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Maternal Mortality Risk Factors Based On An Epidemiological Approach

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ABSTRACT

Maternal mortality remains a serious public health problem, especially in developing countries. The Maternal Mortality Rate (MMR) is an important indicator in assessing the level of public health and the quality of maternal health services. An epidemiological approach is used to identify risk factors contributing to maternal mortality through an analysis of people, place, and time. This article aims to examine the risk factors for maternal mortality based on an epidemiological approach. The method used is a literature review of epidemiology textbooks, national health reports, and scientific journals. The results of the study indicate that risk factors for maternal mortality include biological, behavioral, socioeconomic, access to health services, and health care system factors. It is concluded that preventing maternal mortality requires a comprehensive and cross-sectoral approach.

Keywords: Maternal Mortality, Risk Factors, Epidemiology, Maternal Health





1. Introduction

Maternal mortality is defined as the death of a woman during pregnancy, childbirth, or within 42 days of termination of pregnancy, caused by conditions related to or aggravated by the pregnancy or its management. The maternal mortality rate (MMR) remains relatively high and poses a major challenge to health development.

An epidemiological approach plays a crucial role in understanding the patterns and determinants of maternal mortality. By analyzing the distribution and causal factors of maternal deaths, prevention efforts can be designed more precisely. The classical epidemiological model divides risk factors into three main components: the host (mother), the agent (direct cause), and the environment.

Various studies have shown that maternal mortality is not solely caused by obstetric complications, but is also influenced by social, economic, and healthcare system factors. Therefore, examining risk factors for maternal mortality using an epidemiological approach is crucial for reducing maternal mortality.

2. Research Methods

a. Types and Design of Research

This research uses a literature study method (literature study) review with an epidemiology-based descriptive-analytical approach. This design was chosen to identify, analyze, and synthesize various scientific findings related to maternal mortality risk factors by reviewing aspects of the person (host), direct cause (agent), and environment and service system (environment).

An epidemiological approach is used to comprehensively understand the distribution patterns of maternal deaths and the determinants that influence them.

b. Epidemiological Approach

This study adopts classical and modern epidemiological approaches, including:

- 1) Descriptive epidemiological approach (person, place, time).
- 2) Framework of maternal mortality determinants (direct and indirect factors).
- 3) Model Three Delays, namely:
 - Delay in making decisions
 - Delay in reaching health facilities
 - Delay in receiving adequate service

This approach allows for a more comprehensive analysis of the causes of maternal death.

c. Research Data Sources

The data in this study comes from secondary data, which includes:

- 1) Primary Sources
 - Reputable national and international journal articles.





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- WHO, UNFPA, and UNICEF publications.
- 2) Secondary Sources
- Textbook of epidemiology and obstetrics
 - Official report of the Ministry of Health of the Republic of Indonesia
 - Perinatal surveillance and audit report
- d. Literature Search Strategy**
- Literature search was conducted systematically through databases:
- PubMed
 - Google Scholar
 - ScienceDirect
- Keywords used include:
- *Maternal mortality*
 - *Risk factors*
 - *Epidemiology*
 - *Three delays model*
 - *Maternal health services*
- e. Literature Inclusion and Exclusion Criteria**
- **Inclusion Criteria**
- 1) Articles and reports discussing maternal mortality
 - 2) Using an epidemiological or public health approach
 - 3) Publications in the last 10–15 years
 - 4) Available in full text (*full text*) text
 - 5) Speak Indonesian or English
- **Exclusion Criteria**
- 1) Articles not relevant to maternal mortality risk factors
 - 2) Publication of opinions without scientific basis
 - 3) Articles with unclear methodology
- f. Literature Selection Procedure**
- The literature selection process is carried out through the following stages:
- 1) Identify the title and abstract
 - 2) Topic suitability filtering
 - 3) Assessment of the feasibility of the methodology
 - 4) Full text review
 - 5) Determination of selected literature for analysis
- g. Data collection technique**
- Data collection is carried out by:
- 1) Record important information from each source





- 2) Grouping data based on host, agent, and environment factors
- 3) Identifying similarities and differences in findings between literature

h. Data Analysis Techniques

The data was analyzed qualitatively descriptively, with the following steps:

- 1) Classification of maternal death risk factors
- 2) Analysis of the relationship between risk factors and maternal mortality events
- 3) Interpretation of findings based on epidemiological theory and framework
- 4) Synthesis of study results into a scientific narrative description

i. Data Validity and Validity

To maintain data validity, the following is done:

- 1) Triangulation of sources (journals, books, official reports)
- 2) Selection of literature from reliable sources
- 3) Comparison of results between studies

j. Methodological Limitations

This research has limitations in the form of:

- Dependence on the quality and completeness of the literature
- Not using primary data
- Variations in methods of literature sources

The literature study approach still provides a broad and in-depth picture of the risk factors for maternal mortality.

k. Research Ethics

This research does not involve human subjects directly, so it does not require *ethical considerations. clearance*. However, the principles of academic ethics are maintained by:

- 1) Correct citation of reference sources
- 2) Avoiding plagiarism
- 3) Respect the author's copyright

3. Results And Discussion

a. Discussion Results

- 1) Risk Factors Based on Host Characteristics

Table 1.

