

## **Factors Influencing Early Detection of Preeclampsia in Pregnant Women in Urban and Rural Areas: A Systematic Literature Review**

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**Abstract— Background** The maternal mortality rate (MMR) in Indonesia is currently the highest in Southeast Asia, based on the 2017 Indonesian Demographic and Health Survey (IDHS) the maternal mortality rate (MMR) is 305 per 100,000 live births with 14,623 cases. Antenatal care is one of the key interventions to reduce maternal mortality and achieve the Sustainable Development Goals (SDGs) targets that have been implemented in various countries. The aim of this study was to determine the factors that influence early screening of preeclampsia in pregnant women at the health centre. This research **method** was conducted using Systematic Literature Review by using academic journal search engines from online databases such as Pubmed, Web of Science, Scopus, and Springer Link published between 2012-2022. **Results** the findings of this study found that the factors most associated with early detection of preeclampsia were knowledge of pregnant women towards early detection of preeclampsia and acces to health services.

**Keywords—** Early detection, preeclampsia, pregnant women, urban and rural areas

### **1. Introduction**

Maternal mortality remains a major public health problem. The global maternal mortality rate (MMR) is increasing every year. The global MMR is estimated at 211/100,000 live births or 295,000 maternal deaths every year in the world. Meanwhile, at least 800 women die every day due to complications during pregnancy and or childbirth, especially in developing countries. This figure is 40 times higher than the MMR of countries in Europe, and almost 60 times higher than developed countries. The WHO estimates that half a million women die each year from pregnancy-related causes and 99% of these deaths occur in developing countries. About 75% of maternal deaths are due to direct obstetric complications, including haemorrhage 27%, hypertension 14%, sepsis 11%, abortion 8%, embolism 3% and other direct causes. [1]

The Maternal Mortality Rate (MMR) in Indonesia is currently the highest in Southeast Asia, based on the 2017 Indonesian Demographic and Health Survey (IDHS) the maternal mortality rate (MMR) is 305 per 100,000 live births with 14,623 cases. [2]The direct causes of maternal death (AKI) are caused by preeclampsia and bleeding. In addition, there are indirect causes of maternal mortality at the community level called 3 (three) delays or 3T, namely delay in recognising danger signs, delay in referral, and delay in optimal service. Delay in recognising danger signs can result in late arrival and late referral to health services, so that by the time it is referred the condition is already in an emergency.

Pre-eclampsia is described as a pregnancy-specific syndrome characterised by hypertension (blood pressure = 140/90 mmHg) and proteinuria (protein = 0.3 g in the urine) occurring after

20 weeks of pregnancy in a previously normotensive woman. Severe preeclampsia is characterised by blood pressure = 160/110 mmHg and proteinuria = 5 g with two examinations at least six hours apart. [3] The cause of pre-eclampsia is uncertain, but the condition may be influenced by parity, race, genetic and environmental factors. Pregnancy with pre-eclampsia is more common in primigravida, while in multigravida it is associated with chronic hypertensive disease, diabetes mellitus and renal disease.

## 2. Methods

### 2.1 The Criteria of Eligibility

The eligibility of this study included a) academic journals from online databases such as Pubmed, Web of Science, Scopus, and Springer Link, b) Year of publication between 2012-2023, c) Language in English, d) Outcome measures were factors affecting early detection of preeclampsia in pregnant women at health centres e) Population was pregnant women living in urban and rural areas, f) The research design was any type of study. This study excluded papers without full text or meeting abstracts or papers that did not meet the criteria.

### 2.2 The Search Strategy

With Mendel software, references are managed and duplicates are found automatically. The study selection process includes identification, screening, eligibility and individual studies. The search in the database used Boolean terms in PICO keywords: "Pregnant women" AND "Preeclampsia" AND "Early Detection" AND "factor" OR "determinant" AND "rural" OR "development" AND "urban" OR "developed". Initial identification is based on the title and abstract that are in accordance with the planned PICO. Studies that did not meet the inclusion criteria were then excluded. Selected studies were downloaded in full text and studies were included after critical appraisal. The results of the search are outlined in the following diagram:

