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Factors associated with the prevalence of anemia in pregnancy: a scoping review

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ABSTRACT

Backgroud: Anemia initially begins with low hemoglobin with respect to the number and quality of healthy red blood cells decrease. It thereby reduces the oxygen transported in the tissues. Anemia is one of the main causes of maternal morbidity and mortality, especially in developing countries. During pregnancy, the expansion of red blood cell mass increases oxygen transport and iron transfer to the placenta and the fetus. **Purpose:** This study seeks to determine the factors associated with the prevalence of anemia in pregnant women. **Method:** The method used consisted of five stages of the identification of scooping review questions with the PEOS framework (Population, Exposure, Outcomes, Study). The identification of relevant articles was carried out using databases such as Wiley Online Library, PubMed, and ProQuest. Article selection employed The Joana Briggs Institute, data charting as well as arranging, summarizing, and reporting the results. **Results:** From 105 articles, 44 articles with relevant titles and abstracts were obtained. 9 articles met the inclusion and exclusion criteria. Five factors associated with the prevalence of anemia in pregnancy were found. They are maternal age, gestational age, parity, birth spacing, and socioeconomic factor. **Conclusion:** This study concludes that five factors associated with the prevalence of anemia among pregnant women are maternal age, gestational age, parity, birth spacing, and socio-economic factor.

1. Introduction

Anemia usually starts with low hemoglobin that the number and quality of healthy red blood cells decrease. It reduces the oxygen transported in the tissues. It can occur in all age groups, especially in pregnant women (Anato & Loha, 2019). Anemia in pregnancy is determined according to pregnancy trimester. It is considered to be anemia if in the first and third trimesters (TM), the hemoglobin count is less than 11 g/dL and for the second trimester is less than 10.5 g/dL. Based on data from the World Health Organization (WHO), anemia is considered a mild public health problem if the prevalence of anemia is between 5%-19.9%, a moderate public health problem if the prevalence is between 20%-39.9% and, a severe public health problem if the prevalence is ≥ 40%. Currently, worldwide, around 32.4 million (38.2%) pregnant women are affected by anemia and it is a high burden in developing countries, especially in Southeast Asia and Africa (World Health Organization, 2018).

Data from the Basic Health Research (Riskesdas) in 2018 showed the prevalence of anemia in pregnancy increased by 37.1% in 2013 and 48.9% in 2018. Referring to Yulianti (2018) in Alamsyah (2020), in Indonesia, it is estimated the emergence of 41 cases of anemia daily with 20 death of women due to anemia. Anemia is a cause of maternal morbidity or mortality, especially in developing

countries with maternal and fetal consequences. The high prevalence of anemia during pregnancy can lead to high mortality in women due to pregnancy problems such as bleeding during pregnancy or after childbirth (Berhe, Legese, et al., 2019; Sirenden et al., 2018). Pregnant women with anemia can also lead to premature birth, intrauterine growth restriction, perinatal mortality, and low birth weight (Astuti, 2016; Chowdhury et al., 2015).

Pregnant women have a higher risk of developing anemia, given the increased need for iron (Anjarwati & Ruqoiyah, 2020). During pregnancy, the expansion of red blood cell mass increases oxygen transport and iron transfer to the placenta and the fetus. The global prevalence of pregnancy with anemia is 41.8%. In Africa, the prevalence of anemia is 55.8% which is higher than the prevalence in Asia (41.6%), and Europe (18.7%).

Pregnancy with anemia is a global health problem, especially in developing countries where there is an inadequate diet and lack of prenatal vitamins, as well as nutritional deficiencies of iron and folate, which affects physical health and mental development (Derso et al., 2017; Lin et al., 2018). Every year anemia causes >115,000 maternal and 591,000 perinatal mortalities globally. This is the most common problem during pregnancy. 56% of pregnant women with anemia are in low and middle-income countries.

