RISK FACTORS FOR ANEMIA IN PREGNANT WOMEN: LITERATURE REVIEW

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ABSTRACT

Twenty percent (20%) of maternal mortality in developing countries is caused by iron deficiency anaemia. Meanwhile, the prevalence of anaemia in pregnancy in Asia is estimated at 48.2%, Africa 57.1%, America 24.1%, and Europe 25.1%. The trend of anaemia in pregnancy has increased in every years. To find out the risk factors that cause anaemia in pregnant women based on the research results in the health sector from 2014 to 2018. A literature review, by analyzing various studies regarding risk factors for anaemia in pregnant women. There are 17 studies from Indonesian and international researchers. From the results obtained, the educational factor is the most widely studied with a significant result (OR=2.467). Maternal factors that have significant influence are gestational age (OR=1.29) and nutritional status (OR=2.921), while nutrient intake factors that have a significant effect on anaemia in pregnant women are food intake (OR=2.54) and fluid intake (OR=2.91). Education level, nutritional status, food and beverage consumed are risk factors that have an effect on anaemia in pregnant women. Therefore, prevention measures for anaemia in pregnant women can be done by increasing maternal education and improving nutritional status with adequate nutrient intake.

Keywords *: Anemia, pregnant women, systematic review*

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INTRODUCTION

Anemia is a public health problem affecting over 1.62 billion people globally. It affects all age groups and is particularly more prevalent in pregnant women.[1] A pregnant woman suffers anaemia if she has a Haemoglobin (Hb) level of less than 11g%. It affects the physical health and cognitive development of individual causing low productivity and poor economic development of a country. WHO report showed that anaemia affects more than half a billion reproductive age women globally. From this, 38% of the anemic women were pregnant.[2]

Anaemia in pregnant women is a factor causing maternal morbidity and mortality during pregnancy, childbirth,

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puerperium as a result of pregnancy complications.[3] A pregnant woman with anaemia can also increase the risk of complications, among: miscarriage , birth of prematurus, prolonged labor, atonia uteri, shock and infection postpartum, postpartum depression, and even lead to postpartum death due to bleeding. While the impact of pregnancy anaemia in neonatals, amonga : abortus, intra uterine fetal death, low birth weight, intra uterine growth retardation, infection of baby, and low intelegency.[4]

The risk factors of anaemia in pregnancy are diverse ranging from the individual's behaviors to characteristics. Socioeconomic and cultural, nutrition, parasitic diseases like malaria and hookworm, and human immune deficiency virus infection are the most understood factors responsible for its occurrence. Factors affecting anaemia in pregnancy vary greatly, so that anaemia in pregnant women must be handled properly. Efforts to prevent anaemia in pregnant women can be done by giving blood tablets, adequate nutrient intake during pregnancy, and vitamin C.[4]

In the academic field, there have been numerous and varied research on pregnancy anaemia conducted by students, lecturers, practitioners, and researchers in the past two decades. According to preliminary surveys, research on anaemia in pregnant women is divided into three point, namely research on risk factors causing pregnancy anaemia, promotive and preventive efforts as well as curative efforts in pregnancy anaemia. There have been many studies conducted on risk factors that cause anaemia in pregnant women, but there is still no comprehensive research on risk factors causing anaemia in pregnant women in developing countries. WHO report showed that anaemia affects more than half a billion reproductive age women globally, especially pregnant women in developing countries.

Anaemia in pregnancy is one of the most-researched health topics, but still affects 1.62 billion people globally. Methods this study employed a literature review approach, to understanding anaemia topic, especially risk factors for anaemia in pregnant women according to previous research both from local and international researchers. A Literature review is a systematic research in identifying literature, explicit in the statement of objective, materials, and method, as well as developing in research methodology and conclusion. The excellence of using this literature review

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approach is that it has valid findings that can be applied from several previous studies on a specific phenomenon. This research aims to determine the risk factors that cause anaemia in pregnant women based on the results of research in the health sector in developing countries.

