Review Article: Systematic Review, Meta-Analysis, Integrative Review, Scoping Review

RISK FACTORS FOR THE ANEMIA IN PREGNANT WOMEN: A LITERATURE REVIEW

Nurnaningsih 1*, Mardiana Ahmad 1, Isharyah Sunarno 2, Nur Aliya Arsyad 1

1 Midwifery Study Program, Graduate School Hasanuddin University, Makassar, Indonesia
2 Department of Obgyn and Gynecology, Faculty of Medicine Hasanuddin University, Makassar, Indonesia

*Correspondence:
Nurnaningsih
Midwifery Study Program, Graduate School Hasanuddin University, Makassar, Indonesia
Graduate School, Hasanuddin University Makassar, Jln. Perintis Kemerdekaan KM.10 Makassar-90245
Email: nurnaningsih20p@student.unhas.ac.id

Abstract
Background: Anemia in pregnancy is still a global public health problem and is the largest contributor to morbidity and mortality. Some studies report that risk factors for anemia vary from place to place, so more in-person observations are needed regarding anemia risk factors.

Objectives: This study aimed to determine the risk factors of anemia in pregnant women. Methods of using literature review studies.

Design: This study design is a literature review to search and review article from database and the theory which is descriptive.

Data Sources: Search for scientific articles using the Mendeley application by entering the keyword "Risk Factors, Anemia, Pregnancy" with Published year 2018-2021, English and Indonesian, full text, National journal has ISSN and open access.

Review Methods: The literature review method using narrative review based on inclusion criteria, namely articles discussing anemia in pregnant women, published in 20158-202, International and National Publications, having ISSN National Journals, Articles using English, original articles, full text and open access. While the Exception Criteria for Articles other than English, type of research literature review and RCT, articles are then collected and a journal summary is made containing the name of the researcher, the year the journal was published, the title of the study, the method and a summary of the results or findings. The summary of research journals is entered into a table according to the format, and 10 articles are eligible.

Results: From the 10 selected articles, it can be concluded that the risk factors for anemia, especially in developing countries, are multifactorial, including micro-iron deficiency, folate, and vitamins A and B12 as well as anemia due to parasitic infections such as malaria and hookworms or chronic infections such as TB, HIV, parasites, intestines, infection of working mothers (farmers), contaminated drinking water sources, consumption of coffee/tea and diet. Meanwhile, other factors in Indonesia are unfavorable geographical location, level of education, lack of public awareness of health, socio-economic situation, parity (number of children), and chronic energy shortages (KEK).

Conclusion: Anemia is still a global health problem and still has to be addressed, especially in developing countries. Therefore, efforts are needed to better understand the main causes of anemia, including iron deficiency as well as other nutritional deficiencies, diseases, and Hb disorders related to anemia so that appropriate action can be given. Biochemical measurement of micronutrients (especially iron and Vitamin A), inflammatory signs in addition to hematological index when assessing anemia clinically are also urgently needed.

Keywords: Risk Factors, Anemia, Pregnancy.
INTRODUCTION

Anemia in pregnancy is still a public health problem globally and is the largest contributor to morbidity and mortality (A. et al., 2005; Black et al., 2013; Brabin et al., 2001; Haider & Bhutta, 2017; Keats et al., 2019; Means, 2020; Stephen et al., 2018).

The World Health Organization (WHO) reports about 32.4 million pregnant women suffer from anemia worldwide, with the highest prevalence in Africa (44.6%) followed by Asia with a prevalence of 39.3% (World Health Organization, 2015a).

Anemia is a decrease in the number and size of red blood cells (hemoglobin / Hb concentration) below the set limit value, resulting in a lack of ability for blood to transport oxygen throughout the body (L.T. et al., 2017; Osman et al., 2020; Stephen et al., 2018; WHO, 2006, 2012). About 20% of maternal deaths are caused by anemia and most occur in developing countries. (Black et al., 2013; Kefiyalew et al., 2014; Osman et al., 2020; Stephen et al., 2018). Gestational anemia significantly affected 32.4 million (38.2%) pregnant women. This health problem is most severe in Southeast Asia (48.7%) and Africa (46.3%) (Osman et al., 2020; Stevens et al., 2013; WHO, 2006).

Basic Health Research (2013) reported that the incidence of anemia in pregnant women in Indonesia amounted to 37.1%. (Badan Penelitian dan Pengembangan Kesehatan, 2013) Increased to 48.9% in 2018 (RISKESDAS, 2018).

While the incidence of anemia in Biak Numfor Regency in 2018 was 81% of 3,087 pregnant women, and in 2019 amounted to 79 (%) of 3,063 pregnant women (Profil Dinas Kesehatan Kab. Biak Numfor).

It is reported that 40% of the most common cases of anemia are caused by iron deficiency or about 1.24 billion people worldwide are affected by iron deficiency anemia, but this causative factor is different in each community group and each region (de Leeuw et al., 1966; Means, 2020; Osman et al., 2020; WHO, 2006).

Anemia that occurs in pregnant women has a devastating impact on health, social, and economic status, leading to an increased risk of lack of physical activity, increasing the risk of premature birth, low birth weight, intrauterine fetal death, neonatal death, maternal death, and consequently infant mortality, especially in mothers with severe anemia (Ayano, 2018; Ezzati et al., 2004; Figueiredo et al., 2018; Gedefaw et al., 2015; Haider et al., 2013; Osman et al., 2020; Rahman et al., 2016; Sharma et al., 2020; Zhang et al., 2009).

The study findings report that the risk factors for anemia vary from place to place so more deep observation is needed related to the risk factor of anemia (Osman et al., 2020; WHO, 2006).

Based on the above problems, the researcher wants to examine more deeply related risk factors for anemia in pregnant women by using literature studies.

METHODS

Design

The design of this research is Literature Review or literature review. The nature of this study is descriptive analysis, which is the regular parsing of data that has been obtained, then given understanding and explanation in order to be well understood by readers.

