PREVALENCE AND PREVENTION OF IRON DEFICIENCY ANEMIA IN PREGNANCY IN INDONESIA : A COMPREHENSIVE SYSTEMATIC REVIEW

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ABSTRACT

Background: *Pregnancy-related anemia is a global problem that affects both industrialized and developing nations. This disorder is associated with higher rates of morbidity and death, unfavorable birth outcomes, and delayed infant development. It also has major health ramifications.*

Aims : *This systematic review is to review the prevalence of iron deficiency anemia in Indonesia and way to prevent it.*

Methods: *This study demonstrated compliance with all requirements by means of a comparison with the standards established by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020. Thus, the specialists were able to guarantee that the research was as current as feasible. Publications released between 2014 and 2024 were considered for this search strategy. This was accomplished by utilizing a number of distinct online reference sites, including Pubmed, ScienceDirect, and SagePub. It was determined that reviews, previously published works, and partially completed works would not be included.*

Result: *In the PubMed database, the results of our search brought up 47 articles, whereas the results of our search on SAGEPUB brought up 545 articles, our search on SCIENCE DIRECT brought up 2238 articles. The results of the search conducted for the last year of 2014 yielded a total 31 articles for PubMed, 132 articles for SAGEPUB and 985 articles for SCIENCE DIRECT. In the end, we compiled a total of 7 papers, 5 of which came from PubMed, 1 of which came from SAGEPUB and 1 of which came from SCIENCE DIRECT. We included seven research that met the criteria.*

Conclusion: *In summary, pregnant women should be counseled to be mindful of their nutritional intake, especially iron and folic acid supplements, and the bride and groom should be counseled on pregnancy preparedness.*

Keyword: *Iron deficiency anemia, prevention, indonesia*

INTRODUCTION

Pregnancy-related anemia is a global problem that affects both industrialized and developing nations. This disorder is associated with higher rates of morbidity and death, unfavorable birth outcomes, and delayed infant development. It also has major health ramifications. Preterm delivery, low birth weight, early rupture of the membranes, preeclampsia, and maternal and fetal death are among the negative consequences of anemia during pregnancy.[1,2]

When red blood cell synthesis is unable to sustain normal Hb concentration levels, hemoglobin (Hb) levels in the blood fall below 11.0gr%, a condition known as anemia in pregnancy. A motherless person's hemoglobin level of less than 11.0gr% in the first trimester or less than 10.5gr% in the second and third trimesters is considered anemia during pregnancy.[3,4]

Reducing the high rate of anemia in expectant mothers in underdeveloped countries, such as Indonesia, is still a critical concern. By 2025, the World Health Organization (WHO) wants to see a 50% decrease in the prevalence of anemia among women who are fertile. In order to address anemia, the Indonesian government has started a number of programs, such as the distribution of supplements that increase blood flow. However, the ongoing COVID-19 epidemic has brought about substantial societal changes that have impacted people's general health, particularly anemia, and the viability of putting health services into place in a sustainable manner.[5,6]

Anemia during pregnancy can put the unborn child and the mother at higher risk of death and morbidity. Pregnant women who are anemic may experience postpartum hemorrhage, early membrane rupture, abortion, and maternal death. Maternal anemia increases the risk of low birth weight, birth abnormalities, perinatal mortality, and low infant IQ in her offspring. Anemia during pregnancy can be caused by a number of factors, including hemoglobin abnormalities, folic acid insufficiency, iron inadequacy, and infections.[3,6,7]

In order to satisfy iron requirements, particularly during the third trimester of pregnancy, the World Health Organization advises taking an oral iron supplement daily in the amount of 30 to 60 milligrams. In Indonesia, a countrywide program has been implemented by the government to prevent anemia and provide free iron supplements. Despite the lengthy history of this iron supplementation program, a significant number of pregnant women still suffer from anemia, which can lead to difficulties during childbirth.[8]

