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RELATIONSHIP OF ANTENATAL CARE VISIT, EMESIS GRAVIDARUM, AND DIETARY HABIT AGAINST ANEMIA IN PREGNANCY

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ABSTRACT

Introduction: Anemia is one of the clinical conditions that can be found in many countries, particularly developing countries. The prevalence of anemia in pregnant women in Indonesia is 37.1% with the highest in rural areas, namely 37.8%, and the lowest in urban areas, 36.4%. Multifactors can influence anemia in pregnancy. **Aims:** This study aimed to determine the relationship between ANC visits, emesis gravidarum, and diet on anemia in pregnant women patients. **Methods:** This study is a cross-sectional study. The research was conducted at the Independent Practice Place of Midwife Rabiah, AM.Keb, Sentosa Village, The District of Seberang Ulu II, Palembang City, South Sumatra Province. The independent variables in this study were ANC visits, emesis gravidarum, and diet, while the dependent variable was anemia in pregnant women. Our study used the SPSS ver.25 program. This study conducted univariate and bivariate analysis. The bivariate used chi-square test. **Results:** Based on the chi-square test with CI = 95% obtained p-value <0.001 (P<0.05), a significant association between dietary patterns and anemia in expectant mothers at TPMB Rabiah, Am.Keb, Sentosa Village, Sebrang Ulu District, Palembang City, South Sumatra Province, 2023. **Conclusion:** This study showed a significant association between Antenatal Care visits, Emesis Gravidarum, and Diet against anemia in expectant mothers, which can be used as a source of information for expectant mothers.

Keywords: Anemia, Antenatal Care, Diet, Emesis, Pregnancy

INTRODUCTION

Anemia is one of the clinical conditions that can be found in many countries, particularly developing countries. It is characterized with a hemoglobin level below 12 g/dL in females and 13 g/dL in males (Domenica Cappellini and Motta, 2015; Lodia Tuturop et al., 2023). Anemia in pregnancy can be diagnosed by hemoglobin level below 11 g/dL. The earlier study stated that anemia in pregnancy is indicated by a hemoglobin levels below 11 g/dL at the first and third trimesters, less than 10.5 g/dL of hemoglobin levels at the second trimester, and a hemoglobin level below 10 g/dL after childbirth (Ramadhan et al., 2023).

In Indonesia, anemia in pregnancy prevalence occurs at 37.1%, with the highest in rural areas, namely 37.8%, and the lowest in urban areas, 36.4%. This data provides a deeper understanding of anemia in pregnant women in this country. With the previous Basic Health Research in 2018, anemia in pregnancy in Indonesia were found in 48.9%, particularly, 84.6% of expectant mother who aged 15-24 years were diagnosed with this condition. In addition, anemia in pregnancy in South

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Sumatra Province in 2019 reached 7.26%. Anemic pregnant women in districts/cities range from 0.16 to 61.02%, with the highest cases in the PALI district (61.02%). Meanwhile, the data from the Palembang City Health Service in 2018 revealed that the reached 6.2% or approximately 1793 expectant mother in Palembang City experienced anemia during pregnancy (Research, 2018).

The negative impact of anemia in pregnancy is reported to increase the risk of mortality in maternal and perinatal (Efendi et al., 2023). The expectant mothers may feel fatigue, impaired of work performances and immune systems. It may also increase the risk of cardiovascular diseases, and mortality rate. This condition contributes to 23% of indirect causes of mortality of expectant mothers in developing countries (Margawati et al., 2023). In addition, negative impacts can occur in fetal development when the mothers have anemia. (Javed et al., 2018).

Anemia in pregnancy is often reported to occur due to iron deficiency (62.3%); other causal factors are also reported, such as deficiencies of vitamin B12 (cobalamin) (18.9%) and vitamin B9 (folic acid) (11.7%) and due to other factors (7.4%) (Handari et al., 2022). Multifactor can influence anemia in expectant mothers. Previous research stated that factors related to anemia in pregnant women were parity, age, and *antenatal care* (ANC) visits. This is supported by research showing that maternal age and history of *antenatal care* (ANC) visits are associated with anemia in pregnancy (Lumbanraja, 2017). A previous study also had similar results which revealed that complete antenatal care visits also correlated significantly with anemia in pregnancy (Laturake et al., 2023). Other study that was conducted in a clinic in Medan also showed a significant association between *antenatal care* (ANC) visits and anemia during pregnancy ($p<0.05$) (Mardha and Syafitri, 2021).

Other research states that enabling factors such as pregnancy interval, emesis gravidarum, and diet were found related to the incidence of anemia in expectant mothers (Dewanti et al., 2020). Based on a previous study which conducted in Pandeglang in 2022 showed that emesis gravidarum had significant correlation with incidence of anemia in pregnancy ($p=0.002$) (Susnaningtyas and Lisca, 2024). On dietary habits aspects, the previous study analyzed the dietary habits of pregnant women and its association to the incidence of anemia. The study indicated that expectant mothers who did not drink tea or coffee with food were 0.06 times less likely to have anemia compared with those who consumed beverages with meals. Moreover, the earlier study also revealed that expectant mothers who ate food less than three times a day were 2.92 times have the chances to have anemia during pregnancy compared to the women who ate three or more times daily. In this study, researchers only focused on three variables to be studied, namely *antenatal care* (ANC) visits, *emesis gravidarum,* and diet, which are related to anemia in expectant mothers.

