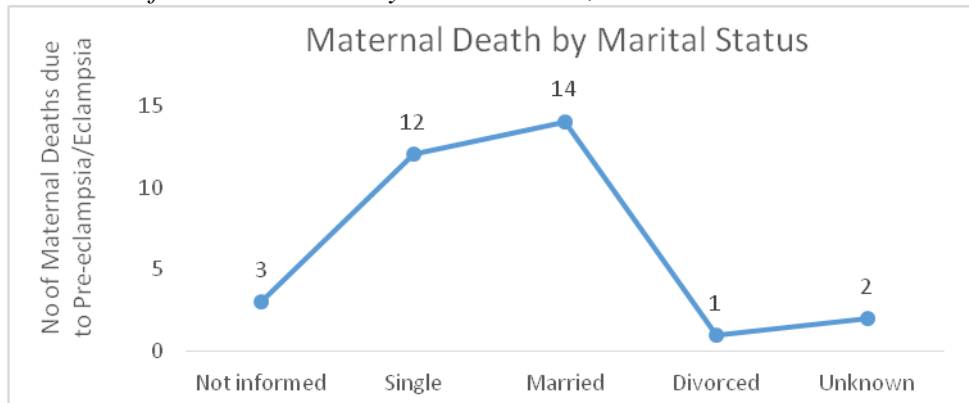
Figure 5. *Maternal Mortality specific to Pre-eclampsia/Eclampsia, Occurring in the State of Santa Catarina per year, 2005-2013*



Source: Authors' estimations.

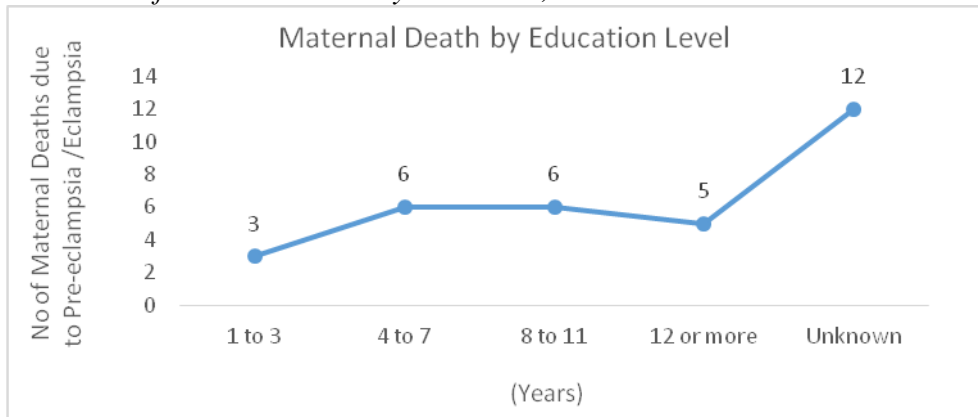
Figure 6 shows the maternal deaths by Pre-eclampsia/Eclampsia by marital status. 43.75% deaths occurred in married women and 37.5% deaths occurred in single women while 3.13% women deaths occurred in divorced women. Similarly, Figure 7 presents the deaths from Pre-eclampsia/Eclampsia by education. The highest value of deaths that occurred were 37.5% deaths with the level of their education unknown. The lowest value was 9.5% of deaths and their education level was 1-3years education.

Figure 6. *Maternal Mortality specific to Pre-eclampsia/Eclampsia, Occurring in the State of Santa Catarina by marital status, 2005-2013*



Source: Authors' estimations.

Figure 7. *Maternal Mortality specific to Pre-eclampsia/Eclampsia, Occurring in the State of Santa Catarina by education, 2005-2013*



Source: Authors' estimations.

Discussions

The rate of maternal deaths including Eclampsia and hypertensive disorders in pregnancy, have decreased steadily over recent years. However in developing countries where maternal mortality is still high, Pre-eclampsia/Eclampsia are the major cause of most of these deaths. Even in countries where maternal mortality is low, pre-eclampsia/eclampsia is responsible for a substantial proportion of deaths (Goldenberg et al. 2011).

For instance, Pre-eclampsia/eclampsia is the second leading cause of maternal deaths in Afghanistan. In a study with 322 eclamptic patients in Afghanistan, 72.7% were diagnosed as pre-eclampsia and the 27.3% as eclampsia. 41.0% among pre-eclampsia patients were aged from 30-39 years and 35.2% among eclampsia patients were aged 29 years or younger (Hamajima et al. 2015).

