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RISK FACTOR FOR ANEMIA AMONG WOMEN OF ADOLESCENTS AND PREGNANT WOMEN (REPRODUCTIVE AGE) IN INDONESIA: A SCOPING REVIEW

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ABSTRACT

Background: Anemia is one of the most prevalent health problems in Indonesia. Women of reproductive age are the most affected group. The purpose of this scoping review is to determine the risk factors for anemia in women of reproductive age, including adolescents and pregnant women. **Methods:** A scoping review was conducted using four database sources: Proquest, Google Scholar, Pubmed, and Willey Online Library with published years 2019-2024. Journal selection was carried out through a screening process and adjusted to the research inclusion criteria, resulting in 13 articles in this study. **Results and Discussions:** From a total of 354 articles, the search results obtained 13 articles that match the research objectives. The increased risk of anemia in adolescents is associated with several factors, including lack of knowledge related to anemia, menstrual patterns, age of menarche, and MUAC. While pregnant women, among others, gestational age, CED, parity, and adherence to IFA tablet consumption. **Conclusions:** The most influential factors on anemia were adherence to IFA tablet consumption, duration of menstruation, and gestational age.

Keywords: *Anemia, Women of reproductive age, Risk factors*

1. Introduction

Anemia is a worldwide public health problem that impairs women's health and well-being (Sumihartini et al., 2022). The condition when the body does not have enough red blood cells or hemoglobin is called anemia. Hemoglobin is the main component of blood that carries oxygen to the cells. The lack of hemoglobin in the blood can lead to reduced oxygen availability in the body, resulting in anemia (Atanu and Bhadra, 2020). Clinical signs of anemia include weakness, dizziness, lethargy, foggy eyes, and a pale face (Muhayati and Ratnawati, 2019). Anemia can occur due to lack of nutritional intake, red blood cell loss caused by infection, chronic bleeding, menstruation, and red blood cell formation disorders such as thalassemia. Lack of knowledge related to nutrition affects the selection of nutritious foods, the habit of consuming coffee and tea, which are inhibitors of iron absorption, low breakfast habits, and the unreliability of Fe tablet consumption (Mardlotillah and Sumarmi, 2024).

Children and women of reproductive age are the groups most at risk, with an estimated prevalence of anemia in women of 29.9% (aged 15-49 years) and anemia in children aged 6-59 months of 39.8% (WHO, 2019). Women need a lot of special nutrition because of the menstrual period, pregnancy, and breastfeeding that they experience in their lives. There is a lot of blood loss during menstruation and pregnancy (Atanu and Bhadra, 2020). Anemia can increase the risk of maternal mortality during childbirth, low birth weight, fetal and maternal

infection, miscarriage, and premature birth (Ministry of Health, 2015). The morbidity consequences associated with chronic anemia extend to loss of productivity from impaired work capacity, cognitive impairment, and increased susceptibility to infection, which also imposes an economic burden (Gardner et al., 2023).

More than 50% of anemia cases worldwide are directly caused by a lack of iron intake (Safiri et al., 2021). This statement is in line with the research of Suminar et al. (2021) conducted on 52 adolescent girls in Klampis Bangkalan; 23% had low Hb levels. The factors that cause anemia in the population involve a complex interaction of social, political, ecological, and biological factors (Balarajan et al., 2011). Iron deficiency can also be exacerbated by poor nutritional status, especially when associated with folic acid, vitamin A, or B12 deficiency (Pala et al., 2018).

2. Research Method

This study is a scoping review that is used as a precursor to a systematic review to identify the type of evidence available according to the topic discussed, to find an overview of how research is carried out on a particular topic or field, and to identify characteristics or key factors associated with a concept (Munn et al., 2018). The stages in conducting a scoping review are identification of questions using the PEOs (population, exposure, outcomes) framework, identification of relevant articles, and selection of articles (Arksey and O'Malley, 2005).