MATERIAL AND METHOD

This research is a literature review with literature sources from the Science Direct, Scopus, and Google Scholar database. In the process of researching literature, the keywords used were risk factors for anaemia in pregnancy, determinant of anaemia in pregnant women, and factors that influence the occurrence of anaemia in pregnancy. The literature was limited to the research in the last 10 years. 59 studies were found through Science Direct database, 392 studies from Scopus, while 1,052 studies from Google Scholar conducted by the researcher from Indonesia. Those studies were analyzed to obtain research that are in accordance with the criteria of researchers, namely the type of quantitative research, conducted in the last 10 years, have more than 2 variables and more than 100 people as the sample. According to these criteria, the number of studies obtained was 17 studies, both conducted by Indonesian and international researchers. Most of the studies are articles in scientific journals. Research from international journals are 11 articles and 6 articles are from Indonesia.

RESULT

The results of the univariate analysis in a general overview of research on risk factors for anaemia in pregnant women from 2014 to 2018. The number of samples was between 101 to 2,345 people. Most of the research used a cross-sectional design with more than 2 variables. The literature used in the research were between 13 to 66 literature with previous studies or scientific articles as the most-used literature.

The literature used was in the form of a textbook, popular scientific books, books published by the Indonesian Ministry of Health, and journals. According to the data, it can be seen that most international research use journals, scientific articles, and previous research as a reference while research from Indonesia use more books or textbooks.

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Table 1 General overview of research on risk factors for anaemia in pregnant women from 2014 to 2018

Researcher(s)	Year	Variable(s) Studied	Significant Variable(s)	Number of Samples	Research Design	Literature		Instrument
						Indonesian	International	
Alene & Dohe, 2014	2014	11	6	577	Cross-sectional	0	18	Interview & questionnaire
Ugwu et al., 2014	2014	5	2	396	Cross-sectional	0	19	Questionnaire
Chowdhury et al., 2015	2015	8	5	224	Cross-sectional	0	24	Questionnaire
Taner et al., 2015	2015	11	7	1,221	Retrospective study	0	22	Questionnaire & secondary data
Tanziha et al., 2016	2016	8	1	452	Cross-sectional	6	32	Interview & questionnaire
Mariza et al., 2016	2016	3	3	102	Cross-sectional	10	0	Questionnaire
Onyeneho & Subramanian, 2016	2016	11	6	1,500	Mix Method (Quantitative -Qualitative)	10	37	Questionnaire, FGD, in-depth interview
Xu et al., 2016	2016	17	15	2,345	Cross-sectional	0	23	Questionnaire
Purwaningtyas & Prameswari ,2017	2017	10	2	272	Cross-sectional	19	1	Questionnaire, laboratory examination
Abay et al., 2017	2017	28	9	762	Cross-sectional	0	24	Interview, structured questionnaire
Kassa et al., 2017	2017	20	19	1,467	Systematic Review and Meta Analysis	0	59	Database
Astriana , 2017	2017	2	2	277	Cross-sectional	25	1	Secondary data
Kumera et al., 2018	2018	5	2	234	Cross-sectional	0	66	Questionnaire
Weldekidan et al., 2018	2018	19	6	333	Case Control	0	26	Questionnaire
Mekonnen et al., 2018	2018	17	2	295	Cross-sectional	0	20	Questionnaire
Rizkah & Mahmudiono, 2017	2017	5	2	153	Cross-sectional	17	0	Questionnaire
Pradila, 2015	2015	8	3	101	Cross-sectional	13	34	Questionnaire

Table 1 show a general overview of research on risk factors for anaemia in pregnant women from 2014 to 2018. The number of samples was between 101 to 2,345 people. Most

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of the research used a cross-sectional design with more than 2 variables. The literature used in the research were between 13 to 66 literature with previous studies or scientific articles as the most-used literature.