The factors that lead to anemia in pregnant women include gestational age, maternal age, economic status, education level, compliance with iron tablet consumption, and parity. Ariyani (2016) in Wasaraka (2019) states that factors associated with anemia in pregnancy are maternal age, gravidity, Chronic energy deficiency (CED) status, antenatal care (ANC), husband's support, knowledge, economic status, culture, education level, and birth spacing. Efforts that can be made to reduce the prevalence of anemia in pregnant women include early detection of anemia through hemoglobin tests during antenatal care and iron supplementation in pregnancy (Dewi et al., 2019). 90 Fe tablets are given to pregnant women as stipulated in the Regulation of the Minister of Health No. 88 of 2014 concerning standards of Fe tablets for pregnant women (Astriana, 2017; Wasaraka, 2019).

2. Methods

The method carried out in this study consists of five stages. The stages include the identification of scooping review questions with the PEOS framework (Population, Exposure, Outcomes, and Study). The identification of relevant articles was carried out using databases such as Wiley Online Library, PubMed, and ProQuest. Article selection employed The Joana Briggs Institute, data charting as well as arranging, summarizing, and reporting the results (Ayaz et al., 2020; Hoffman et al., 2020).

2.1. Identify the review question or focus of the review

This scoping review explored the factors associated with the prevalence of anemia in pregnancy. There is a need for a literature review to look for intervention factors for hypertension in reducing maternal mortality and the complications for newborns by identifying key concepts, gaps in research, and the type and sources of evidence to inform practice, policy, and research on family or community implementation. The final result is a review of the question that reads 'What are the factors associated with the prevalence of anemia in pregnancy?

2.2. Framework PEOS

In developing the review focus and search strategy, the researcher used the Population, Exposure, outcome, and Study Design (PEOS) Framework in arranging and completing the review focus described in Table 1. The use of the PEOS framework helped identify key concepts in the focus questions, develop appropriate search terms to describe the problem, and determine the inclusion and exclusion criteria (Anggreni, 2020).

Table 1. PEOS Framework

P (Population)	E (Exposure)	O (Outcome)	S (Study Research)
Pregnant woman	Anemia	Maternal age, gestational age, parity, birth spacing, and socioeconomic factor	Original Articles, qualitative and quantitative studies

2.3. Identifying Relevant Studies

A literature search in this scoping review used databases such as PubMed, Wiley Online Library, and ProQuest. The literature used in this study was obtained through a comprehensive literature search. The literature search method used articles from 2010 to 2020 by restrictions on articles in English and Bahasa Indonesia, original articles, and the keywords are included in the title/abstract (Kebede et al., 2018; Rahayu, 2017; Singal et al., 2018).

Articles were extracted from Pubmed, Willey, and ProQuest electronic databases. The search used keywords (Factors) OR (Risk Factors) AND (Pregnant Women) OR (Pregnancy) OR (Pregnant) AND (Anemia)) (Astuti & Kulsum, 2018). The articles were screened according to the criteria determined by the researcher as well as to the questions. The search strategy was carried out using a Boolean operator strategy by adding AND, OR in the search (Wemakor, 2019). Merging search terms using AND resulted in article citations containing all search terms and making the desired results more focused. The search was added OR to search for certain terms in the article by combining synonyms and related terms.

2.4. Study Selection

The selection of research articles was based on inclusion and exclusion criteria. The inclusion and exclusion criteria are described in Table 2.

Table 2. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
- Articles published in 2010-2020	- Opinion article
- Articles from developed and developing countries	- Review article
- Articles published in English and Bahasa Indonesia	- Report/book
- Articles discussing the anemia in pregnancy	

PRISMA serves to track and write down the number of sources examined, selected, or discarded for later use such as in a systematic review of meta-analyses PRISMA has a flowchart that provides details of the four main stages in the review process, consisting of identification, screening, eligibility, and inclusion (Ayaz et al., 2020; Taner et al., 2015).