But even with iron supplement therapy, pregnant women's commitment to taking iron supplements plays a critical role in the effectiveness of IDA therapy. Adherence to iron supplementation is influenced by a variety of factors, including pregnant women's motivation and level of understanding. Pregnant women are more likely to discontinue iron therapy due to a variety of adverse symptoms associated with iron consumption, including nausea and frequent vomiting. Additionally, IDA in pregnant women is caused by endemic illnesses including malaria and helminthes, which are prevalent in underdeveloped nations. Furthermore, genetic variables could possibly be very important for the red blood cells' globin production.[9,10]

METHODS
Protocol
The author of this study ensured that it complied with the standards by adhering to Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines. This is done to guarantee the accuracy of the results that are derived from the investigation.

Criteria for Eligibility
In order to completse this literature evaluation, we looked at published research that discusses the prevalence of iron deficiency anemia in Indonesia and way to prevent it. This is done to enhance the patient's therapy management and to offer an explanation. This paper's primary goal is to demonstrate the applicability of the issues that have been noted overall.

To be eligible to participate in the study, researchers had to meet the following requirements: 1) English must be used to write the paper. The manuscript must fulfill both of these conditions in order to be considered for publication. 2) A few of the examined studies were released after 2013 but prior to the time frame considered relevant by this systematic review. Editorials, submissions without a DOI, already published review articles, and entries that are nearly exact replicas of journal papers that have already been published are a few examples of research that are prohibited.

Search Strategy
We used "pregnancy anemia" and "indonesia" as keywords.The search for studies to be included in the systematic review was carried out using the PubMed and SAGEPUB databases by inputting the words: (("iron deficiency anaemia"[All Fields] OR "anemia, iron deficiency"[MeSH Terms] OR ("anemia"[All Fields] AND "iron deficiency"[All Fields]) OR "iron-deficiency anemia"[All Fields] OR ("iron"[All Fields] AND "deficiency"[All Fields] AND

"anemia"[All Fields]) OR "iron deficiency anemia"[All Fields]) AND ("pregnancy"[MeSH Terms] OR "pregnancy"[All Fields] OR "pregnancies"[All Fields] OR "pregnancy s"[All Fields]) AND ("indonesia"[MeSH Terms] OR "indonesia"[All Fields] OR "indonesia s"[All Fields] OR "indonesias"[All Fields])) AND (2014:2024[pdat]) used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.
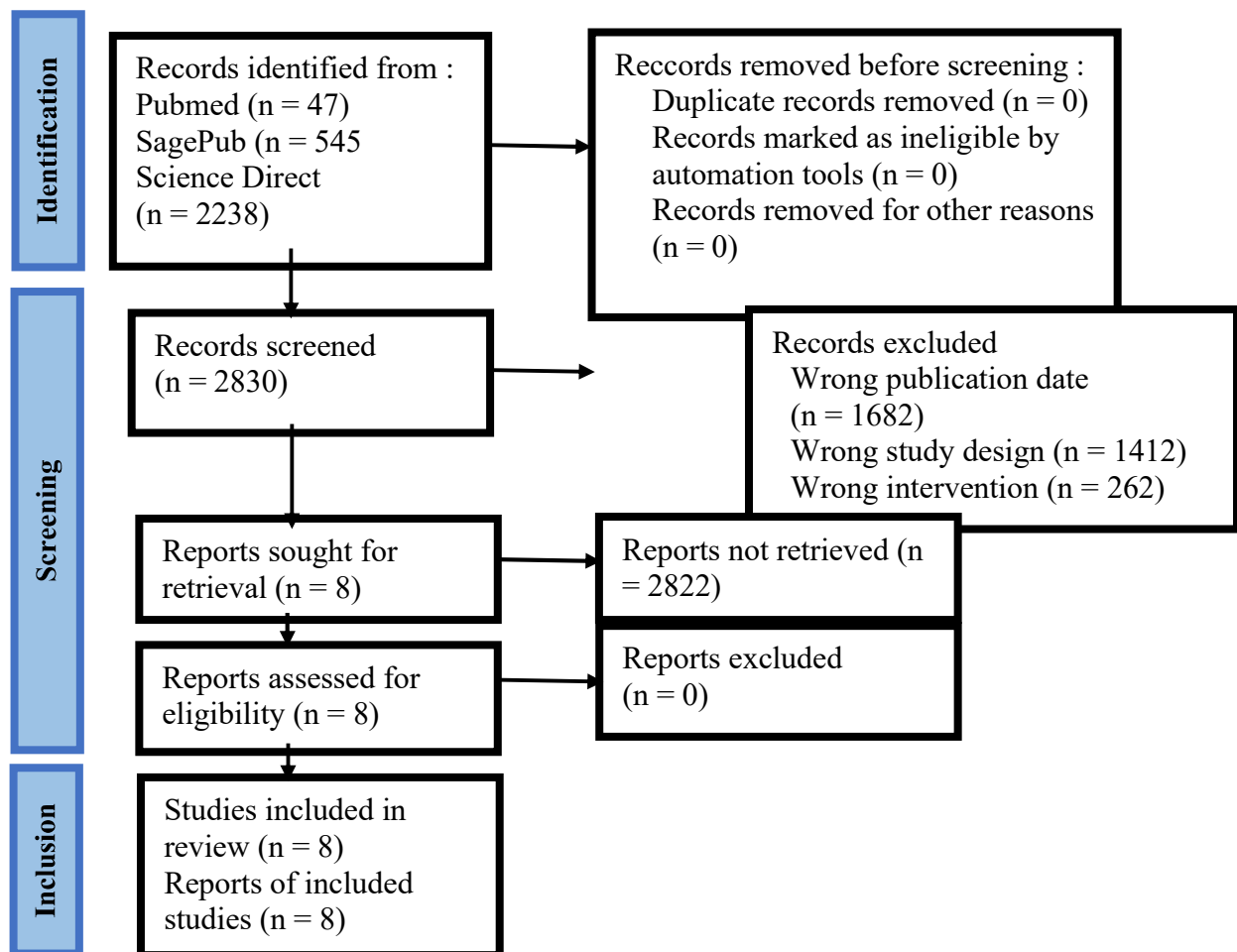