Search Methods

Literature review is compiled through the search of research articles that have been published both nationally and internationally.
The population and sample were pregnant women with anemia.

Search for scientific articles using the Mendeley application by entering the keyword "Risk Factors, Anemia, Pregnancy" with Published year 2018-2021. Articles selected based on:

a. Inclusion Criteria
   1. Article discussing anemia in pregnant women;
   2. Published year 20158-2021;
   3. International and National Publications;
   4. Have an ISSN for National Journal;
   5. Articles using English; and
   6. Original articles, full text and open access.

b. Exclusion Criteria
   1. Articles other than English; and
   2. Types of review literature research and RCT.

**Search Outcome**

From the search obtained 4,124 articles after filtering the year that is 2018-2021 obtained 990 articles, then selecting the category of journals, duplication, open access, research design taken is mix methods study, cross sectional study, correlation analysis, and qualitative study obtained 90 articles.

The final process is to conduct journal selection based on inclusion criteria obtained by 10 journals that are eligible for review. Article Search Strategy can be seen in figure 1.

**Quality Appraisal**

This literature review is synthesized using narrative methods by grouping similar extraction data according to the results measured to answer the purpose. Research journals that fit the inclusion criteria are then collected and made journal summaries including the name of the researcher, the year of publication of the journal, the title of the study, methods and summary of results or findings (Fadlallah et al., 2019; Pesut et al., 2020).

The summary of the research journal is entered into the table in accordance with the format mentioned above. To further clarify abstract analysis and full text the journal is read and observed. The journal summary is then conducted an analysis of the content contained in the purpose of the research and the results / findings of the study.

Analysis of the contents of the journal, then coded into the contents of the journal reviewed based on the outline or core of the study is done by parsing in a sentence then if it has been collected then searched for similarities and differences in each study and then discussed to draw conclusions.

**RESULTS**

From the search for articles using the Mendeley application, results can be seen on table 1 extraction result of research.
### Table 1. Extraction of Research Results.

| Title                                                                 | Author/Year | Type of Research and Sample | Data Analysis                              | Result                                                                                                                                                                                                 |
|-----------------------------------------------------------------------|-------------|-----------------------------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Risk factors of anemia among pregnant women attending antenatal care in health facilities of Eastern Zone of Tigray, Ethiopia | (Berhe et al., 2019) | Control case studies. Sample 600 pregnant women in 2017/2018. | Bivariate and multivariate logistic regression analysis | Risk factors for anemia during pregnancy are significantly intestinal parasites, occupation (farmers), unprotected (polluted) drinking water sources, drinking coffee/tea with or immediately after daily meals and diet. |
| Risk Factors for Anemia in Pregnant Women (Study In The Working Area of Slawi Kab. Tegal Health Center) | (Fatkhiah, 2018) | Observational research with case control design. Sample 60 pregnant women divided into 2 groups. | Chi square | There is a positive association of parity with the incidence of anemia during pregnancy. |
| Prevalence and risk factors of anemia among ever-married women in Jordan | (Arabyat et al., 2019) | Cross sectional. Representative sample of married women aged 15-49 years tested for hemoglobin levels in JPFHS 2012. | Univariate and multivariate logistic regression | Knowledge is related to the incidence of anemia. |
| Spatial distribution and determinant factors of anaemia among women of reproductive age in Ethiopia: a multilevel and spatial analysis | (Kibret et al., 2019) | Observational. 645 cluster of enumeration area (EA). | Multivariable logistic regression model | Factors of risk for anemia are demographics, level of public education, low income, transport, lack of health care facilities, lack of public attention to health, low socioeconomic conditions, and nutrition status of pregnant women. |
| Anemia in pregnant women participants of the First 1000 Days of Life Program in Agats, Asmat, Papua: Prevalence and analysis of risk factors | (Astari et al., 2018) | Descriptive observational. Sample 230 pregnant women. | Univariate, bivariate, and multivariate. | Risk factors for anemia among pregnant women in Agats include the geographical location of Asmat, low level of public education, lack of health care facilities, lack of public attention to health, low socioeconomic conditions, and nutritional status of pregnant women. |
| Prevalence and Determinant of The Incidence of Anemia pregnant women | (Harna et al., 2020) | Cross sectional. Sample 94 pregnant women. | Descriptive and presented in the form of frequency and cross tabulation | Factors that affect the incidence of anemia are gestational age, KEK status and parity. |
| Anaemia in Pregnancy: Prevalence, Risk Factors, and Adverse Perinatal Outcomes in Northern Tanzania | (Stephen et al., 2018) | Cohort study. Sample 539 pregnant women. | Proportions were used for categorical variables and mean or median with respective measures of dispersion for numerical variables. Odds Ratio (OR) with 95% | The mother's low level of education is a factor associated with anemia during pregnancy. |
DISCUSSION

Anemia is a worldwide public health problem, particularly in developing countries that can affect human health, development, social and economic health (Black et al., 2013; Kassebaum et al., 2016; Mbule et al., 2013; Stephen et al., 2018; Stevens et al., 2013; Vaz-Tostes et al., 2016; WHO, 2011; WHO and UNICEF, 2004). The goal of the study was to identify risk factors for anemia by considering as many factors as possible.

The results of the journal review identified several risk factors of anemia namely micronutrient deficiency of iron, folate, and vitamins A and B12 and anemia due to parasitic infections such as malaria and hookworms or chronic infections such as TB, HIV, intestinal parasites, maternal work (farmers), contaminated drinking water sources, drinking coffee/tea and diet are major risk factors for anemia in developing countries (Berhe et al., 2019; Foote et al., 2013; Hoffmann et al., 2015; Metz, 2008; Ononge et al., 2014; Stephen et al., 2018; WHO, 2005 Zhang et al., 2009; Hirani and Karmaliani, 2013; Stephen et al., 2018; Dogra, 2020).