Table 2. Sociodemographic factors that influence anaemia in pregnant women

No	Researcher(s)	Year	Number of Samples	Sociodemographic Factors													
				Mother's age	Status	Religion	Residence	Ethnicity	Education	Occupation	Income	Marriage Age	Social Class	Parity/number of children	Number of family members		Health Index
1	Alene & Dohe	2014	577	√	√	√		√	√	√	√	√				√	√
2	Ugwu, et.al	2014	396	√	√				√				√	√			
3	Chowdhury, et.al	2015	224	√			√		√	√	√						
4	Taner, et.al	2015	1,221	√					√	√	√			√			
5	Tanziha, et. Al	2016	452	√					√								
6	Mariza A.	2016	102						√				√				
7	Onyeneho & Subramanian	2016	1,500	√	√	√			√	√	√						√
8	Xu Xianglong, et.al	2016	2,345	√	√				√	√	√			√			
9	Purwaningtyas M.L & Prameswari G.N	2017	272	√					√		√			√			
10	Abay, et.al	2017	762	√	√	√		√	√	√					√		√
11	Kassa G.M., et.al	2017	1,467	√			√		√	√	√			√			
12	Astriana W.	2017	277	√										√			
13	Kumera G., et.al	2018	234	√	√	√		√	√	√	√				√		
14	Weldekidan F., et.al	2018	333	√		√		√	√	√				√			
15	Mekonnen, et.al	2018	295	√	√				√	√	√						
16	Rizkah & Mahmudiono	2017	153	√					√	√							
17	Fitri Y.P, et.al	2015	101	√					√								
	Total			**16**	**7**	**5**	**2**	**4**	**16**	**11**	**9**	**1**	**2**	**7**		**3**	**3**

Table 2 shows sociodemographic factors that influence anaemia in pregnant women. The factors listed in table 2 are risk factors that have been extensively (> 5 studies). Maternal age and education are the most studied sociodemographic factors (16 studies).

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Table 3 Maternal factors that influence anaemia in pregnant women

No	Researcher(s)	Year	Sample(s)	Maternal Factors												
				Gestational age	Gravida	Pregnancy gap	ANC	Nutritional status	Illness	Pregnancy / childbirth history	Reproductive health history	Complaints during pregnancy	Body weight during pregnancy	Fe Tablet	Folic Acid
1	Alene & Dohe	2014	577	√	√	√	√							√	
2	Ugwu, et.al	2014	396									√		√	
3	Chowdhury, et.al	2015	224	√	√									√	
4	Taner, et.al	2015	1,221	√			√						√	√	√
5	Tanziha, et. al	2016	452			√	√	√						√	
6	Mariza A.	2016	102												
7	Onyeneho & Subramanian	2016	1,500			√									
8	Xu Xianglong, et.al	2016	2,345	√											
9	Purwaningtyas M.L & Prameswari G.N	2017	272											√	
10	Abay, et.al	2017	762	√	√	√			√	√				√	
11	Kassa G.M., et.al	2017	1,467		√	√	√		√					√	
12	Astriana W.	2017	277												
13	Kumera G., et.al	2018	234		√	√				√					
14	Weldekidan F., et.al	2018	333	√	√	√				√	√				
15	Mekonnen, et.al	2018	295	√						√	√				
16	Rizkah &Mahmudiono	2017	153		√										
17	Fitri Y.P, et.al	2015	101	√			√		√					√	
	Total			**8**	**7**	**7**	**5**	**1**	**3**	**4**	**2**	**1**	**1**	**7**	**1**

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Table 3 shows the maternal factors that influence anaemia in pregnant women. Maternal age, gravida, and pregnancy gap are the most-researched maternal factors, that is 7-8 studies.

Table 4 Factors of nutrient intake, daily activity, and other factors influencing anaemia in pregnant women

No	Researcher(s)	Year	Sample(s)	Factors of Nutrient Intake, Daily Activity, and Others											
				Dietary habit	Fluid intake	Sleep Pattern	Smoking	Nutritional Status	Knowledge	Compliance Consumption of Fe Tablet	Physical Activity	Alcohol Consumption	Recreation Pattern	Environment	Family Support
1	Alene & Dohe	2014	577	√	√			√							
2	Ugwu, et.al	2014	396												
3	Chowdhury, et.al	2015	224												
4	Taner, et.al	2015	1,221				√								
5	Tanziha, et. Al	2016	452												
6	Mariza A.	2016	102												
7	Onyeneho & Subramanian	2016	1,500						√	√					
8	Xu Xianglong, et.al	2016	2,345	√		√	√				√	√	√		
9	Purwaningtyas M.L & Prameswari G.N	2017	272		√			√							
10	Abay, et.al	2017	762	√	√			√							
11	Kassa G.M., et.al	2017	1,467												
12	Astriana W.	2017	277												
13	Kumera G., et.al	2018	234	√	√									√	
14	Weldekidan F., et.al	2018	333	√	√										
15	Mekonnen, et.al	2018	295	√	√										
16	Rizkah &Mahmudiono	2017	153												
17	Fitri Y.P, et.al	2015	101						√	√					√
	Total			**6**	**6**	**1**	**1**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**

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Table 4 shows the factors of nutrient intake, daily activity, and other risk factors for anaemia in pregnant women.