Figure 1. Prisma Flow Diagram

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 47 articles, whereas the results of our search on SAGEPUB brought up 545 articles, our search on SCIENCE DIRECT brought up 2238 articles. The results of the search conducted for the last year of 2014 yielded a total 31 articles for PubMed, 132 articles for SAGEPUB and 985 articles for SCIENCE DIRECT. In the end, we compiled a total of 7 papers, 5 of which came from PubMed, 1 of which came from SAGEPUB and 1 of which came from SCIENCE DIRECT. We included seven research that met the criteria.

Wirawan, et al[11] (2022) showed that the risk of childhood anemia was elevated by pre-pregnancy anemia. Better prevention of morbidity risk in mothers and children might be possible with a public health approach that prioritizes maternal health prior to conception.

Darmawati, et al[12] (2020) showed that health professionals face several challenges and impediments while managing the prevention of iron deficient anemia. As a result, competent medical personnel and top-notch facilities are essential to the therapy of anemia. In order to avoid anemia and achieve optimal treatment, health workers and pregnant women must collaborate.

Syarif, et al[13] (2024) showed that pregnant women in urban slum regions were more likely to experience iron shortage due to a lack of knowledge and poor practices surrounding the use of iron boosters. Pregnant women who are iron deficient, particularly those who reside in slum settlements, have serious health concerns that need to be addressed. Improved health promotion and better healthcare services might lower the prevalence of iron anemia in pregnancy under a more ideal healthcare system for expectant mothers.