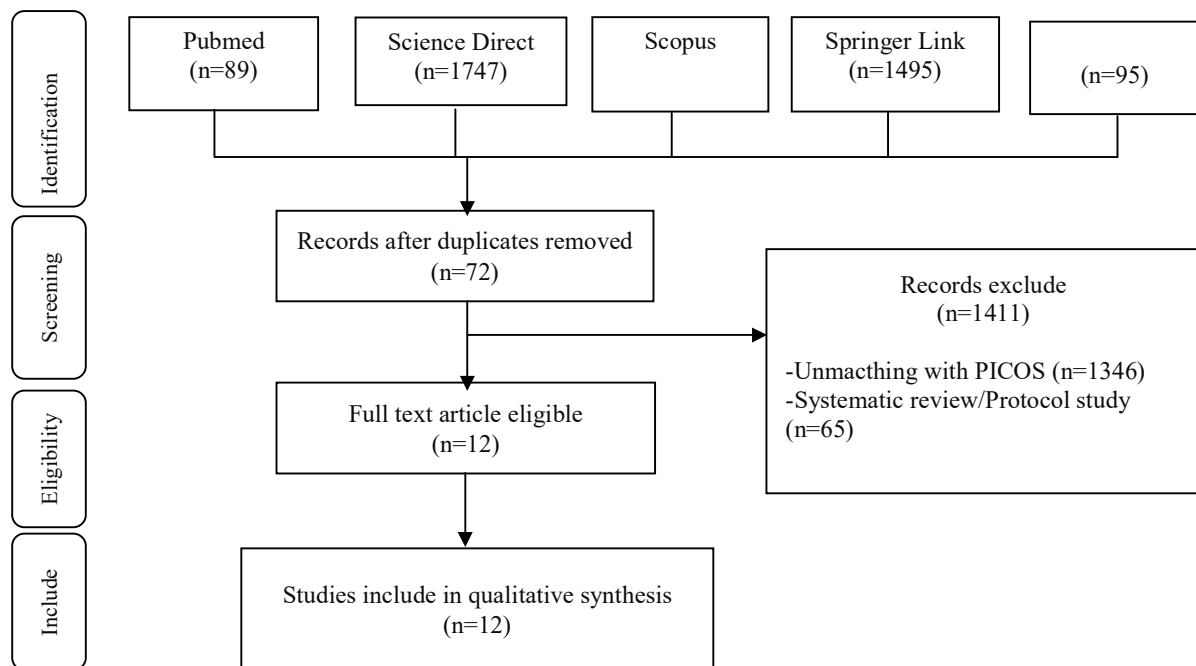


Figure 1. PRISMA Diagram of the Study

### 3. Results

#### 3.1 Characteristics of the Article

This study included 12 articles from all studies related to Factors affecting early detection of preeclampsia in pregnant women at health centers. Years of publication between 2012-2022 were conducted in urban and rural areas such as United Kingdom, Kenya and South Africa, Iran, Morocco, Ethiopia, Chicago, Zambia, and India. Furthermore, the total sample size included in this study was 41,352 pregnant women. In addition, the sampling methods used were random sampling, purposive sampling, and literature review methods. This individual study reported several data sets including *UK NICE Hypertension in Pregnancy data, Kenya and East Africa Hospital data, obstetrician clinics and offices in Kerman, Iran data, CCMO data, TBAS data, Woldya and Lalibela public hospital data, University Medical Center in Utrecht data, University of Chicago data, Hospital in Southern Province of Zambia data, Online data, NRHM data, and Health Pregnancy project versus the common practice in rural Guatemala data.* The characteristics of the articles can be seen in table 1 and 2.

Table 1. Article Characteristics

No	Author/ Year	Study period	Country	Method	Sampling Method	Sample size	Data Set
1	Liza B., Louise P., et al 2021	December 2015- December 2017	United Kingdom	Controlled clinical trial	Randomised	154	UK NICE Hypertension in Pregnancy data
2	Charity N., Georgeo, et al 2020	September 2015- October 2017	Kenya and East Africa	A Retrospective cohort study	Randomised	620	Kenya and East Africa Hospital data
3	Sasa P., Reza K., et al 2019	2018	Kerman, Iran	Case control study	Randomised	110	obstetrician clinics and offices in Kerman, Iran data
4	Fatimah O., Bernice E., et al 2018	N/A	Morocco and Netherlands	Qualitative interview study	Purposive sampling	9 Netherlands and 10 Morocco	CCMO data
5	Boris M., Enma C., et al 2018	April 2016 - March 2017	Guatemala	RCT	Randomised	64	TBAS data
6	Moreday D., et al 2021	February to March 2020	Ethiopia	Case control study	Purposive sampling	- 65 cases - 195 control	Woldya and Lalibela public hospital data
7	Josephus F., et al 2020	N/A	Netherlands	Case control study	Purposive sampling	- 103 cases	University Medical Center