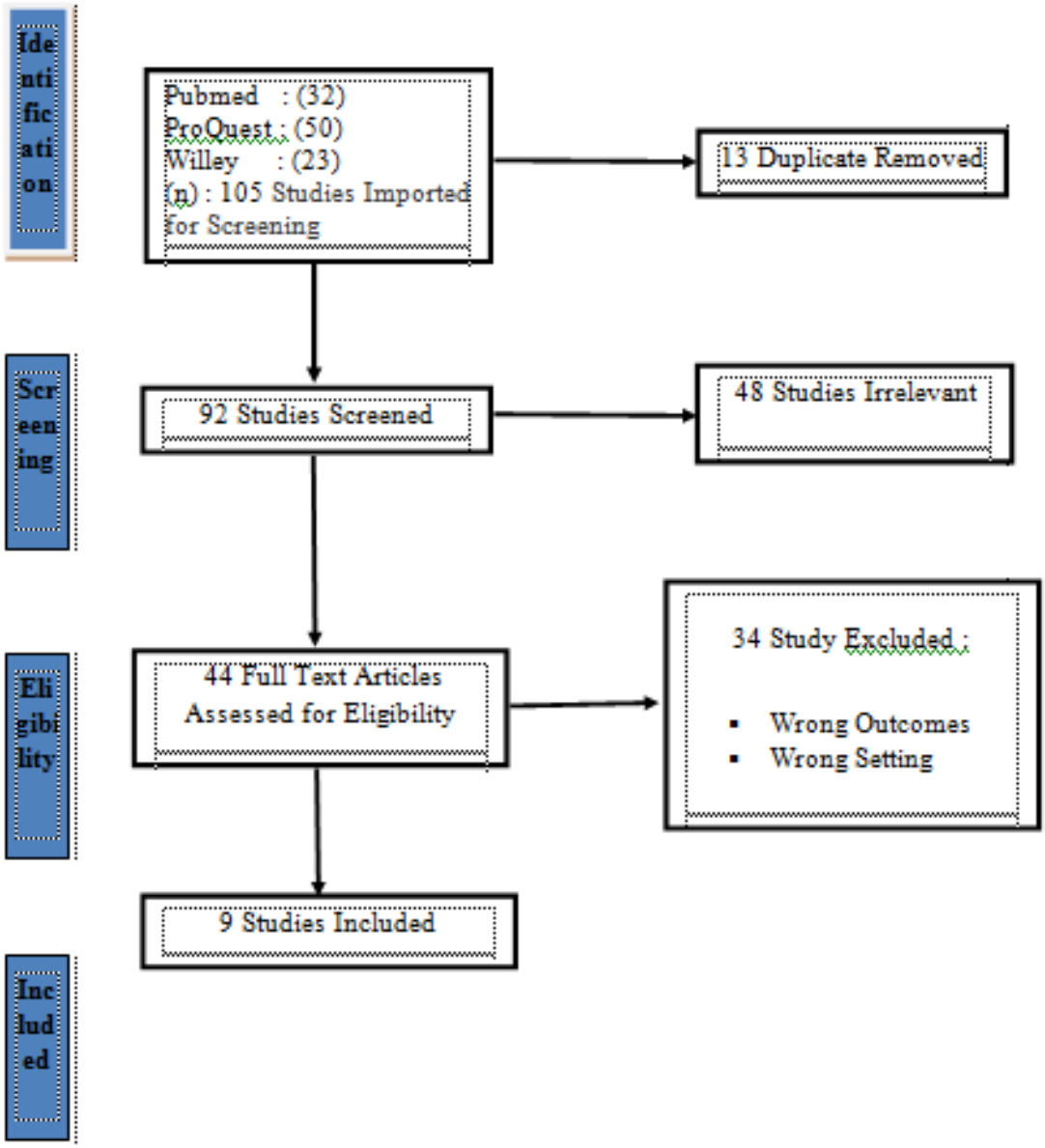

Fig. 1. Prisma Diagram

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2.5. Data Charting

Table 3. *Data Charting* Faktor yang Mempengaruhi Kejadian dalam Kehamilan

No.	Author/ Year/ Title	Country	Purpose	Research Design	Data Collection	Population and Sample	Results
1.	(Gudeta et al., 2019) Magnitude and factors associated with anemia among pregnant women attending antenatal care in Bench Maji, Keffa and Sheka zones of public hospitals, Southwest, Ethiopia, 2018: A cross - sectional study.	Ethiopia	To assess the magnitude and factors associated with anemia among pregnant women attending antenatal care in Bench Maji, Keffa, and Sheka zones of public hospital, southwest, Ethiopia.	Cross-sectional study	Data were collected using anthropometric measurements and pre-test questionnaires.	Sample Size: 1871 All third-trimester pregnant women attended antenatal care at MTUTH Public Hospital, Tepi, Gebretsadik, Shawo, and Wacha.	The themes obtained from this study, that affect the prevalence of anemia in pregnancy are maternal age, gestational age, number of family members, nutritional status, level of education, caffeine, and alcohol use.
2.	(Mahamoud et al., 2020) Prevalence of Anemia and Its Associated Socio-Demographic Factors Among Pregnant Women Attending an Antenatal Care Clinic at Kisugu Health Center IV, Makindye Division, Kampala, Uganda	Uganda	To determine the prevalence of anemia and Associated Socio-Demographic Factors among pregnant women attending antenatal care clinic at Kisugu Health Center IV, Makindye Division, Kampala, Uganda.	Cross-sectional study	Data collection used laboratory analysis of blood samples to determine hemoglobin concentration, and a structured questionnaire to obtain socio-demographic factors associated with anemia during pregnancy.	Sample Size :345 Pregnant women who attend antenatal care at Kisugu Health Center IV.	The themes obtained from this study, factors associated with the prevalence of anemia among pregnant women are gestational age, marital status, education, occupation, and parity.
3.	(Anato & Loha, 2019) Prevalence of anemia and associated factors among pregnant women in Southern Ethiopia: A community based cross-sectional study	Southern Ethiopia	To determine the prevalence of anemia and associated factors among pregnant women in Lemo District, Southern Ethiopia.	Cross-sectional study	Data collection was carried out using a pretest structured questionnaire with face-to-face interviews.	Sample Size: 507 All pregnant women who attend seven health centers and thirty five health posts in the district.	The themes obtained from this study that factors associated with the prevalence of anemia in pregnancy were socio-economic status, gestational age, parity, not supplemented with, low dietary diversity, and hookworm infection.