Judistiani, et al[14] (2020) showed that the greatest predictor to predict anemia in the third trimester was the serum ferritin level ≤27.23 ng/ml in the first trimester. It was extremely helpful for secondary screening for anemia in pregnancy, focusing on those who could require a strict regimen for iron deficiency therapy to avoid anemia in pregnancy.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Result
Wirawan et al, 2022[11]	Indonesia	Cohort study	637 patients	Maternal pre-pregnancy anemia persisted as an independent risk factor for anemia after risk stratification based on potential confounding variables. This included children who were still breastfed at the time of data collection, children who were given water before the age of six months, children whose mothers had a normal or underweight pre-pregnancy body mass index, and children whose mothers did not currently have anemia.
Darmawati et al, 2020[12]	Indonesia	Qualitative study	18 patients	Three primary themes emerged: (1) deficiencies in health practitioner competency and lack of formulating guidelines; (2) sociocultural issues; and (3) facilities, infrastructures, and supplement support.
Syarif et al, 2024[13]	Indonesia	Cross sectional study		Seventy-eight percent of pregnant women were iron deficient. According to the results of the logistic regression analysis, the two main variables linked to iron insufficiency in pregnant women were practices related to using iron enhancers (AOR

				= 2.85, CI 95% 1.18-6.92, P = 0.020) and low knowledge (AOR = 3.03, CI 95% 1.26-7.29, P = 0.013).
Judistiani et al, 2020[14]	Indonesia	Cohort study	345 patients	The greatest sign to predict anemia in the third trimester of pregnancy, according to the study's findings, was the serum ferritin level in the first trimester. Hepcidin and sTfR showed subpar results. With a 67% area under curve (95% CI 60%–75%, p < 0.0001, Youden index J 0.28), 86.29% (95% CI 79.0%–91.8%), LR (+) 3.07 (95% CI 1.8–5.3), and RR 2.48 (95% CI 1.67–3.68), the revised ferritin level cutoff point of ≤27.23 ng/ml produced the best ROC. The ferritin level below 30 ng/ml was the prior cutoff criterion, however these most recent values were superior.
Widyawati et al, 2015[15]	Indonesia	Nonradomized controlled study	354 patients	There were 354 people in the research that were enrolled. Comparing the intervention group to the control group, the adjusted odds ratio for increased hemoglobin of ≥ 0.5 g/dL at 35–37 weeks of gestation was 25.0 (95% CI 12.03-52.03, p = 0.001). 95.0 percent of women in the intervention group and 57.2 percent (p = 0.001) of women in the control group received five or more prenatal care visits. Professional birth attendants attended with every birth in both groups.
Sigit et al, 2024[16]	Indonesia	Cross sectional study	1995 patients	Anemia affected over 49% of teenage girls in Karanganyar. Anaemia showed inverse relationships with both BMI and Mid-Upper-Arm Circumference. in contrast to people who have a BMI-for-age Z-Score. Anaemia was adversely correlated with the consumption of fruits [0.32(0.10-0.98)] and vegetables [0.30(0.11–0.78)]. There was no correlation found between anemia and menstrual state (length, duration, and number of pads/day).
Mansyur et al, 2019[17]	Indonesia	Qualitative study	105 patients	105 female employees took part in this study, and 14 FGDs were held in all. A majority of the participants

				had a strong comprehension of the symptoms and indicators associated with anemia. They anticipated that the business would enhance the factory health service by lowering the cost and increasing the accessibility of food, as well as by limiting dangerous materials that are thought to be risk factors for anemia at work.

Widyawati, et al[15] (2015) showed that when compared to standard care for anemic pregnant women, the Four Pillars Approach is beneficial in raising participants' hemoglobin levels and prenatal care visits.

Sigit, et al[16] (2024) showed that the high rate of anemia among teenage girls in Karanganyar, Indonesia, and maybe in other rural locations, highlights the need for focused treatments. Anaemia is more likely to occur in underweight individuals, highlighting the need of dietary modifications. Anaemia may be avoided by eating fruits and vegetables high in iron. Anaemia did not seem to be related to menstruation status.

Mansyur, et al[17] (2019) showed that first, workplace nutrition education is a useful tool for raising female employees' awareness of the value of controlling and preventing anemia through the consumption of foods high in iron, including leafy green vegetables. Second, to offer healthy meals and make up for family food shortages brought on by budgetary constraints and cultural obstacles, industrial canteen services had to be enhanced. Third, via occupational hazard prevention and control, industrial health services should shift from a therapeutic strategy to a health promotion and preventative one.