While in Indonesia the risk factor of anemia is the unfavorable geographical location, education level, lack of public attention to health, socio-economic circumstances, parity (number of children), adequacy of iron consumption, and KEK status (Amallia et al., 2017; Astari et al., 2018; Fatkhiah, 2018; Harna et al., 2020; Irwanti et al., 2019; Pasmawati & Hatma, 2019; Ristica, 2013; Satriani et al., 2019; Tanzih, 2016). In addition to factors above culture is a contributing factor to the occurrence of anemia (Afiyah Sri Harnany, 2006; Contento, 2008).

Several vitamins play a role in iron metabolism, including riboflavin (B2), pyridoxine (B6), cobalamin (B12), and folate. Deficiency of this nutrient has been linked to the incidence of anemia, but the extent of this vitamin’s role in anemia is not yet clearly known (Arredondo et al., 2006).

Deficiency of vitamin B12 (cobalamin) and folate can cause macrocytic anemia that can affect DNA synthesis and cell division in the bone marrow (megaloblastic changes), such as hypersegmentated neutrophils (Arredondo et al., 2006; Chaparro & Suchdev, 2019; Fishman et al., 2000; Hacibekiroglu et al., 2015; Jafari et al., 2013; Wieringa et al., 2016).

In general, iron deficiency is a cause of anemia, although deficiencies in other nutrients and vitamins can also cause anemia, including deficiencies in vitamins A, B12, B6, C, D, and E, folate, riboflavin, copper, and zinc. Some of these vitamins such as vit A, B6, and B12, folic acid, and riboflavin are needed by the body to produce red blood cells normally. While other nutrients, such as vitamins C and E, can protect
red blood cells as anti-oxidants. (Chaparro & Suchdev, 2019; Losken et al., 2005).

Malaria caused by the Plasmodium parasite can cause severe anemia, in addition to other complications including death. (Baird, 2007; Barcus et al., 2007; M. et al., 2007; Sohail et al., 2015; World Health Organization, 2016).

P. falciparum malaria during pregnancy is the leading cause of maternal and fetal morbidity and mortality. Although P. vivax infection receives less attention from P. falciparum infection, both play an important role in causing anemia in the mother and cause BBLR type of infection to always coexist. (Duffy et al., 2001; Hamer et al., 2009; Sohail et al., 2015).

Parasites require iron for growth, and malaria significantly disrupts iron metabolism in a variety of ways including through hemolysis, heme release, damaged erythropoiesis, increased iron in macrophages, and decreased iron absorption. (Sohail et al., 2015; Spottswoode et al., 2014).

Anemia is the most common hematological disorder among patients infected with HIV. The disease is usually characterized as normochromic and normocytic anemia with low reticulocyte counts, normal iron storage, and impaired EPO responses.

The prevalence of anemia in HIV-positive people increases along with the development of the disease caused by several factors either indirectly or directly related to the virus. HIV infection causes chronic disease acute phase response, increased hepcidin and AI, and altered iron metabolism (Minchella et al., 2015; Redig & Berliner, 2013; Sohail et al., 2015).

Intestinal parasites (hookworms, Ascaris lumbricoides, Trichuris trichiura) are a risk factor for anemia in pregnancy, this is in line with research conducted in Vietnam (Kramer & Kakuma, 2012), Nigeria (Idowu et al., 2005), Benin (Ouédraogo et al., 2012), Ethiopia (Haidar & Pobocik, 2009), Gilgel Gibe area (Getachew et al., 2012), Southeastern Ethiopia (Kefiyalew et al., 2014), Southern Ethiopia (Lebso et al., 2017), and in Northwestern Ethiopia (Asrie, 2017).

Intestinal parasites cause blood loss, so the mother and fetus are at high risk of anemia. This is because worms in the intestine can cause intestinal necrosis and blood loss due to attachment to the intestinal mucosa (Brooker et al., 2008; World Health Organization, 2015).

Pregnant women who work as farmers are at risk of anemia, which is associated with a lack of information about balanced nutritional intake during pregnancy, economic factors that impact on not being able to access and utilize health services. (EDHS, 2016; Kassa et al., 2017; Xu et al., 2016).

Sources of water that are not clean (polluted), can cause various infections that affect the reduction of iron and other micronutrients and can cause anemia (Berhe et al., 2019).

Consuming coffee/tea after meals or immediately after meals, anemia can affect the presence of anti-nutritional factors such as tannins and caffeine, which are found in tea and coffee, respectively (Baig-Ansari et al., 2008; Obse et al., 2013; Taylor & Meyers, 2012).

Tea and coffee can decrease iron absorption by 60% and 50% respectively (Allen, 2000; Anderson & Fitzgerald, 2010). The effect of tea on the absorption of non-hem iron is thought to stem from the formation of an insoluble tannate iron complex (Obse et al., 2013).

In some studies, the level of education has been reported to have an effect on the reduced risk of anemia. Educated pregnant women have a better income so that it affects the food to be consumed so that they do not experience nutritional anemia (Tanzania Bureau of Statistics, 2010).

It was further reported in Ethiopia that the prevalence of anemia was higher in uneducated pregnant women (Melku et al., 2014). Secondary and higher education levels are also associated with maternal compliance in terms of exclusive breastfeeding, ANC visits in accordance with the recommendations given (Tanzania Bureau of Statistics, 2010).
Income levels also affect the incidence of anemia, this is because low income leads to an inability to consume nutritious foods. A study in Ethiopia showed that women with low incomes are more at risk of suffering from anemia than women with higher incomes (Bekele et al., 2016; Gedefaw et al., 2015; Stephen et al., 2018).