4.	(Gunderson et al., 2018) Prevalence, risk factors and associated adverse pregnancy outcomes of anaemia in Chinese pregnant women: a multicentre retrospective study	China	To assess the prevalence and associated risk factors for anemia during pregnancy in a multicenter retrospective study.	Cohort Retrospective study	Data collection was carried out with a structured questionnaire to collect socio-demographic characteristics, hemoglobin levels, and pregnancy outcomes from all participants.	Sample Size: 44.002 (RM) Medical records of pregnant women who delivered between June 2013 and May 2015 were collected from 21 hospitals, including 15 centers in Beijing, 5 centers in Guangzhou, and 1 center in Chengdu.	The themes that affect the prevalence of anemia in pregnancy are socio-economic, maternal age, and rural residence
5.	(Kejel et al., 2020) Prevalence of anemia and its associated factors among pregnant women attending antenatal care follow up at Wollega University referral hospital, Western Ethiopia	Ethiopia	To determine the prevalence of anemia and associated factors among pregnant women attending Antenatal Care (ANC) at the Referral Hospital of the Wollega University, West Ethiopia.	Cross-sectional study	Data collection was done by questionnaire, physical examination, and laboratory investigation.	Sample Size: 286 All pregnant women at the Referral Hospital of Wollega University.	The themes obtained from this study, factors that affect the prevalence of anemia in pregnancy are birth spacing and occupation.
6.	(Wemakor, 2019) Prevalence and determinants of anaemia in pregnant women receiving antenatal care at a tertiary referral hospital in Northern Ghana	North Ghana	To assess the prevalence and determinants of anemia in pregnant women receiving the antenatal clinic (ANC) at a tertiary referral hospital in Northern Ghana.	Cross-sectional study	Data collection was carried out using a semi-structured questionnaire and 24-hour dietary recall.	Sample Size : 400 pregnant women receiving antenatal care in Tamale Teaching Hospital	The themes obtained from this study, factors associate with that the prevalence of anemia in pregnancy is gestational age and knowledge on anemia.
7.	(Gedefaw et al., 2015) Anaemia and associated factors among pregnant women attending antenatal care clinic in Walayita Sodo town, Southern Ethiopia	Ethiopia	To determine the prevalence and risk factors associated with anemia in pregnant women.	Cross-sectional study	Socio-demographic data were collected through questionnaire-based interviews.	Sample Size: 363 Pregnant women who attend antenatal care clinics in Wolayita Soddo Otona Hospital from January to March 2014.	The themes obtained from this study, factors contributing to the prevalence of anemia in pregnancy are maternal age, gestational age, parity, family size, intestinal parasitic infection, income, history of contraception, and menstruation.