DISCUSSION

Because of a decrease in hemoglobin concentration despite a rise in red cell mass, anemia during pregnancy is a typical occurrence in low- and middle-income nations. Anemia can lead to poor fetal growth and problems with bleeding for the mother throughout pregnancy, during delivery, and after the baby is delivered. In 2016, the World Health Organization (WHO) revealed that 40% of pregnant women globally suffer from anemia. According to RISKESDAS 2018, anemia prevalence among pregnant women in Indonesia is at 48.9%, or over half of the country's pregnant population. This figure is more than the 37.1% that was recorded in 2013. Pregnant women in the 15–24 age range had the highest percentage of anemia (84.6%), followed by those in the 25–34 age range (33.7%), the 35–44 age group (33.6%), and the 45–54 age group (24%).[6,18,19]

The World Health Organization defines anemia in pregnancy as low hemoglobin concentration in pregnant women (<11 g/dl). Both biological and non-biological causes may contribute to low hemoglobin concentration, but biological risk factors include infections, long-term illnesses, and certain dietary deficiencies that are linked to micronutrient shortages. Gestational age, maternal sociodemographic traits, a poor diet, a lack of adherence to iron tablet supplementation, and the body mass index (BMI) were non-biological risk factors for anemia during pregnancy.[20,21]

The etiology of the anemia, which is typically iron deficiency, determines the course of treatment. For iron treatment, either intravenous or oral iron products can be employed. Studies have demonstrated that when appropriate, intravenous iron therapy outperforms oral iron therapy in terms of the rate and total amount of hemoglobin rise.[22]

Additionally, 20% of patients who receive oral iron treatment experience clinically significant gastrointestinal side effects (such as gastric intolerance and constipation), which can be prevented with intravenous iron therapy (LoE Ib). Numerous investigations have demonstrated the safety and tolerability of specific IV iron products during pregnancy (LoE Ib). With the new non-dextran iron products, hypersensitivity responses (skin exanthema, bronchoconstriction, potential reduction in blood pressure) are quite uncommon.[22]

For moderate instances of iron-deficiency anemia and iron deficiency without anemia in pregnancy, the main course of treatment is oral iron therapy, which involves taking 160–200 mg/day of iron II salts or iron III polymaltose (preferably on an empty stomach, fractionated). Due to the extra need for iron throughout pregnancy, the same holds true for iron deficiency and low iron storage (ferritin < 30 µg/L) without anemia at the start of the pregnancy. Iron replacement that contains less than 100 mg of iron per day, as the 80 mg of iron in some multivitamin formulations like Elevit®, is insufficient. Checks should be made to determine whether therapy has been effective after 2-4 weeks (LoE IIa).[22]

Pregnancy examinations, also known as antenatal care, are examinations performed on expectant mothers by medical professionals during their pregnancy. These visits typically occur at least four times during the pregnancy and include taking the woman's history, performing a general physical and obstetric examination, performing laboratory tests for specific indications, and performing basic and special indications tests. Early pregnancy testing will enable the identification of any anomalies or health issues the mother may be experiencing, allowing for the implementation of any necessary interventions to save both the mother and the fetus.[23]

The frequency of visits and the nature of the inspections are included in the ANC service standard. During pregnancy, anticoagulant therapy (ANC) is administered a minimum of four times: once in the first trimester, once in the second trimester, and twice in the third trimester. The seven types of examinations include weight assessment, blood pressure monitoring, fundus uteri height measurement, TT vaccination, supplementation with iron pills, testing for sexually transmitted infections, and a colloquium in relation to referral preparation. Pregnant women who have routine prenatal examinations are at a lower risk of developing anemia since the condition may be identified early and iron supplements can be administered at each appointment.[23]

CONCLUSION

In summary, pregnant women should be counseled to be mindful of their nutritional intake, especially iron and folic acid supplements, and the bride and groom should be counseled on pregnancy preparedness.

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