Parity is a factor in the occurrence of anemia in pregnant women, this is associated with the theory that a mother who often gives birth has a risk of anemia in subsequent pregnancies if she does not pay attention to nutritional needs, because during pregnancy nutrients will share for the mother and the fetus they contain. The more often a woman gives birth, the greater the risk of blood loss and has an impact on decreasing Hb levels. Each time a woman gives birth, the amount of iron lost is estimated at 250mg (Pasmawati & Hatma, 2019).

Adequacy of iron consumption related to the occurrence of anemia is due to the need for iron in pregnancy increased, especially in the final trimester, in the process of maturation of iron red blood cells taken from plasma transferin which is the iron reserve in serum. (Pasmawati & Hatma, 2019).

Pregnant women with an arm circumference (LILA) of less than 23 cm are at risk of anemia. (Milman et al., 2000). The upper arm is the measure used for nutritional status assessment, with the normal limit being 23 cm for adult women, while the lesser arm circumference is also associated with undernutrition status. This is in line with the results of studies reported in eastern Ethiopia and western Ethiopia, Kenya, Nepal, and India (Alene & Mohamed Dohe, 2015; Mondal et al., 2006; Osman et al., 2020). With the similarity of reported research results, malnourished pregnant women are at higher risk of anemia.

Culture is one of the factors of anemia. Culture is the experience of people from the moment they are born, culture is also shared knowledge and shared meaning, where the meaning indicates the complexity of belief or knowledge and the connection of values or feelings with beliefs (Contento, 2008). The results of health ethnographic research in Indonesia showed that maternal and child health problems are still very concerning.

In Mexico, pregnant women and after childbirth are prohibited from eating foods that are "cold". In Indonesia alone pregnant women and after childbirth are prohibited from eating eggs, meat, shrimp, sea fish and catfish, conch, lembayung leaves, bitter melon, pineapple, brown sugar, and foods fried with oil (Harnany, 2006).

So that by knowing the risk factors for anemia, health workers can implement policies that focus more on the risk group and perform treatment for insufficient iron and provide appropriate iron supplements. With proper treatment is expected to reduce the number of deaths and the number of pains caused by anemia.

CONCLUSION
Anemia is still a global health problem and still has to be addressed especially in developing countries. So, efforts are needed to better understand the main causes of anemia including iron deficiency as well as other nutritional deficiencies, diseases, and Hb disorders associated with anemia so that appropriate measures can be given. Biochemical measurements of micronutrients (especially iron and Vitamin A), signs of inflammation, in addition to the hematological index when assessing anemia clinically are also urgently needed.

ACKNOWLEDGMENT
Thank you to the supervisor who has taken the time to direct in the preparation of literature studies.

DECLARATION OF CONFLICTING INTEREST
This comprehensive summary or systematic review is independent writing, so there is no conflict of interest in the writing.
FUNDING
This systematic review is writing independently, not funded or get funding from any party.

AUTHOR CONTRIBUTION
Nurnaningsih: Designed the study, collected and analyzed articles, and contributed to the completion of a systematic review.

Mardiana Ahmad: Contribution as a supervisor guide and discuss the final results of the review literature manuscript.

Isharyah Sunarno: Contribution as a supervisor involved in planning and supervision in the completion of the literature review.

Nur Aliya Arsyad: Contributed to the preparation of the final manuscript.

ORCID
Yohana Rita Bitbit
None.

Mardiana Ahmad
https://orcid.org/0000-0002-0798-0457

Isharyah Sunarno
None.

Nur Aliya Arsyad
None.

REFERENCES
A., L., D., F., M., K., M., M., & E., S. (2005). Maternal anemia during pregnancy is an independent risk factor for low birthweight and preterm delivery. European Journal of Obstetrics and Gynecology and Reproductive Biology.

Afiyah Sri Harnany. (2006). PENGARUH TABU MAKANAN, TINGKAT KECUKUPAN GIZI, KONSUMSI TABLET BESI, DAN TEH TERHADAP KADAR HEMOGLOBIN PADA IBU HAMIL DI KOTA PEKALONGAN TAHUN 2006. UNIVERSITAS DIPONEGORO.

Alene, K. A., & Mohamed Dohe, A. (2015). Prevalence of Anemia and Associated Factors among Pregnant Women in an Urban Area of Eastern Ethiopia. Anemia. https://doi.org/10.1155/2014/561567

Allen, L. H. (2000). Anemia and iron deficiency: Effects on pregnancy outcome. American Journal of Clinical Nutrition. https://doi.org/10.1093/ajcn/71.5.1280s

Amallia, S., Afriyani, R., & Utami, S. P. (2017). Faktor Risiko Kejadian Anemia pada Ibu Hamil di Rumah Sakit BARI Palembang. Jurnal Kesehatan. https://doi.org/10.26630/jk.v8i3.639

Anderson, J., & Fitzgerald, C. (2010). Iron : An Essential Nutrient. Food and Nutrition Series|Health.

Arabyat, R., Arabyat, G., & Al-Taani, G. (2019). Prevalence and risk factors of anaemia among ever-married women in Jordan. Eastern Mediterranean Health Journal. https://doi.org/10.26719/emhj.18.074

Arija, V. (2018). PREVALENCE OF ANAEMIA, RISK OF HAEMOCONCENTRATION AND RISK FACTORS DURING THE THREE TRIMESTERS OF PREGNANCY. Nutrición Hospitalaria. https://doi.org/10.20960/nh.1045

Arredondo, M., Martínez, R., Núñez, M. T., Ruz, M., & Olivares, M. (2006). Inhibition of iron and copper uptake by iron, copper and zinc. Biological Research. https://doi.org/10.4067/S0716-97602006000100011

Asrie, F. (2017). Prevalence of anemia and its associated factors among pregnant women receiving antenatal care at Aymiba Health Center, northwest Ethiopia. Journal of Blood Medicine. https://doi.org/10.2147/JBM.S134932