8.	(Sushen et al., 2017) Factors associated with maternal anaemia among pregnant women in Dhaka city	Dhaka	To find out the factors associated with maternal anemia among pregnant women who attend antenatal clinics in Dhaka City.	Cross-sectional study	Data collection in the form of a semi-structured questionnaire was used to collect information about socio-demographic characteristics, reproduction, and health history.	Sample Size :224 A pregnant woman who visiting antenatal clinic in Marie Stops, Dhaka	The themes obtained were factors that affect the prevalence of anemia in pregnancy are maternal age, education, income, and living area.
9.	(Berhe, Fseha, et al., 2019) Prevalence of anemia and associated factors among pregnant women in Adigrat General Hospital, Tigrai, northern Ethiopia, 2018	Tigria, North Ethiopia	To find out the prevalence and factors associated with anemia at Adigrat General Hospital.	Cross-sectional study	Data on socio-demographic characteristics of study participants and determinants of anemia were collected using an interviewer-based questionnaire.	Sample Size: 304 All pregnant women aged 18 years.	The themes obtained from this study, factors that influence the prevalence of anemia in pregnancy are gestational age, birth space, place of residence, and history of abortion.

2.6. Mapping/Scoping

a. Geographical Characteristics

The systematic search found ten articles published in 2010-2020, nine articles were articles with grade A and all of these articles were quantitative researches consisting of Cross-Sectional and Retrospective Cohort studies (Belay et al., 2020; Shishehgar et al., 2018). Nine articles were obtained from developed and developing countries of Ethiopia, China, Uganda, Gana, and Dhaka.

b. Thematic

From the review, several themes were found that matched the focus of the review as shown in Table 4.

Table 4. Thematic Mapping

Themes	Sub Themes
Factor associated with anemia among pregnant women	a. Maternal Age b. Gestational Age c. Birth Spacing d. Parity e. Socio-economic factor

3. Results and Discussion

There are factors associated with the prevalence of anemia among pregnant women:

3.1. Maternal Age

Advanced maternal age was statistically associated with anemia during pregnancy. As the mother ages, she may face complications related to pregnancy and childbirth as well as other diseases that can predispose the mother to anemia. Less than 20 years old, the mood is not the best physiological state, it is easy to feel anxious, resulting in a lack of awareness of the nutritional needs of pregnancy. While at the age of more than 35 years, there is a decrease in immunity that a person is more susceptible to diseases.

Maternal age can affect the prevalence of anemia in pregnancy. Women under the age of 20 will have higher nutritional needs. If the nutritional needs are not met, there will be a nutritional battle between the mother and the fetus (Nuraeni et al., 2018; Sumiyarsi et al., 2018). Maternal age in a study conducted by Jasmi (2019), is one of the causes of anemia in pregnancy. This is caused by the reproductive system which can cause various complications during pregnancy. The age of 20-35 years is a healthy and safe reproductive age for mothers undergoing pregnancy.

3.2. Gestational Age

Gestational age is associated with the prevalence of anemia in pregnant women. At the first and second trimesters, pregnant women have greater chance of experiencing anemia compared to those in the first trimester. Anemia is more common in the third trimester due to a maternal iron deficiency. It is in line with a study conducted by Gudeta (2019) that gestational age greater or equal to 37 weeks are more prone to anemia.