1. Identify review questions

To develop the focus review and search strategy, researchers used the Population, Exposure, and Outcome (PEOs) Framework in managing and solving the focus review. The use of PEOs will assist in identifying key concepts in the focus review, developing appropriate search terms to describe the problem, and determining inclusion and exclusion criteria. The focus of the article search is qualitative research, so PEOs are considered appropriate to use (Bettany-Saltikov, 2010).

Table 1. PEOs Framework

P (Population)	E (Exposure)	O (Outcome)	S (Study Design)
Women of reproductive age Women aged 15-49 years Pregnant mom	Risk factors for anemia	Anemia in women of reproductive age	Cross sectional & case control

Based on the PEOs framework, the research question obtained was "What risk factors cause anemia in women of adolescents and pregnant women (reproductive age)?"

2. Identify relevant articles

Scoping reviews are used to review, interpret results, map concepts, as sources of evidence and types of evidence (Tricco et al., 2018). This scoping review uses Prisma-ScR, this method was chosen because it has a cheklist that can be used to facilitate the preparation of a scoping review, consisting of:

1) Protocol and Registration

Prisma - ScR has 22 assessment items contained in the checklist used as a guide in this scoping review (Tricco et al., 2018).

2) Eligibility criteria

There are exclusion and inclusion criteria, namely

Table 2. inclusion and exclusion criteria

Inclusion	Exclusion
1 Published in the last 5 years	1. Review article
2 English article	2. Article in the form of book reporting
3 Original article	

3) Information sources
The databases used were Pubmed, Proquest, Google Scholar and Willey Online Library.

4) Search
The keywords used in this scoping review are "risk factor" AND "women of childbearing age" OR "women of reproductive age" AND "anaemia" OR "anemia" OR "anemic" AND "female pregnant" OR "pregnant women" AND "adolescent girl" OR "female students" OR "adolescent princess".

5) Selection of sources of evidence
Based on searches from four databases, namely Pubmed, Proquest, Google Scholar and Willey Online Library, 354 articles were found, after reviewing 123 articles were excluded because duplicates were found, 191 other articles were excluded because they were irrelevant, then 26 articles were excluded because of incompatibility based on inclusion criteria and the final result obtained 13 articles used for scoping review. The next step is to assess the articles obtained, the total results of the article screening are described in the PRISMA-SC Flowchart.