Astari, P., Rinonce, H. T., Kasim, F., Pudjohartono, M. F., Debora, J., & Winata, M. G. (2018). Anemia pada ibu
hamil peserta Program 1000 Hari Pertama Kehidupan di Agats, Asmat, Papua: Prevalensi dan analisis faktor risiko. *Journal of Community Empowerment for Health.*
https://doi.org/10.22146/jcoempf.39261

Ayano, B. (2018). Assessment of Prevalence and Risk Factors for Anemia Among Pregnant Mothers Attending Anc Clinic at Adama Hospital Medical Collage, Adama, Ethiopia, 2017. *Journal of Gynecology and Obstetrics.*
https://doi.org/10.11648/j.jgio.20180603.11

Badan Penelitian dan Pengembangan Kesehatan. (2013). Riset Kesehatan Dasar 2013. *Riset Kesehatan Dasar 2013.*

Baig-Ansari, N., Badruddin, S. H., Karmaliani, R., Harris, H., Jehan, I., Pasha, O., Moss, N., McClure, E. M., & Goldenberg, R. L. (2008). Anemia prevalence and risk factors in pregnant women in an urban area of Pakistan. *Food and Nutrition Bulletin.*
https://doi.org/10.1177/156482650802900207

Baird, J. K. (2007). Neglect of Plasmodium vivax malaria. In *Trends in Parasitology.*
https://doi.org/10.1016/j.pt.2007.08.011

Barcus, M. J., Basri, H., Picarima, H., Manyakori, C., Sekartuti, Elyazar, I., Bangs, M. J., Maguire, J. D., & Baird, J. K. (2007). Demographic risk factors for severe and fatal vivax and falciparum malaria among hospital admissions in northeastern Indonesian Papua. *American Journal of Tropical Medicine and Hygiene.*
https://doi.org/10.4269/ajtmh.2007.77.984

Bekele, A., Tilahun, M., & Mekuria, A. (2016). Prevalence of Anemia and Its Associated Factors among Pregnant Women Attending Antenatal Care in Health Institutions of Arba Minch Town, Gamo Gofa Zone, Ethiopia: A Cross-Sectional Study. *Anemia.*
https://doi.org/10.1155/2016/1073192

Berhe, K., Fseha, B., Gebremariam, G., Teame, H., Etsay, N., Welu, G., & Tsegay, T. (2019). Risk factors of anemia among pregnant women attending antenatal care in health facilities of eastern zone of tigray, Ethiopia, case-control study, 2017/18. *Pan African Medical Journal.*
https://doi.org/10.11604/pamj.2019.34.12.1.15999

Black, R. E., Victora, C. G., Walker, S. P., Bhatta, Z. A., Christian, P., De Onis, M., Ezzati, M., Grantham-Mcgregor, S., Katz, J., Martorell, R., & Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. In *The Lancet.*
https://doi.org/10.1016/S0140-6736(13)60937-X

Brabin, B. J., Hakimi, M., & Pelletier, D. (2001). An analysis of anemia and pregnancy-related maternal mortality. *Journal of Nutrition.*
https://doi.org/10.1093/jn/131.2.604s

Brooker, S., Hotez, P. J., & Bundy, D. A. P. (2008). Hookworm-related anaemia among pregnant women: A systematic review. In *PLoS Neglected Tropical Diseases.*
https://doi.org/10.1371/journal.pntd.0000291

Chaparro, C. M., & Suchdev, P. S. (2019). Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. In *Annals of the New York Academy of Sciences.*
https://doi.org/10.1111/nyas.14092

Contento, I. R. (2008). Nutrition education: Linking research, theory, and practice. In *Asia Pacific Journal of Clinical Nutrition.*
https://doi.org/10.1097/FCH.0b013e3182385c56

de Leeuw, N. K. M., Lowenstein, L., & Hsieh, Y. S. (1966). Iron deficiency and hydremia in normal pregnancy. *Medicine (United States).*
https://doi.org/10.1097/00005792-196607000-00002

Duffy, P. E., Craig, A. G., & Baruch, D. I.
(2001). Variant proteins on the surface of malaria-infected erythrocytes - Developing vaccines. *Trends in Parasitology.*
https://doi.org/10.1016/S1471-4922(01)02022-0

EDHS. (2016). *Ethiopia 2016 Demographic and Health Survey. Ethiopia Demographic and Health Survey.*

Ezzati, M., Lopez, A. D., Rodgers, A., & Murray, C. J. (2004). Comparative Quantification of Health Risks Global and Regional Burden of Disease. In *Comparative Quantification of Health Risks Global and Regional Burden of Disease.*

Fadlallah, R., El-Jardali, F., Nomier, M., Hemadi, N., Arif, K., Langlois, E. V., & Akl, E. A. (2019). Using narratives to impact health policy-making: A systematic review. In *Health Research Policy and Systems.*
https://doi.org/10.1186/s12961-019-0423-4

Fatkiyah, N. (2018). *FAKTOR RISIKO KEJADIAN ANEMIA PADA IBU HAMIL (STUDI DI WILAYAH KERJA PUSKESMAS SLAWI KAB. TEGAL).* *Indonesia Jurnal Kebidanan.*
https://doi.org/10.26751/ijb.v2i2.561

Figueiredo, A. C. M. G., Gomes-Filho, I. S., Silva, R. B., Pereira, P. P. S., Da Mata, F. A. F., Lyrio, A. O., Souza, E. S., Cruz, S. S., & Pereira, M. G. (2018). Maternal anemia and low birth weight: A systematic review and meta-analysis. In *Nutrients.*
https://doi.org/10.3390/nu10050601

Fishman, S. M., Christian, P., & West, J. (2000). The role of vitamins in the prevention and control anaemia. *Public Health Nutrition.*
https://doi.org/10.1017/s1368980000000 173

Foote, E. M., Sullivan, K. M., Ruth, L. J., Oremo, J., Sadumah, I., Williams, T. N., & Suchdev, P. S. (2013). Determinants of anemia among preschool children in rural, western Kenya. *American Journal of Tropical Medicine and Hygiene.*
https://doi.org/10.4269/ajtmh.12-0560