The previous preliminary study conducted at TPMB Rabiah, Am. Keb, Sentosa Village, Sebrang Ulu District, Kota Palembang, South Sumatra Province in 2022 shows the prevalence of anemia in TPMB Rabiah, Am. Keb is 47 (30%) with a total of 155 pregnant women, while in 2023, the prevalence of anemia in January-September is 40 (33%) with 120 pregnant women. Therefore, researchers feel it is essential to investigate the relationship between *antenatal care* (ANC) visits, emesis gravidarum, and diet on anemia in pregnant women.

METHODS

Study Design

The research method used in this research is descriptive quantitative. The design used is cross-sectional. This study studies the relationship dynamics between risk factors and effects using an approach, observation, or data collection carried out simultaneously and without a follow-up

period. This study is held in the Independent Practice Place for Midwives Rabiah, AM.Keb, Sentosa Village, Seberang Ulu II District, Palembang City, South Sumatra Province due to its increasing incidences of anemia in pregnanc. This research will be carried out in December 2023.

Study Sample

The study's population were expectant mothers in their first trimester at TPMB Rabiah, Am.Keb. The sample size uses total sampling techniques. The study sample consisted of 35 respondents. The study sample was expectant mothers in their first trimester at TPMB Rabiah, Am. Keb in October-December. Our study had inclusion criteria which is expectant mothers in their first trimester at TPMB Rabiah, Am.Keb., with age 15-45 years. Our exclusion Then, 35 respondents were willing to become research respondents by signing informed consent in October-December. The exclusion criteria need to be completed with questionnaire data.

Data Collection and Processing

Research instruments are tools used by the authors to collect data and furthermore to make the work easier and better results (Sugiyono, 2018). In this research, the author collected secondary and primary data. Secondary data was taken from the Perdana Health Center medical record book to see whether there was anemia and the KMS/KIA book owned by the respondent to measure the respondent's *antenatal care* (ANC) visits. The dietary pattern and emesis gravidarum variables were measured using a questionnaire. The questionnaire was adopted from a study by Hazelina in 2013, which consisted of nine questions. This study was conducted in Indonesia and also used Bahasa Indonesia to facilitate the respondents who were also Indonesian. The questionnaire was paper-based and already validated in a previous study. In the previous study, the data were collected and analyzed by Hazelina (Hazelina, 2013).

For anemia classification, authors used the previous study which classified the anemia into three groups, such as mild (8-9.9 g/dL); moderate (6-7.9 g/dL; severe (<5 g/dL) (Simorangkir et al., 2022) In addition, the emesis variables will be measured with PUQE-24 which had been validated in a previous study. The instruments consist of three questions and categorized the emesis into three groups. Mild emesis was 3-6 times, moderate was 7-12, and severe was >13) (Ebrahimi et al., 2009)

Data collection is a one of the research activities that collects data that will be used in research (Notoatmodjo, 2018) After the data is collected, then the next step is data processing, which consists of editing, coding, entry, and cleaning. The data are re-checked to confirm the data are suitable for the variables of the study. Furthermore, the data were transformed into numbers for variable grouping. After coding each variable, the data is then entered into a template that will be used for data analysis. Then, the data cleaning was conducted to make sure all of the variables were already filled with suitable code.

Statistical Analysis

Our study used the Statistical Package for the Social Science (SPSS) ver.25 program. This study conducted univariate and bivariate analyses. The univariate analysis was intended to describe the characteristics of our study respondents. In addition, the univariate analysis in our study was intended to show the frequency distributions of each variable. We also conducted the bivariate analysis and applied the chi-square test to analyze the association between the study variables. Our study analyzes the association between antenatal care visits, emesis gravidarum, and dietary habits with anemia in pregnancy. The Spearman test will be conducted if the data are not distributed normally. While the Pearson will be

conducted if the data were normally distributed. Our study was approved by the local clinical research ethics committee Approval No. 042/KEPK/STIKEP/PPNI/JABAR/II/202.