					ing	- 133 control	tre inUtrechtda ta
8	EllieP.,eta l2020	January20 15- March 2017	Chicago	Casecontr olstudy	Purposi vesampl ing	654	University of Chicago data
9	YasuhiroM ., et al2019	January 2017- December 2017	Zambia	Cross - sectio nalstu dy	Purposi vesampl ing	1704	Hospital inSouthernPr ovince ofZambia data
10	PeterV., etal	N/A	India	Meta analysis	Purposive sampling	36008	Online data
11	UmeshC., et al2018	January - March20 13	ElagaviandBag alkotedistrictsof ruralKarnataka, South India	Qualitati ve	Purposi vesampl ing	14	NRHMdata
No	Author/ Year	Study period	Country	Method	Sampling Method	Sample size	Data Set
12	PatrciaH., et al 2016	Septemb er 2012- Novemb er 2013	Guatemala	Observatio nal	Purposi ve samplin g	1509	Health pregnancy versus the common practice in rural Guatemala data

Table 2. Factors affecting early detection of preeclampsia in pregnant women at urban and rural areas

No	Author/ Year	Factors				
		Primary	Secondary			
		Knowledge	Education	Gestational Age	Acces to Health Services	Income
1	Liza B., Louise P., et al 2021	In womenwith chronichyperte nsion the meanpercentag e of days onwhich SMBPreadings were givenwas 77%(IQR 51- 89). A median of81% (IQR71- 96) weeks	Whenlookin g atfactors that may be associatedwit hadherence, there was no evidence of differences based on age, body mass index, ethnicity, education or	Whenlooking atfactors that may be associated withadherenc e, therewasno evidenceof differences based onage, body mass index, ethnicity, educationor	N/A	N/A

		included four or more SMBP readings, and a median of 94% (IQR 78-100) weeks included two or more SMBP readings.	smoking in the chronic hypertension or gestational hypertension groups.	smoking in the chronic hypertension or gestational hypertension groups.		
2	Charity N., George O, et al 2020	N/A	N/A	N/A	Due to the lack of routine record-keeping (e.g. little information on referrals and clinical forms), we were also unable to collect specific data that would help assess more aspects of the clinical management of women referred to KNH from other sites, especially previous medication dosage, mode of administration and treatment.	N/A
3	Sara P., Reza K., et al 2019	The knowledge of mothers exposed to graphical educational tools for pre-eclampsia	the increase in education level after the intervention had no significant	Improvement in education level after the intervention had no significant association	Educating people about pre-eclampsia can lead to early recognition of the signs and	N/A

		increased by 8% and 22%, respectively. This was compared to mothers who were exposed to standardised pamphlets or who did not receive education.	relationship with education level, residence, occupation, number of pregnancies and gestational age of pregnant women, education through mobile-based applications was equally beneficial for all demographic groups	with education level, residence, occupation, number of pregnancies and gestational age of pregnant women, education through mobile-based applications was equally beneficial for all demographic groups.	symptoms of the condition and timely referral to a healthcare provider, resulting in appropriate care and treatment and subsequently better outcomes for the health of the mother and her baby.	
4	Fatimah O., Bernice E., et al 2018	Most women stated that they received no or little information about potentially dangerous symptoms in pregnancy from their midwife or obstetrician. Some women would look for information on the internet.	Most of the women interviewed in Morocco were illiterate or had low education. Although many studies in Morocco have shown a link between maternal morbidity and education, it seems that the latter is not the most dominant factor in women's lack of knowledge about HDP. In another context, other studies have argued in their research that women,	N/A	The responses of pregnant women in Morocco about their behaviour in case of risk are mixed between seeking help from health professionals or the use of traditional medicines, indicating their ignorance with the disease and its impact on their health and the health of their fetus.	N/A

			regardless of literacy levels, have a poor understanding of preeclampsia.			
5	Boris M., Enma C., et al 2018	N/A	N/A	The primary outcome is the number of monthly referrals to facility-level care from TAB for maternal and perinatal complications, adjusted for monthly birth volume.	Our findings suggest that the introduction of such technology in TBA practice is feasible and could lead to improvements in the detection of pregnancy and labour complications and timely referral of patients to hospital care.	The high number of maternal and child deaths due to preeclampsia impacts Guatemala's rural indigenous Mayan population, where perinatal and maternal mortality rates are much higher than the non-indigenous Guatemalan population.
6	Moreday D., et al 2021	Those who could read and write were three times [AOR=3.22, 95%CI: (1.05-9.84)] and attended primary school were 7 times [AOR =7.02, 95%CI: (1.57-31.45)] more likely to develop preeclampsia than those who could not read	N/A	WHO recommends that pregnant women be screened for preeclampsia during their second and third antenatal visits at 32 weeks, health workers may skip screening women for preeclampsia at four or more ANC visits if women have	N/A	N/A