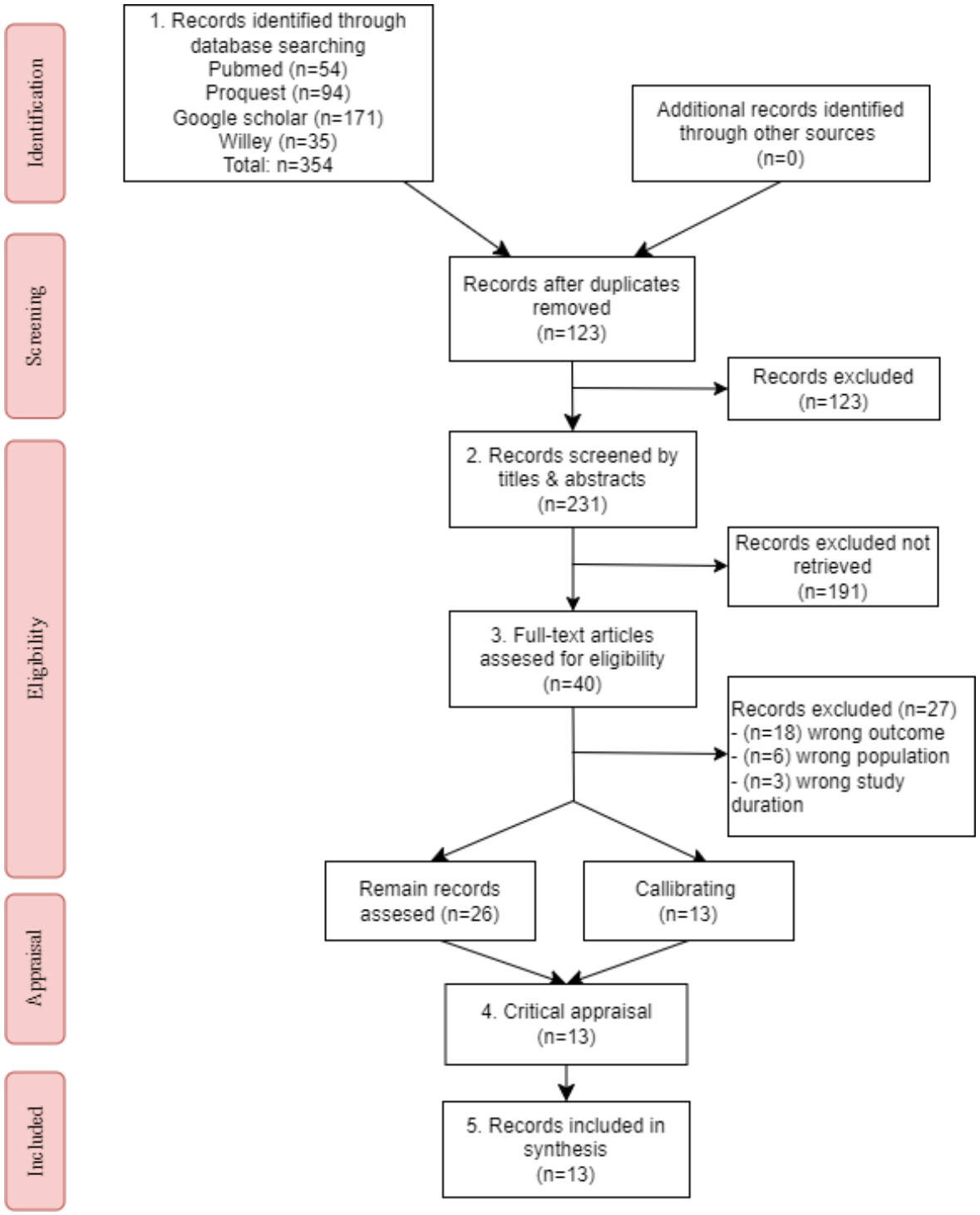

Figure. 1 PRISMA-ScR

6) Data charting process

Table 3. Data Charting

	Author(s)/ Year	Aim	Population and sample size	Methodology	Findings
1	Sari et al. Anemia among Adolescent Girls in West Java, Indonesia: Related Factors and Consequences on the Quality of Life (2022)	Analyze related factors of anemia among adolescent girls, and the effect of anemia on the quality of life.	286 female students (15-19 years)	Cross-sectional	The prevalence of anemia was 14.3%. Factors associated with anemia in this study were: duration of menstrual bleeding, iron consumption, body weight, height, and Hb level. From the bivariate analysis, anemia affected the social relationship domain with $p < 0.05$. Based on the study, it shows that the most influential factors in anemia are MUAC and duration of blood discharge per menstruation. Anemia affects the social relationship domain. In this study, the two main factors affecting anemia were Hb and duration of blood per menstrual cycle.
2	Sumihartini et al. Anemia and its Factors in Women of Reproductive Age: A Community-Based Study in West Papua, Indonesia (2021)	Determine the prevalence, severity, and correlates of anemia in women of reproductive age in West Papua Province of Indonesia, as well as to discuss the burden of anemia in Papuan women.	221 women aged 15-49 years	Cross-sectional	A very high prevalence of anemia at 72.9% was found among women of reproductive age. In this study, low maternal education level was identified as a risk factor for anemia.
3	Kintan et al. Affecting Anaemia among Pregnant Women in Tegalrejo Public Health Center (2019)	Identify factors affecting anaemia among pregnant women in Tegalrejo Public Health Center.	172 pregnant women in Tegalrejo Public Health Center	Case control	Factors associated with anemia in pregnant women are gestational age, maternal age, parity, and CED. CED is a factor that affects anemia in pregnant women. Gestational age, maternal age, parity, and CED are factors that cause anemia. CED is the most influential factor.
4	Davidson et al. Factors Affecting the Incedence of Anemia in Pregnant Women at Ampel and Gladagsari Puublic Health Center	To determine what factors are the main causes of anemia in the working area of Ampel Health Center and Gladagsari Health Center.	Ampel Health Center (193 pregnant women) and Gladagsari Health Center (246 pregnant women).	Cross-sectional	The results showed that nutritional status (0.001), pregnancy distance (0.003), parity (0.032) and age of pregnant women (0.032) had a significant relationship with the incidence of anemia at Puskesmas Ampel < (0.05). The sample of Puskesmas