Gedefaw, L., Ayele, A., Asres, Y., & Mossie, A. (2015). Anemia and Associated Factors Among Pregnant Women Attending Antenatal Care Clinic in Wolayita Sodo Town, Southern Ethiopia. *Ethiopian Journal of Health Sciences.*
https://doi.org/10.4314/ehjs.v25i2.8

Getachew, M., Yewhalaw, D., Tafess, K., Getachew, Y., & Zeynudin, A. (2012). Anaemia and associated risk factors among pregnant women in Gilgel Gibe dam area, Southwest Ethiopia. *Parasites and Vectors.*
https://doi.org/10.1186/1756-3305-5-296

Hacibekiroglu, T., Basturk, A., Akinci, S., Bakanay, S. M., Ulas, T., Guney, T., & Dilek, I. (2015). Evaluation of serum levels of zinc, copper, and Helicobacter pylori IgG and IgA in iron deficiency anemia cases. *European Review for Medical and Pharmacological Sciences.*

Haidar, J. A., & Pobocik, R. S. (2009). Iron deficiency anemia is not a rare problem among women of reproductive ages in Ethiopia: A community based cross sectional study. *BMC Blood Disorders.*
https://doi.org/10.1186/1471-2326-9-7

Haider, B. A., & Bhutta, Z. A. (2017). Multiple-micronutrient supplementation for women during pregnancy. In *Cochrane Database of Systematic Reviews.*
https://doi.org/10.1002/14651858.CD004 905.pub5

Haider, B. A., Olofin, I., Wang, M., Spiegelman, D., Ezzati, M., & Fawzi, W. W. (2013). Anaemia, prenatal iron use, and risk of adverse pregnancy outcomes: Systematic review and meta-analysis. In *BMJ (Online).*
https://doi.org/10.1136/bmj.f3443

Hamer, D. H., Singh, M. P., Wylie, B. J., Yeboah-Antwi, K., Tuchman, J., Desai, M., Udhayakumar, V., Gupta, P., Brooks, M. I., Shukla, M. M., Awasthy, K., Sabin, L., MacLeod, W. B., Dash, A. P., & Singh, N. (2009). Burden of malaria in pregnancy...
in Jharkhand State, India. Malaria Journal. https://doi.org/10.1186/1475-2875-8-210

Harna, Muliani, E. Y., Sa’ pang, M., Dewanti, L. P., Muh, A., & Irwan, A. (2020). Prevalensi Dan Determinan Kejadian Anemia Ibu Hamil. JIK (Jurnal Ilmu Keperawatan).

Harmany, A. S. (2006). Hubungan Tabu Makanan dan Asupan Zat Gizi dengan Kejadian Anemia pada Ibu Hamil di Kota Pekalongan. Universitas Diponegoro Semarang.

Hoffmann, J. J. M. L., Urrechaga, E., & Aguirre, U. (2015). Discriminant indices for distinguishing thalassemia and iron deficiency in patients with microcytic anemia: A meta-analysis. Clinical Chemistry and Laboratory Medicine. https://doi.org/10.1515/cclm-2015-0179

Idowu, O. A., Maﬁana, C. F., & Dapo, S. (2005). Anaemia in pregnancy: A survey of pregnant women in Abeokuta, Nigeria. African Health Sciences. https://doi.org/10.5555/afhs.2005.5.4.295

Irwanti, L., Sulistiyani, S., & Rohmawati, N. (2019). DETERMINAN KEJADIAN ANEMIA GIZI BESI PADA IBU HAMIL KURANG ENERGI KRONIS DI WILAYAH KERJA PUSKESMAS SUMBERJAMBE KABUPATEN JEMBER. IKESMA. https://doi.org/10.19184/ikesma.v15i2.17 553

Jafari, S. M., Heidari, G., Nabipour, I., Amirinejad, R., Assadi, M., Bargahi, A., Akbarzadeh, S., Tahmasebi, R., & Sanjiddeh, Z. (2013). Serum retinol levels are positively correlated with hemoglobin concentrations, independent of iron homeostasis: A population-based study. Nutrition Research. https://doi.org/10.1016/j.nutrres.2013.02.0 04

Kassa, G. M., Muche, A. A., Berhe, A. K., & Fekadu, G. A. (2017). Prevalence and determinants of anemia among pregnant women in Ethiopia; a systematic review and meta-analysis. BMC Hematology. https://doi.org/10.1186/s12878-017-0090-z

Kassebaum, N. J., Fleming, T. D., Flaxman, A., Phillips, D. E., Steiner, C., Barber, R. M., Hanson, S. W., Moradi-Lakeh, M., Coffeng, L. E., Haagsma, J., Kyu, H. H., Graetz, N., Lim, S. S., Vos, T., Naghavi, M., Murray, C., Yonemoto, N., Singh, J., Jonas, J. B., … Levy, T. S. (2016). The Global Burden of Anemia. In Hematology/Oncology Clinics of North America. https://doi.org/10.1016/j.hoc.2015.11.002

Keats, E. C., Haider, B. A., Tam, E., & Bhutta, Z. A. (2019). Multiple-micronutrient supplementation for women during pregnancy. In Cochrane Database of Systematic Reviews. https://doi.org/10.1002/14651858.CD004 905.pub6

Kefiyalew, F., Zemene, E., Asres, Y., & Gedefaw, L. (2014). Anemia among pregnant women in Southeast Ethiopia: Prevalence, severity and associated risk factors. BMC Research Notes. https://doi.org/10.1186/1756-0500-7-771

Kibret, K. T., Chojenta, C., D’Arcy, E., & Loxton, D. (2019). Spatial distribution and determinant factors of anaemia among women of reproductive age in Ethiopia: A multilevel and spatial analysis. BMJ Open. https://doi.org/10.1136/bmjopen-2018-027276