**Distribution of Maternal Death Risk
Factors Based on Individual Characteristics (Host)**

Host Factors	Risk Category	Impact on Maternal Mortality
Mother's age	<20 years	Risk of anemia, prolonged labor
	>35 years	Risk of preeclampsia, bleeding
Parity	Grand multipara	Atonia uterine bleeding





Host Factors	Risk Category	Impact on Maternal Mortality
Nutritional status	Anemia, KEK	Infection, bleeding
Comorbidities	Hypertension, heart	Pregnancy complications

2) Distribution of Maternal Deaths Based on Direct Cause (Agent)

Table 2.
Distribution of Direct Causes (Agents) of Maternal Death

Direct Cause	Sample case	Dominant Proportion*
Bleeding	Postpartum hemorrhage	Tall
Pregnancy hypertension	Preeclampsia / eclampsia	Tall
Infection	Puerperal sepsis	Currently
Obstructed labor	Obstructed labor	Currently
Abortion complications	Unsafe abortion	Low–Medium

Description: based on national and international literature trends.

3) Distribution of Maternal Mortality Based on Place (Environment)

Table 3.
Environmental and Social Risk Factors (Environment)

Environmental Factors	Risk Conditions	Impact
Geographic access	Remote area	Delay in referral
Socio-economic	Low income	ANC is not optimal
Mother's education	Low education	Lack of recognition of danger signs
Culture	Traditional beliefs	Non-medical delivery

4) Distribution of Maternal Deaths by Time

Table 4.
Distribution of Maternal Deaths Based on Time of Occurrence

Period	Risk of Death
Trimester I–II	Low
Third Trimester	Increase
Intrapartum	Tall
≤24 hours postpartum	Very high





Period	Risk of Death
2–42 days postpartum	Tall

5) Three Analysis Delays Model

Table 5.
Risk Factor Analysis
Based on the Three Model Delays

Types of Delays	Causative factor	Impact
Delay I	Not recognizing danger signs	Too late to seek help
Delay II	Transportation & distance	Late arrival at the facility
Delay III	Limited human resources & facilities	Suboptimal handling

6) Summary of Key Findings

Table 6.
Summary of Maternal Death
Risk Factors and Prevention Efforts

Risk Factors	Level	Prevention Efforts
Age & parity	Individual	Education & Family Planning
Anemia	Individual	Fe Supplementation
Bleeding	Clinical	PONED/PONEK
Reference access	System	Strengthening transportation
Quality of service	System	perinatal audit

b. Discussion

1) Host Agent Environment Integration

The epidemiological approach emphasizes that obstetric complications (agents) become fatal when vulnerable hosts (extremes of age, anemia) are in an unfavorable environment (weak access & systems). Therefore, a single focus on clinical is insufficient.

2) Bleeding and Hypertension: Critical Points for Intervention

Postpartum hemorrhage and preeclampsia/eclampsia are time-sensitive conditions. The availability of uterotonics, MgSO₄, blood, and a trained team is crucial for maternal safety. Strengthening BEONC/BEONC and rapid referral are key.

3) The Role of Quality ANC





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ANC is not just about frequency, but also quality: anemia/hypertension screening, birth planning, and complication preparedness. Quality ANC reduces Delays I and III.

4) Three Delays as a Program Framework

This framework helps map intervention points: family education (Delay I), transportation/referral (Delay II), and service quality (Delay III). Programs that target only one delay tend to be less effective.

5) Health System Implications

Strengthening human resources, availability of essential drugs, blood banks, maternal -perinatal audits, and referral management are key determinants. Global recommendations from the World Health Organization The organization emphasizes system-based EPMM.

6) National Context

Reports from the Indonesian Ministry of Health and the United Nations show regional disparities; interventions need to be area-based.

7) Limitations of the Study

- Depends on the quality of the literature.
- Variation in definitions and methods between studies.
- Not using primary data.

Further research is recommended using multivariate analytics and case audits.

4. Conclusion And Suggestions

a. Conclusion

Maternal mortality risk factors based on an epidemiological approach include individual maternal factors, direct obstetric causes, the socioeconomic environment, and the health care system. The epidemiological approach provides a comprehensive picture of the determinants of maternal mortality.

b. Suggestion

- 1) Continuous strengthening of maternal health services.
- 2) Improving women's education and empowerment.
- 3) Improvement of the referral system and quality of obstetric services.
- 4) Further research with an analytical approach to measure the magnitude of the risk of each factor.

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