	Boyolali Regency in 2019 (2022)				Gladagsari showed different results where nutritional status (0.003), pregnancy spacing (0.007), parity (0.005), Fe tablet consumption compliance (0.049) and age of pregnant women (0.046) had a significant relationship with the incidence of anemia < (0.05). Maternal wholesome status amid pregnancy is the most noteworthy cause of frailty.
5	Sigit et al. Factors Influencing the Prevalence of Anaemia in Female Adolescents: A population-based Study of Rural Setting in Karanganyar, Indonesia (2024)	Investigates the prevalence of anaemia and its associations with anthropometric indices, dietary habits, and menstruation status among female adolescents in Karanganyar, a rural subdistrict in Indonesia.	730 female students (16-18 years)	Cross-sectional	The prevalence of anemia among adolescent girls in Karanganyar was 49%. BMI and MUAC, as well as fruit and vegetable consumption, inversely proportional to anemia.
6	Vaira et al. Factors Related to Anemia in Adolescence Girl (2022)	To determine the factors associated with the incidence of anemia in adolescent girls.	75 female students of class XI and XII at SMAS PGRI 2 Banjarmasin	Cross-sectional	A total of 29.3% of adolescent girls experienced anemia. In this study, it was found that there was a relationship between BMI, MUAC, diet, menstrual patterns with the incidence of anemia in adolescent girls.
7	Munira & Viwattanakulvanid. Influencing Factors and Knowledge Gaps on Anemia Prevention among Female Students in Indonesia (2021)	To understand the influencing factors and gaps of knowledge related to anemia prevention among female high school students.	9 female students (15-18 years old) from two senior high schools in Banjarmasin	Case study	In this study, it was found that lack of knowledge about anemia, the importance of taking blood supplement tablets, and nutrition education in adolescents are factors that cause anemia.
8	Nadiyah et al. Relationship between Characteristics and Nutrient Intake with Anemia among Pregnant Women at Kebon Jeruk Public Health Center, Jakarta (2021)	To explore the characteristics, nutrient intake among pregnant women, and their relationships with anemia in Public Health Center Kebon Jeruk, West Jakarta.	60 pregnant women at PHC Kebon Jeruk, West Jakarta	Cross-sectional	This study shows that trimester, mother's education, husband's income, nutritional status, energy intake, protein, vitamin C, B6, B12, E, folate, iron, copper and calcium are risk factors for anemia.