Kramer, M. S., & Kakuma, R. (2012). Optimal duration of exclusive breastfeeding (Review ) Optimal duration of exclusive breastfeeding. Biostatistics, 8. https://doi.org/10.1002/14651858.CD003 517.pub2.Copyright

L.T., N., I., S., B., S. -P., S., P., I., A.-Z., M., R., A.F., J., S., V., Nyflot, L. T., Sandven, I., Straay-Pedersen, B., Pettersen, S., Al-Zirqi, I., Rosenberg, M., Jacobsen, A. F., & Vangen, S. (2017). Risk factors for severe postpartum hemorrhage: A case-control study. BMC Pregnancy and Childbirth. Lebso, M., Anato, A., & Loha, E. (2017).
Prevalence of anemia and associated factors among pregnant women in Southern Ethiopia: A community based cross-sectional study. PLoS ONE. https://doi.org/10.1371/journal.pone.0188783

Lin, L., Wei, Y., Zhu, W., Wang, C., Su, R., Feng, H., & Yang, H. (2018). Prevalence, risk factors and associated adverse pregnancy outcomes of anaemia in Chinese pregnant women: A multicentre retrospective study. BMC Pregnancy and Childbirth, 18(1). https://doi.org/10.1186/s12884-018-1739-8

Losken, A., Fishman, I., Denson, D., Moyer, H., & Carlson, G. (2005). An objective evaluation of breast symmetry using 3-dimensional images. Annals of Plastic Surgery, 55(6), 571–575.

M., D., F.O., ter K., F., N., R., M., K., A., B., & R.D., N. (2007). Epidemiology and burden of malaria in pregnancy. In Lancet Infectious Diseases.

Margwe, J. A., & Lupindu, A. M. (2018). Knowledge and attitude of pregnant women in rural Tanzania on prevention of anaemia. African Journal of Reproductive Health, 22(3). https://doi.org/10.29063/ajrh2018/v22i3.8

Mbule, M. A., Byaruhanga, Y. B., Kabahenda, M., & Lubowa, A. (2013). Determinants of anaemia among pregnant women in rural Uganda. Rural and Remote Health. https://doi.org/10.22605/rrh2259

Means, R. T. (2020). Iron deficiency and iron deficiency anemia: Implications and impact in pregnancy, fetal development, and early childhood parameters. In Nutrients. https://doi.org/10.3390/nu12020447

Melku, M., Addis, Z., Alem, M., & Enawgaw, B. (2014). Prevalence and predictors of maternal anemia during pregnancy in Gondar, Northwest Ethiopia: An institutional based cross-sectional study. Anemia. https://doi.org/10.1155/2014/108593

Metz, J. (2008). A high prevalence of biochemical evidence of vitamin B12 or folate deficiency does not translate into a comparable prevalence of anemia. Food and Nutrition Bulletin. https://doi.org/10.1177/15648265080292s111

Milman, N., Byg, K. E., & Agger, A. O. (2000). Hemoglobin and erythrocyte indices during normal pregnancy and postpartum in 206 women with and without iron supplementation. Acta Obstetricia et Gynecologica Scandinavica. https://doi.org/10.1034/j.1600-0412.2000.079002089.x

Minchella, P. A., Armitage, A. E., Darboe, B., Jallow, M. W., Drakesmith, H., Jaye, A., Prentice, A. M., & McDermid, J. M. (2015). Elevated hepcidin is part of a complex relation that links mortality with iron homeostasis and anemia in men and women with HIV infection. Journal of Nutrition. https://doi.org/10.3945/jn.114.203158

Mondal, B., Tripathy, V., & Gupta, R. (2006). Risk factors of Anemia during pregnancy among the Garo of Meghalaya, India. J Hum Ecol, 14(14), 27–32.

Obse, N., Mossie, A., & Gobena, T. (2013). Magnitude of anemia and associated risk factors among pregnant women attending antenatal care in Shalla Woreda, West Arsi Zone, Oromia Region, Ethiopia. Ethiopian Journal of Health Sciences.

Ononge, S., Campbell, O., & Mirembe, F. (2014). Haemoglobin status and predictors of anaemia among pregnant women in Mpiigi, Uganda. BMC Research Notes. https://doi.org/10.1186/1756-0500-7-712

Osman, M. O., Nour, T. Y., Bashir, H. M., Roble, A. K., Nur, A. M., & Abdilahi, A. O. (2020). Risk factors for anemia among pregnant women attending the antenatal care unit in selected jigjiga public health facilities, somali region, east ethiopia 2019: Unmatched case–control study. Journal of Multidisciplinary Healthcare. https://doi.org/10.2147/JMDH.S260398
Ouedraogo, S., Koura, G. K., Accrombessi, M. M. K., Bodeau-Livinec, F., Massougbodji, A., & Cot, M. (2012). Maternal anemia at first antenatal visit: Prevalence and risk factors in a malaria-endemic area in Benin. *American Journal of Tropical Medicine and Hygiene*. https://doi.org/10.4269/ajtmh.2012.11-0706

Pasamawati, P., & Hatma, R. D. (2019). Determinan Anemia Ibu Hamil Trimester II dan III di Indonesia (Analisis Data Riset Kesehatan Dasar). *Jurnal Kesehatan*. https://doi.org/10.26630/jk.v10i1.1178

Pesut, B., Greig, M., Thorne, S., Storch, J., Burgess, M., Tishelman, C., Chambaere, K., & Janke, R. (2020). Nursing and euthanasia: A narrative review of the nursing ethics literature. In *Nursing Ethics*. https://doi.org/10.1177/096973301984527

Profil Dinas Kesehatan Kab. Biak Numfor. (n.d.).