Table 5 Sociodemographic factors that influence anaemia in pregnant women

Sociodemographic Factor	Research Results				Total
	Significant	Sample(s)	Not significant	Sample(s)	
Mother's Age	4	224;762;277;153	12	577; 396; 1,221; 452; 1,500; 2,345; 272; 1,467; 234; 333; 195; 101	16
Marital Status	1	1,500	6	577; 396; 2345; 762; 234; 295	7
Religion	-	-	5	577; 1,500; 762; 234; 333	5
Residence	2	224; 1,467	-	-	2
Ethnicity	-	-	4	577; 762; 234; 333	4
Education	6	396; 224; 1,221; 102; 1,500; 295	10	577; 452; 2,345; 272; 762; 1,467; 234; 333; 153; 101	16
Occupation	5	1,500; 2,345; 333; 295; 153	6	577; 224; 1,221; 762; 1,467; 234	11
Income	3	224; 1,221; 2,345	6	577; 1,500; 272; 1,467; 234; 295	9
Marriage Age	-		1	577	1
Social Class	2	396; 102	-	-	2
Parity	3	1,221; 2,345; 277	3	396; 272; 1,467	6
The number of family members	1	762	2	577; 234	3
Health Index	1	577	2	1,500; 762	3

In table 5, the research conducted by Ugwu et.al shows an OR value of 5.53 p-value < 0.001. While the results of Taner's research obtained an OR value of 2.23 with a p-value <

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0.001. The average OR value of the 6 studies was 2.467, meaning that mothers with low education had 2.467 times the opportunity to have anaemia during pregnancy compared to mothers with high education.

Table 6 Maternal factors affecting anaemia in pregnant women

Maternal Factor	Research Result				Total
	Significant	Sample(s)	Not significant	Sample	
Maternal Age	5	577; 1221; 2345; 762; 101	3	224; 333; 295	8
Gravida	4	577; 762; 1467; 153	3	224; 234; 333	7
Pregnancy Gap	3	762; 1467; 333	4	577; 452; 1500; 234	7
Antenatal care	2	1221; 101	3	577; 452; 1467	5
Nutritional Status	5	577; 452;1221; 272; 762	0	-	5
Illness	1	1467	2	762; 101	3
Pregnancy and Childbirth History	0	-	4	762; 234; 333; 295	4
Reproduction Health History	1	333	1	295	2
Complaints during Pregnancy	1	396	0	-	1
Body Weight during Pregnancy	0	-	1	1221	1
Fe Tablet	4	577; 396; 1221; 101	5	224; 452; 272; 762; 1467	9
Folic Acid Tablet	0	-	1	1221	1

In Table 6, Alene & Dohe study showed OR value of 3.32 with p-value < 0.05. While the results of Abay's study obtained an OR value of 0.33 with a p-value < 0.001. The average OR value of the 5 studies was 1.69, meaning that gestational age > 27 weeks (trimester III) has a 1.69 times the risk of having anaemia.[5-10]

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Table 7 Aspects of nutrient intake, daily activity, and other factors affecting anaemia in pregnant women

Factors of nutrient, ADL, and other factors	Research Results				Total
	Significant	Sample(s)	Not significant	Sample(s)	
Food intake	3	2,345; 762; 333	3	577; 234; 295	6
Fluid intake	3	762; 234; 333	3	577; 272; 295	6
Sleep pattern	0	-	1	2,345	1
Smoking	0	-	1	2,345	1
Knowledge	1	1,500	1	101	2
Compliance Consumption of Fe Tablet	1	101	1	1,500	2
Physical activity	0	-	1	2,345	1
Alcohol consumption	0	-	1	2,345	1
Recreation pattern	0	-	1	2,345	1
Environment	1	234	0	-	1
Family support	1	101	0	-	1