		and write.		had no problems in their previous visits.		
7	Josephus F., et al 2020	Current knowledge gaps including the safety and impact of telemonitoring on (early) detection and/or prediction of complications and its effect on subsequent interventions such as medication use and hypertension control, induction of labour, optimal corticosteroid administration	N/A	Starting self-monitoring at 30-36 weeks gestation, fewer visits were required with self-monitoring compared to the retrospective group with traditional care in both studies.	More importantly, the switch from hospital to home care did not appear to negatively impact pregnancy outcomes, although the study sample size was likely not large enough to determine this.	N/A
8	Ellie P., et al 2020	N/A	Previous population-based studies have shown an increased risk of SMM in patients who are non-white, less educated, entering pregnancy with pre-existing medical conditions, or have Medicaid/Medicare insurance.	It is therefore an opportunity to improve the training of doctors, nurses and support staff to ensure more timely and universal treatment for sustained severe blood pressure.	N/A	N/A
9	Yasuhiro M., et al 2019	N/A	In addition, education to pregnant	Information on maternal characteristic	In addition, education to pregnant	High-income countries

			women is considered important because they tend to visit health facilities only after their condition is really severe. We need to encourage them to go to antenatal clinics for blood pressure checks and go to health facilities as soon as possible when they have some danger signs such as headaches, blurred vision and epigastralgia, etc.	s such as maternal age, parity and gestational age of delivery were collected in each category. Perinatal and maternal outcomes were analysed in each category. Information on mode of delivery, birth weight, number of stillbirths, Apgar score and number of neonatal deaths were collected as perinatal outcomes.	women is considered important because they tend to visit health facilities only after their condition is really severe. We need to encourage them to go to antenatal clinics for blood pressure checks and go to health facilities as soon as possible when they have some danger signs such as headaches, blurred vision and epigastralgia, etc.	have been able to reduce the incidence and case fatality rates associated with eclampsia by about 90% using a combination of early detection with blood pressure and urine protein measurements during perinatal care and improved access to hospital care for timely induction of labour or cesarean delivery for women experiencing severe PE.
10	Peter V., et al 2020	Once individual participant consent was obtained, data were collected on basic individual- and household-level information, antenatal care, and maternal, foetal, and	The three-cluster randomised controlled trial focused on counselling and education at home or home visits by traditional birth	The exception was neonatal morbidity, which was increased among those with eight or more visits (vs no visits) and was not associated with differences in gestational age	N/A	N/A

		neonatal adverse outcomes up to 6 weeks after birth (for mothers) or 28 days after birth (for neonates).	attendants asking about warning symptoms of pregnancy complications.	at delivery (mean 39 weeks in intervention and control groups).		
11	Umesh C., et al 2018	Most community leaders agreed that ASHAs can safely measure BP at home; however, some had concerns about their knowledge, education, effectiveness, training, Experience and supervision. Overall, there was acceptance of ASHAs being assigned to measure BP at home once they were appropriately trained.	Most community leaders agreed that ASHAs can safely measure BP at home; however, some had concerns about their knowledge, education, effectiveness, training, Experience and supervision. Overall, there was acceptance of ASHAs being assigned to measure BP at home once they were appropriately trained.	N/A	Pregnant women and female decision-makers were also in favour of this because ASHA was in their area and lived nearby; and would be helpful during emergencies, as reported by other studies	N/A
12	Patricia H., et al 2016	CF is visited by a health professional (qualified nurse) approximately once a month, but the nurse does not have the resources or knowledge to perform additional	Although the study was based on nonrandomised groups, and therefore, it was not possible to statistically evaluate the significance of the results,	N/A	N/A	N/A

		<p>medical tests such as ultrasound scans or blood tests.</p>	<p>the intervention and control groups were highly homogeneous (income level, education, distance to health facilities, etc.) as they all came from the same community and were attended by the same CF. The size of both groups was determined by the number of possible visits during the intervention period.</p>			
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**3.2 The Knowledge and Practice of Early Preeclampsia Screening**

Most of the above studies reported the presentation of knowledge of early detection screening on each indicator, while others did not report an increase in preeclampsia early detection screening after the intervention. In addition, one other study reported the mean score of knowledge of preeclampsia early screening and factors related to it.[4] In practice, most studies reported the percentage of attendance at the screening process at the health facility.