9	Yulianingsih & Porouw. Risk Factor Determination of Anemia Event in Adolescent Princess in the Working Area of Puskesmas Kota Selatan (2020)	To determine the factors associated with the incidence of anemia in adolescent girls in the working area of Puskesmas Kota Selatan, Gorontalo City.	306 adolescent girls of class VII of State Junior High School in the Puskesmas Region of South City, Gorontalo City	Cross-sectional	A total of 32% of adolescent girls experienced anemia. The research instrument used a questionnaire. The results showed that there was a relationship between age at menarche (p=0.001), knowledge (p=0.000), mother's education (p=0.000), menstrual pattern (p=0.000), BMI (p=0.009), menstruation (p=0.003). The most dominant factor in the incidence of anemia in adolescent girls in the working area of the South City Health Center Gorontalo City is the knowledge factor with a p value of 0.001 exp B = 2.650 (CI 1.643-4770) which means that respondents who have good knowledge will have a 2.6 times greater chance of preventing anemia controlled by variables of menstrual patterns, menstrual age and maternal education.
10	Ayurestu & Budiono. Risk Factors for Anemia in Pregnant Women (Case Study in the Manggari Community Health Center Working Area, West Java) (2024)	To identify the risk factors for the occurrence of anemia in pregnant women in the Manggari Community Health Center area.	33 pregnant women who visited the Manggari Community Health Center, Kuningan Regency, West Java	Case study	In this study, it was found that compliance with iron tablet consumption at the Manggari Health Center, Kuningan Regency, is a risk factor that can cause anemia.
11	Aulya et al. The Factors Related to Anemia in Pregnant Women (2024)	To determine the factors associated with the incidence of anemia among pregnant women in the Naibonat Hospital, Kupang Regency.	74 pregnant women	Cross-sectional	Based on this study, it is stated that there is a significant relationship between coffee consumption habits, adherence to taking IFA tablets, pregnancy distance, knowledge about anemia with the incidence of anemia in pregnant women.
12	Susmita et al. The Factors Related to the Incidence of Anemia in Pregnant Women (2023)	To determine the factors related to the incidence of anemia in pregnant women at Regional Technical Implementing Unit's Work Area of Krui Community Health Center,	110 pregnant women in Krui Community Health Center	Cross-sectional	In this study, it is stated that the risk factors that can affect the occurrence of anemia in pregnant women are education, knowledge, family income, nutritional status, consumption of Fe tablets, and pregnancy distance.

		West Pesisir Regency in 2022.			
13	Kalsum and Badar. The Risk Factors Determining Anemia and Its Effect among Senior High School Students in Samarinda, Indonesia (2021)	To know the relationship between the hemoglobin level and Body Mass Index, physical fitness, menstrual cycle, educational achievement, and infectious diseases history on Senior High School students.	97 female students	Cross-sectional	The prevalence of anemia in adolescent girls is 23.7%. In this study, the risk factors that influence the occurrence of anemia are BMI, menstrual cycle and history of infectious diseases.

3. **Results and Discussion**

Based on the articles that have been obtained, the theme categories are

Table 4. Article theme mapping

No.	Theme	Sub Theme
1	Risk factors for anemia in adolescents	a. Menstrual pattern b. Lack of knowledge c. Age at menarche d. Diet e. MUAC
2	Risk factors for anemia in pregnant women	a. Gestational age b. CED c. Parity d. Adherence to Fe tablet consumption

1. Risk Factors for Anemia in Adolescents

Adolescent girls are a period of growth and development characterized by rapid changes both physically, psychologically, and cognitively. Adolescent girls are one of the groups that are prone to anemia along with menstruation which will remove the necessary iron. (Husna and Saputri, 2022). According to data from the 2013 Riskesdas results, the prevalence of anemia in adolescent girls was 37.1%, increasing to 48.9%. The following are risk factors for anemia in adolescents:

a. Menstrual pattern

Based on the articles that have been reviewed, it explains that menstrual patterns are a risk factor for anemia in adolescents. Research by Yulianingsih and Porouw (2020) and Vaira et al. (2022) explained that there is a significant relationship between menstrual patterns and the incidence of anemia in adolescent girls.