Similarly in the United States, Pre-eclampsia/Eclampsia impact 5-8% of all births, where as in Canada and in Western Europe pre-eclampsia alone is responsible for 2-5% incidence (Ronsmans and Graham 2006). In the

developing world, Pre-eclampsia/Eclampsia affect all deliveries ranging from a low percentage of 4% to as high a percentage as 18% in parts of Africa (Ronsmans and Graham 2006). The variation in incidence rates is due to the difference in definitions, procedures, tests and other methodologies. In Latin America, pre-eclampsia is the leading cause of maternal death (Preeclampsia Foundation 2010)

In this study, the percentage of maternal deaths from Pre-eclampsia/Eclampsia in the state of Santa Catarina was 12.5% of the total maternal deaths. Among those deaths, Pre-eclampsia was 37.5% and Eclampsia was 62.5%. The highest percentage of deaths was identified in the health of the region of Foz do Rio Itajaí, with a value of 15.7 %, and the lowest was in the northeast region, with 3.2%. The difference in percentage observed in all regions may indicate differences in the quality of existing health care services as well as in the quality of completion of the death certificate.

About 87.5% of maternal deaths occur by Pre-eclampsia/Eclampsia in the hospital and 3.13% deaths occur in home, public streets and others. This also indicates the poor and inappropriate quality of existing nursing care providers in the health care services in the State of Santa Catarina. Figure 7 also suggests that the greater the level of education and awareness the better it is for the wellbeing of the mother.

According to the World Health Organization (2011), the majority of deaths due to Pre-eclampsia/Eclampsia are preventable in the presence of timely and effective care to the pregnant women. Timely and skilled nursing care during birth is one of the most effective "*interventions*" to reduce maternal mortality. For this, careful planning for the development, education and training of human resources in the field of health care and nursing, must be started and executed (World Health Organization 2011).

Pre-eclampsia/Eclampsia are preventable by introducing comprehensive programs based upon local epidemiological studies, focusing attention on health education, a network of easily available healthcare facilities. Retraining of traditional birth attendants to identify the risk factors and early referral to tertiary care centers is also necessary. Intensive care units must be available in every tertiary center for pregnant women. The medical staff should be trained for early detection, management and care of these patients. In this way, we can prevent and control Pre-eclampsia/Eclampsia (Tabassum et al. 2010).

With the help of skilled nurses, we can increase health awareness, improve our health understanding and medical practices, and make a world where mothers are not threatened by eclampsia and other hypertensive disorders of pregnancy (Ramsey et al. 1991).

Qualifying emergency obstetric nursing care and increasing the number of well-equipped health care facilities are a more viable and fast way for the State of Santa Catarina, Brazil, to cope with pregnancy related complications. The clear nursing care protocol and skillful nursing care of Pre-eclampsia/Eclampsia are required for the better maternal as well as perinatal outcomes in the region.

Conclusions

Nurses and other health professionals of the state of Santa Catarina, Brazil can prevent and control Pre-eclampsia/Eclampsia by providing proper and timely quality nursing care during the antenatal period and labour, and by raising awareness in pregnant women about Pre-eclampsia and Eclampsia during the antenatal visit. Nurses can better manage Pre-eclampsia/Eclampsia by enhancing their scientific understanding, improving the quality of their nursing training about obstetric care, introducing innovative nursing care techniques, skills and care protocols.

The current role of nurses in the management of Pre-eclampsia/Eclampsia in Brazil focuses on the protection of maternal wellbeing. However several factors including ethnicity, obesity, chronic hypertension and socio-economics plays a role in the development of Pre-eclampsia/Eclampsia in pregnant women. In addition, difficulty in accessing proper medical care and early diagnosis in lower income areas further worsen the situation (Conde-Agudelo et al. 2000)

Skilled, timely and quality nursing assessments of the signs and symptoms are essential in the detection, monitoring, and effective management of Pre-eclampsia/Eclampsia. Besides, patient education and awareness and supportive environment provided by nurses are also essential. Finally, individually fitted and warm hearted nursing care of pregnant women will further improve the wellbeing of the mother and baby.

Last but not least technological preventive measures, improvement in evidence based practice, education and training of the nursing professionals providing obstetric care are essential in reducing maternal mortality due to Pre-eclampsia/Eclampsia.

There may be several possible limitations in this study. First, the database used for data extraction cannot be taken as a representative of the whole Brazilian population. There might be some cases which are not reported or might have error in reporting. Second, the sample size is relatively small (based on one state out of 26) and might not be enough for generalization. However, it is anticipated that results of this study will not be very different from other states in Brazil and could contribute to further research in enhancing the quality of care for controlling and managing the complications of Pre-eclampsia/Eclampsia.

According to the results of our study about 87.5% of deaths occurred in hospitals. The reasons behind this alarming number of maternal deaths in hospitals should be identified and necessary action should be taken. We aim to further investigate the factors responsible for the deaths of these women.

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