Rahman, M. M., Abe, S. K., Rahman, M. S., Kanda, M., Narita, S., Bilano, V., Ota, E., Gilmour, S., & Shibuya, K. (2016). Maternal anemia and risk of adverse birth and health outcomes in low- and middle-income countries: Systematic review and meta-analysis. *American Journal of Clinical Nutrition*. https://doi.org/10.3945/ajcn.115.107896

Redig, A. J., & Berliner, N. (2013). Pathogenesis and clinical implications of HIV-related anemia in 2013. In *Hematology / the Education Program of the American Society of Hematology. American Society of Hematology. Education Program*. https://doi.org/10.1182/asheducation-2013.1.377

RISKESDAS. (2018). Riset Kesehatan Dasar 2018. *Kementrian Kesehatan Republik Indonesia*.

Ristica, O. D. (2013). Faktor Risiko Kejadian Anemia pada Ibu Hamil. *Jurnal Kesehatan Komunitas*.

Rimli, S., & Kusumaningtyas, N. (2019). Hubungan Faktor Pendidikan Dan Faktor Ekonomi Orang Tua Dengan Kejadian Anemia Pada Remaja Usia 12-18 Tahun Di Kecamatan Tamaleata Kabupaten Jeneponto. *Jurnal JKFT*.

Sharma, S., Kaur, S. P., & Lata, G. (2020). Anemia in Pregnancy is Still a Public Health Problem: A Single Center Study with Review of Literature. *Indian Journal of Hematology and Blood Transfusion*. https://doi.org/10.1007/s12288-019-01187-6

Sohail, M., Shakeel, S., Kumari, S., Bharti, A., Zahid, F., Anwar, S., Singh, K. P., Islam, M., Sharma, A. K., Lata, S., Ali, V., Adak, T., Das, P., & Raziuuddin, M. (2015). Prevalence of malaria infection and risk factors associated with anaemia among pregnant women in semiurban community of Hazaribag, Jharkhand, India. *BioMed Research International*. https://doi.org/10.1155/2015/740512

Spottiswoode, N., Duffy, P. E., & Drakesmith, H. (2014). Iron, anemia and hepcidin in malaria. In *Frontiers in Pharmacology*. https://doi.org/10.3389/fphar.2014.00125

Stephen, G., Mgongo, M., Hussein Hashim, T., Katanga, J., Stray-Pedersen, B., & Msuya, S. E. (2018). Anaemia in Pregnancy: Prevalence, Risk Factors, and Adverse Perinatal Outcomes in Northern Tanzania. *Anemia*. https://doi.org/10.1155/2018/1846280

Stevens, G. A., Finucane, M. M., De-Regil, L. M., Paciorek, C. J., Flaxman, S. R., Branca, F., Peña-Rosas, J. P., Bhutta, Z. A., & Ezzati, M. (2013). Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995-2011: A systematic analysis of population-representative data. *The Lancet Global Health*. https://doi.org/10.1016/S2214-109X(13)70001-9

https://doi.org/10.25311/keskom.vol2.iss2.49
Tanzania Bureau of Statistics. (2010). Tanzania Demographic and Health Survey 2010. National Bureau of Statistics Dar Es Salaam, Tanzania ICF Macro Calverton, Maryland, USA.

Tanzia, I., Rizal, M., Damanik, M., Juntra Utama, L., Rosmiati, R., Masyarakat, D. G., & Manusia, F. E. (2016). FAKTOR RISIKO ANEMIA IBU HAMIL DI INDONESIA (Anemia risk factors among pregnant women in Indonesia). In Jurnal Gizi dan Pangan.

Taylor, C. L., & Meyers, L. D. (2012). Advanced Nutrition and Human Metabolism Fifth. Modern Nutrition in Health and Disease: Eleventh Edition.

Vaz‐Tostes, M. das G., Verediano, T. A., de Mejia, E. G., & Brunoro Costa, N. M. (2016). Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. Journal of the Science of Food and Agriculture.

WHO. (2005). Worldwide prevalence of anaemia 1993-2005: WHO Global database of Anemia. WHO Report.

WHO. (2006). Neonatal and perinatal mortality: Country region and Global estimates. In World Health Organisation.

WHO. (2011). The global prevalence of anaemia in 2011. WHO.

WHO. (2012). Guideline: Daily Iron and Folic Acid Supplementation in Pregnant Women. http://www.who.int/publications/guidelines/en/

WHO and UNICEF. (2004). Focusing on anaemia: towards an integrated approach for effective anaemia control. Joint Statement by the World Health Organization and the United Nations Children’s Fund.

Wierenga, F. T., Dahl, M., Chamnan, C., Poirot, E., Kuong, K., Sophonneary, P., Sinuon, M., Greuffeille, V., Hong, R., Berger, J., Dijkhuizen, M. A., & Laillou, A. (2016). The high prevalence of anemia in cambodian children and women cannot be satisfactorily explained by nutritional deficiencies or hemoglobin disorders. Nutrients.

WHO. (2005). Worldwide prevalence of anaemia 1993-2005: WHO Global database of Anemia. WHO Report.

WHO. (2016). Malaria Fact Sheet. Malaria Fact Sheet.

Xu, X., Liu, S., Rao, Y., Shi, Z., Wang, L. L., Sharma, M., & Zhao, Y. (2016). Prevalence and sociodemographic and lifestyle determinants of anemia during pregnancy: A cross-sectional study of pregnant women in China. International Journal of Environmental Research and Public Health.

Zhong, Q., Ananth, C. V., Rhoads, G. G., & Li, Z. (2009). The Impact of Maternal Anemia on Perinatal Mortality: A Population-based, Prospective Cohort Study in China. Annals of Epidemiology.

Cite this article as: Nurnaningsih, Ahmad, M., Sunarno, I., Arsyad, N.A. (2022). Risk factors for the anemia in pregnant women: A literature review. Nurse and Health: Jurnal Keperawatan, 11 (1), 137-150. https://doi.org/10.36720/nhjk.v11i1.305