The menstrual pattern experienced by every teenage girl is different. Around the age of menarche until the age of 18, irregular menstruation is likely to occur. Irregular menstruation indicates that the hypothalamus-pituitary-ovarian axis is not yet perfect. Egg release only occurs once per month, which is around day 14 of a normal 28-day menstrual cycle. 28-day normal menstrual cycle. According to Benson (2009), in anovulatory cycles, the sequence of stages is altered by variations in estrogen levels alone. Excessive stimulation results in the amount of bleeding being usually more than usual menstruation (ovulation); otherwise, estrogen deficiency causes less bleeding and the amount of blood lost is less. The main contribution of anemia in adolescent girls is due to abnormal menstrual cycles. So it needs immediate special attention from parents and health care providers to address anemia according to its cause and improve the quality of life of adolescent girls to become healthy mothers in the future

b. Lack of knowledge

Lack of knowledge is one of the risk factors for anemia in women of reproductive age. In line with research by Munira and Viwattanakulvanid (2021), there are still many female students who do not understand the benefits of anemia prevention, and they do not understand the impact of anemia on health or how to prevent anemia.

Female students were also unsure that preventing anemia is important because they did not receive anemia prevention education and why it is important. Lack of knowledge is an important factor affecting anemia prevention practices. The provision of blood supplement tablets without massive information about anemia made students feel unsure. The female students wished that they knew more about the tablets and what benefits they would get when they took the tablets.

Knowledge, or cognitive, is a very important domain in shaping a person's actions (Gunatmaningsing, 2007). Behavior based on knowledge will be implemented longer than behavior that is not based on knowledge. The lack of information received by adolescents leads to incomplete knowledge and misperceptions about anemia (Yulianingsih and Porouw, 2020).

c. Age at menarche

Anemia is 2.2 times more likely to occur in adolescent girls with an abnormal age of menarche. The age of menarche, which is included in the normal category, is menarche experienced by adolescent girls at the age of 11–13 years (Yulianingsih and Porouw, 2020). According to Saifuddin (2009), the age of adolescent girls when they experience their first menstruation (menarche) has a wide variation, but the average is 12.5 years.

Puberty is part of adolescence, which emphasizes more on biological processes that lead to the ability to reproduce (Dewi, 2013). According to Wong (2009: 585), puberty is a process of hormonal maturity and growth that occurs when the reproductive organs begin to function and secondary sex characteristics begin to appear. Adolescent girls need more iron than adolescent boys because adolescent girls experience menstruation every month (Yunarsih, 2014). The prevalence of anemia in adolescent girls is quite large because during adolescence there is rapid growth (growth spurt). During adolescence, bone mass increases and remodeling of bones, soft tissues, organs, and even red blood cell mass increases. This growth causes the need for iron to increase dramatically, and it is during adolescence that the need for nutrients reaches its highest point (Arumsari, 2008).

d. Diet

Based on research results, Vaira et al. (2022) found that there is a relationship between eating habits and the incidence of anemia in adolescent girls at SMAS PGRI 2 Banjarmasin. The nutritional status of adolescent girls is good if they eat foods with good nutritional value, especially foods with high iron content. This can result in a decreased risk of anemia. Therefore, it is very important for adolescent girls to consume foods that contain carbohydrates, protein, fat, fiber, water, vitamins, and minerals in sufficient quantities according to their individual needs so that it can avoid anemia and nutritional status becomes better (Martini, 2015).

e. MUAC (Mid-Upper Arm Circumference)

Insufficient MUAC (<23 cm) has more than double the risk of developing anemia (Sigit et al., 2024). Based on research Sari et al. (2022) there is a relationship between Hb production and MUAC, part of somatic growth (Ahankari, et al., 2020). Somatic changes vary widely in terms of early and late age, speed, and nature, depending on the individual. This finding is in line with the research of Nainggolan et al. (2022), which shows overweight and obese women, regardless of their MUAC score, have a lower risk of developing anemia compared to those with an average BMI (Body Mass Index). The most likely opportunity is the occurrence of anemia in women with low MUAC scores (Sales, et al., 2021).