This happens because, during pregnancy, the need for calories and nutrients will increase to help increase maternal metabolism, blood volume, and nutrient delivery from mother to fetus. This demands more increases in the first and third trimesters. During early pregnancy, there is a decrease in iron absorption due to lower iron requirements and menstruation stops. A study conducted by Astuti and Kulsum (2018) shows that there is a significant relationship between gestational age and the prevalence of anemia in pregnant women. For the magnitude of the relationship, the p-value is 0.000 (<0.05), with Ro = 710.

3.3. Birth Spacing

Pregnancy can lead to iron deficiency. It takes two years for iron levels to return to normal, provided that the mother's diet and health must be in good condition during this period. Therefore, the next pregnancy should be at least two years apart from the previous birth. Pregnant women with

birth intervals <2 years are 2.56 times more likely to be anemic compared to those that of greater than or equal to 2 years due to iron deficiency resulting from rapid successive pregnancies (Kejela et al., 2020).

Referring to the results of research conducted by Linggom et al., (2019), 93.2% of anemia occurs among pregnant women with a birth spacing of <2 years, and 47.6% of pregnant women with a birth spacing of ≥ 2 do not have anemia. Hence, it shows that there is an effect of birth spacing on the prevalence of anemia. The results of a study conducted by Sirenden et al. (2018) showed an OR value of 1.344> 1, which means that pregnant women with a birth spacing of less than 2 years have a 1.3 times greater risk of anemia compared to pregnant women with a birth spacing of more than 2 years. This reveals that birth spacing is one of the risk factors for anemia in pregnancy.

3.4. Parity

Parity is the number of live or dead children born to a mother. Mothers with parity 4 have a higher risk of anemia compared to mothers who have parity 2-3. This is due to the number of births that can affect maternal health. From the point of view of maternal mortality and health, parity 2-3 is the safest one.

A study conducted by Nuraeni et al. (2018) showed that there is a difference between the case and control groups. This means that there is a relationship between parity and the prevalence of anemia in pregnant women with p-value = 0.000 (<0.005) and an OR value of 2.4 (95% CI 1, 5-4.0). The study suggests that pregnant women with a history of parity have a 2.4 times greater chance of being anemic during pregnancy compared to mothers who have no parity risk. Health workers are advised to provide preventive measures by providing counseling to mothers about family planning and some contraceptives to delay or space pregnancies preventing the number of mothers having a history of parity of more than 4 (Bardja, 2017; Jasmi, 2019).

3.5. Socio-economic Factor

The economic status of a family determines the nutritional status of the family members. Poverty is a state of a person's income that does not satisfy the necessities of life such as clothing, food, shelter, and also the nutritional needs of pregnant women. Economic status has a major impact on the health of pregnant women as pregnant women with low economic status are concerned about the cost of living, especially for treatment, antenatal care, and childbirth.

Pregnant women with high income will pay attention to nutritious quality intake. In contrast, low-income mothers often do not care about the food they eat on a daily basis because they cannot buy nutritious, high-quality food. Lack of nutrition during pregnancy can cause problems during pregnancy or childbirth (Desvita et al., 2019). The socio-economic factors have been shown to affect the physical or psychological health of pregnant women.

Anemia in pregnancy is a national problem because it indicates the quality of human resources and the socio-economic welfare of the community. The low socio-economic level leads to insufficient satisfaction of the mother's daily nutritional needs, which affects nutritional needs and can lead to anemia in pregnant women (Hartati & Wahyuni, 2018). A study conducted by Hartati and Wahyuni (2018) obtained a p-value of 0.038 <0.005 which states that socioeconomic affect the prevalence of anemia during pregnancy at Jatinom Health Center.

4. Conclusions

Anemia during pregnancy is a global health problem in the community with a high prevalence and greater impact on mothers and fetuses. The high prevalence of anemia in pregnancy can cause an increase in maternal mortality and morbidity during childbirth. There are five factors associated with the prevalence of anemia in pregnant women including maternal age, gestational age, parity, birth spacing, and socio-economic factors.

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