**3.3 Education of Pregnant Women and Their Relationship with Preeclampsia**

Few studies have described the relationship between early screening for preeclampsia and maternal education, (Ouasmani et al., 2018) Although many studies use education as one of the *baseline* demographics to describe the research sample. However, some studies also explain how important the level of education of pregnant women is to the occurrence of preeclampsia cases.[5]

**3.4 Gestational Age**

Many studies have shown that early screening for preeclampsia at a certain gestational age can minimise the occurrence of preeclampsia in pregnant women. However, there are not

many studies that explain the relationship between early screening for preeclampsia and gestational age.[6]

### **3.5 The Access to Health Services**

The majority of studies describe the relationship between ease of access to health services and preeclampsia screening behaviour. In one study, it was explained that the support of health workers influenced the delivery of information and the behaviour of early preeclampsia screening.[7] In rural areas, preeclampsia early screening is less carried out when compared to urban areas, one of the main factors for this is the lack of access to health services in rural areas.[8]

### **3.6 Income**

There are not many studies that discuss income and its relationship with early screening for preeclampsia.[9] However, there is one study that explains that family income is a factor in high cases of preeclampsia in pregnant women, especially in rural areas.[10]

## **4. Discussion**

### **4.1 Characteristics of the Article**

This study describes the knowledge and practice of early screening for preeclampsia in pregnant women including the factors that influence it. The most common studies were conducted in *the United Kingdom, Kenya and South Africa, Iran, Morocco, Ethiopia, Chicago, Zambia, and India*. Factors influencing early screening for preeclampsia were reported from significant results in each study, therefore the results could not report variables that did not have a significant association. Some studies reported on the subjective interview results of each individual, but there were some studies that reported in the form of quantitative research or numbers. Furthermore, this study focuses on Urban and Rural Areas, and shows a comparison of the two areas. Several articles mention factors that influence the behaviour of early screening for pre- eclampsia including describing the high incidence of pre-eclampsia among pregnant women in areas such as *Ruwanda, Ethiopia and India*. Rural areas have a higher number of maternal and child deaths when compared to urban areas. In some studies, it has been found that socioeconomic factors are behind this.

#### **4.1.1 Knowledge and Practice of Early Preeclampsia Screening**

Knowledge is one of the factors discussed in the above studies. Increased knowledge is considered to improve preeclampsia early detection behaviour in both urban and rural areas. Pregnant women's own knowledge is obtained from various sources, ranging from newspapers, health workers, and the internet. Even eight studies mention that knowledge is the main factor in increasing early detection of preeclampsia.[11]

#### **4.1.2 Education of Pregnant Women and Their Relationship with Preeclampsia**

Some studies did not explain the direct relationship between pregnant women's education and preeclampsia early screening rates. Even in one of the studies explained and describes the level of early screening with the level of income, education, distance to health facilities because the sample used is too homogeneous.[12]

#### **4.1.3 Gestational Age**

The gestational age is one of the factors in knowing the occurrence of preeclampsia in pregnant women. At a certain gestational age, preeclampsia screening can be done. However, the relationship between gestational age and the rate of early screening for preeclampsia in

pregnant women is unknown. This is because there are few studies that explain this.[13]

#### 4.1.4 The Access to Health Services

Access to health services is widely discussed in studies on early screening for preeclampsia. The studies also explain the important role of health workers in providing information to pregnant women about the importance of early preeclampsia screening. Some studies also explain the differences in access to health services in urban and rural areas that cause early preeclampsia screening cannot be done.[14]

#### 4.1.5 Income

Income does not directly influence early screening for preeclampsia. This is because there are few studies that make income the main research variable. The income variable is only used as a *baseline* study to describe the distribution of the sample used.[15]

### 5. Conclusion

In the last 10 years, there has been limited research on factors influencing early detection of preeclampsia among pregnant women in health centres. However, the results of this study can be used as a basis for future research related to early detection of preeclampsia in other developing countries, especially Indonesia. Furthermore, the findings of this study found that the factors most associated with early detection of preeclampsia were knowledge of pregnant women about early detection of preeclampsia and access to health services.

### 6. Acknowledgments

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