2. Risk Factors for Anemia in Pregnant Women

a. Pregnancy Age

Pregnant women with risky gestational age (first and third trimester) have a 2.728 times chance of experiencing anemia compared to pregnant women who do not have risky gestational age (second trimester) (Kintan, Puji Wahyuningsih and Setiyawati, 2019). The results of this study support previous research conducted by Tadesse et al (2017) in Dessie City, Ethiopia. The results showed that there was a relationship between gestational age factors and the prevalence of anemia in pregnant women. Pregnant women in the first trimester have a 2.07 times greater risk of suffering from anemia compared to pregnant women in the second trimester. This is due to morning sickness and hemodilution at the beginning of this trimester. Similarly, pregnant women in the third trimester

have a 2.96 times greater risk of suffering from anemia than pregnant women in the second trimester, which may be due to maternal nutrition and iron reserves in this trimester are used more for fetal development. This happens because the daily need for iron and folic acid is greater in the second trimester, so iron reserves decrease and anemia occurs.

b. CED (Chronic Energy Deficiency)

Research results Kintan, Puji Wahyuningsih and Setiyawati, (2019) showed that the correlation between the status factor of chronic energy deficiency or CED with the incidence of anemia in pregnant women was statistically significant. Pregnant women who experience chronic energy deficiency or CED (MUAC <23.5 cm) have a 3.575 times greater chance of experiencing anemia compared to pregnant women who do not experience chronic energy deficiency or CED (MUAC <23.5 cm). The results of this study support previous research conducted by Derso et al (2017) which states that anemia has a 4.97 times greater risk of occurring in pregnant women who experience chronic energy deficiency (CED) than those who do not experience CED. This study also supports the results of research by Alene et al (2014) which states that pregnant women who have MUAC < 23 cm can increase the risk of anemia. Conversely, pregnant women with MUAC ≥23 have a 59% lower risk of anemia. This can be explained that, in fact, pregnant women who experience nutritional deficiencies are more likely to experience micronutrient deficiencies. Therefore, iron deficiency can make them more prone to anemia (Alemu, 2015).

c. Parity

Based on research (Davidson, Mangalik and Riswandha, 2022) stated that there is a relationship between parity and the risk of anemia in pregnant women. This research is in line with research conducted by Riyani et al. (2020) in their research which found that 55.2% of the total respondents studied had risky parity and experienced anemia. Other studies have also stated that parity of more than 3 children has a high risk of anemia. After the third pregnancy, the risk of anemia in pregnant women increases due to damage to organs, blood vessels and the uterus due to repeated pregnancies which has the potential to disrupt the circulation of nutrients to the fetus. Parity 1 to 3 is the safest parity based on maternal health. Repeated pregnancies can be prevented through family planning programs.

d. Adherence to IFA Tablet Consumption

Based on research Ayurestu and Budiono (2024), there is a relationship between adherence to Fe tablet consumption and the incidence of anemia in pregnant women at the Manggari Health Center, Kuningan Regency. This study is in accordance with research written by Puspitasari et al. (2020) who in their writing concluded that there is a relationship between the level of compliance with Fe tablet consumption and the incidence of anemia in pregnant women. Research conducted by Miarti et al. (2020) also resulted in the same conclusion, namely that there is a relationship between compliance with Fe tablet consumption and the incidence of anemia in pregnant women. WHO (World Health Organization) stipulates that Fe tablet consumption is sufficient during pregnancy if at least 90 tablets are consumed. During pregnancy, additional iron is considered very important to be given to pregnant women. According to Syarfaini et al. (2019) pregnant women who have a high level of compliance in consuming Fe tablets have a lower risk of experiencing anemia. This condition occurs because the higher the frequency of taking IFA tablets during pregnancy, the lower the risk of anemia.

4. Conclusion

The scoping review conducted aims to find out what risk factors can cause anemia in women of reproductive age (adolescents and pregnant women). Based on the analysis of 13 articles, it is known that anemia in adolescents can occur due to lack of knowledge related to anemia, menstrual patterns, menarche age, and MUAC. While in pregnant women anemia can occur due to factors of gestational age, CED, parity and adherence with IFA tablet consumption.

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