Table 7 shows that factors that have a significant influence on anaemia in pregnant women are food and fluid intake. The research conducted by Weldeki and obtained an OR of 2.5 with a p-value < 0.01, while the research of Xu obtained an OR of 1.89 with p-value < 0.01. The average OR of the 3 studies was 2.54 which means that less food intake has 2.54 times the risk of anaemia during pregnancy.[10]

DISCUSSION

The factors that influence anaemia in pregnant women are explained in detail in Table 5, Table 6, and Table 7. Table 5

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shows the sociodemographic factors studied, including age, marital status, religion, residence, ethnicity, education, occupation, income, marriage age, social class, parity/the number of children, the number of family members, and health index. Table 6 presents maternal factors that influence anaemia in pregnant women, and Table 7 presents the factors of nutrient intake, daily activity, and other factors influencing anaemia in pregnant women.

Based on the research results above, it can be seen that educational factors have a significant influence on the incidence of anaemia in pregnancy. In table 5, the average OR value of the 6 studies was 2.467, meaning that mothers with low education had 2.467 times the opportunity to have anaemia during pregnancy compared to mothers with high education. The mother's education level greatly influences her to act and look for causes and solutions in his life. Highly educated people will usually act more rationally, therefore, they will more easily accept new ideas. Likewise, a highly educated mother will have her pregnancy checked regularly to maintain the health condition of herself and the child in her womb.[10]

The low education level is closely related to the level of Fe understanding and the awareness of Fe tablet consumption for pregnant women. The state of iron deficiency in pregnant women is strongly determined by many factors including the education level of pregnant women. The low education level of pregnant women will affect the information received so that knowledge about iron (Fe) becomes limited and results in iron deficiency. The higher education, the higher the mother's awareness to get good nutrition resulting in a low chance of having anaemia in pregnancy.[10]

Maternal factors that have a significant influence on anaemia in pregnant women are gestational age and nutritional status. The average OR value of the 5 studies was 1.69, meaning that gestational age > 27 weeks (trimester III) has a 1.69 times the risk of having anaemia. Gestational age is closely related to the incidence of anaemia because during the third semester of pregnancy, hemoglobin levels tend to be low due to hemodilution. Therefore, supplementation of iron (Fe) tablets is very necessary, at least 90 tablets during pregnancy.

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The average an OR value of the 5 studies was 2.921, meaning that malnutrition has a risk of 2.921 times having anaemia. Malnutrition will certainly cause bad consequences for the mother and fetus. Malnutrition can lead to anaemia in pregnant women. Blood supply that delivers oxygen and food to the fetus may get hampered so that the fetus will experience growth and development problems. Therefore, monitoring nutrition for pregnant women is very important.

Malnutrition can cause the mother to suffer from anaemia due to the hampered blood supply and eventually may cause problems in the growth and development of the fetus.

Kumera et al., (2018) found that pregnant women who consume more than 3 cups of coffee a day have a risk of 2.91 times having anaemia which was reflected on the OR value of 2.91 with a p-value < 0.001.[11] Whereas, Weldekidan et al., (2018) stated that pregnant women who consumed tea after a meal have 3.6 times the risk of having anaemia. This was shown by the OR value of 3.6 with a p-value of 0.01 which was obtained from the research. In the research conducted by Abay (2017), an OR value of 1.96 with a p-value < 0.01 was obtained. This means that pregnant women who drink soft drinks more than 1 bottle a week have a risk of 1.96 times having anaemia.[5] Fluid intake such as excessive coffee, tea, and soft drinks will interfere with iron absorption which can cause anaemia. The presence of iron absorption inhibitors such as caffeine, tannins, oxalates, and phytates that are often consumed by pregnant women may cause inhibited absorption of iron in the body. These inhibitors must be avoided because these substances bind iron so it cannot be absorbed.

CONCLUSION

The most studied sociodemographic factors are its effect on anaemia in pregnant women. The maternal education level proved to be significant for anaemia in pregnant women. Gestational age and nutritional status are also considered as significant maternal factors for anaemia in pregnant women. Meanwhile, the factors of food and fluid intake are proved to be the most significant against the incidence of anaemia in pregnant women. In conclusion, education level, nutritional status, and good nutrition of pregnant

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women can prevent anaemia in pregnancy.

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