RESULT

Table 1. Characteristics of Respondents

Variables	Percentage
Maternal age	
<20 years and >35 years	14%
20 years – 35 years	86%
Education	
Low (below high school)	37%
High (above high school)	73%
Work	
Work	23%
No work	77%
Parity	
Primipara	51%
Multiparous	26%
Grandemulti	23%
Age Pregnancy	
< 3 months	51%
>3 months	49%

Most of the respondents were of productive age, namely 20-35 years, 30 respondents (86%), and for the expectant mothers age <20 years and >35 years, there were 5 respondents (14%). In the education category, the majority had high education >high school, 22 respondents (63%), while for the low education category <high school, there were 13 respondents (37%). For the employment category, most mothers did not work, namely 27 respondents (77%) and 8 respondents (23%). For the parity category, the majority were 18 respondents (51%) in primiparous mothers, 9 respondents in multiparous mothers (26%), and 8 respondents in grandemultis (23%). Meanwhile, in the gestational age category, the majority of pregnant women were < 3 months, namely 18 respondents (51%) and 17 respondents (49%) were pregnant > 3 months. All of these results are shown in table 1.

Table 2. Frequency Distribution of Anemia in Pregnancy

Maternal Anemia Pregnant	n	Percentage
Mild Anemia	11	31%
Moderate Anemia	21	60%
Severe Anemia	3	9%

The majority of pregnant women had moderate anemia, 21 respondents (60%), 11 respondents (31%) had mild anemia, and 3 respondents (9%) had severe anemia had shown in table 2.

Table 3. Frequency Distribution of ANC Visits among Expectant Mothers

ANC visit	N	Percentage
< 6 Visits	18	51%

ANC visit	N	Percentage
> 6 Visits	17	49%

The most expectant mothers who did < 6 ANC visits were 18 respondents (51%), while the expectant mothers who did > 6 ANC visits were 17 respondents (49%).

Table 4. Frequency Distribution of Emesis Gravidarum in Pregnancy

Emesis Gravidarum	N	Percentage
Mild Emesis	20	57%
Moderate Emesis	12	34%
Severe Emesis	3	9%

As shown in table 4, most of expectant mothers experienced mild emesis, 20 respondents (57%), 12 respondents (34%) experienced moderate emesis, and 3 respondents (9%) experienced severe emesis.

Table 5. Frequency Distribution of Dietary Patterns of Pregnant Women

Dietary Pattern	N	Percentage
Good Diet	3	9%
Adequate Diet	21	60%
Poor Diet	11	31%

Table 6. Relationship between Antenatal Care Visits and Anemia in Pregnancy

ANC visit	Mild Anemia		Moderate Anemia		Severe Anemia		P-Value
	N	%	N	%	N	%	
< 6 Visits	0	0	17	49	1	3	<0.001
> 6 Visits	11	31	4	11	2	6	

Note *significant (p<0.05)

The most of respondents have an adequate diet, 21 respondents (60%), 11 respondents (31%) have a poor diet, and 3 respondents (9%) have a good diet (shown in table 5).According to the table 6 that describes the relationship between antenatal care visits and anemia during pregnancy. Our present study divides the amount of sufficient antenatal care visits into two groups (less than 6 times and up to 6 times). Moreover, our results showed that in the category < 6 antenatal care visits, the pregnant women mostly had moderate anemia with seventeen respondents (49%) and one respondent (3%) experienced severe anemia. While in the subgroup of antenatal care visits for more than six times, the majority of pregnant women experienced mild anemia; eleven respondents (31%), four respondents (11%) experienced moderate anemia, and 2 respondents (6%) experienced severe anemia. According to the bivariate test using the chi-square test, there is a significant relationship between antenatal care visits and anemia in pregnant women in one of health care facilities that were examined by midwifery named Rabiah, in Sentosa Village, Sebrang Ulu District, Palembang City, South Sumatra Province in 2023 (p value <0.001).

Table 7. The Relationship between Emesis Gravidarum and Anemia Pregnant Women

Emesis Gravidarum	Mild Anemia		Moderate Anemia		Severe Anemia		P-Value
	F	%	F	%	F	%	
Mild Emesis	0	0	18	51	2	6	<0.001
Moderate Emesis	10	28	2	6	0	0	
Severe Emesis	1	3	1	3	1	3	

Note *significant (p<0.05)

The majority of mothers experienced moderate anemia, namely 21 respondents (60%), mild anemia, 11 respondents (31%), and 3 respondents (9%) experienced severe anemia. For the soft emesis category, the majority of expectant mothers experienced moderate anemia; 18 respondents (51%) and 2 respondents (6%) experienced severe anemia. For the moderate emesis category, most pregnant women experienced mild anemia; 10 respondents (28%) and 2 respondents (6%) experienced moderate anemia. Meanwhile, for the severe emesis category, the majority of pregnant women experienced mild anemia, moderate anemia, and severe anemia, with only one respondent (3%). Moreover, the bivariate analysis obtained there was a significant relationship between emesis gravidarum and anemia in pregnant women in TPMB Rabiah, Am.Keb, Sentosa Village, Sebrang Ulu District, Palembang City, South Sumatra Province, 2023 (p value <0.001).

Table 8. The Relationship between Diet and Anemia in Pregnancy

Dietary Pattern	Mild Anemia		Moderate Anemia		Severe Anemia		P-Value
	F	%	F	%	F	%	
Good Diet	3	9	0	0	0	0	
Adequate Diet	0	0	19	54	2	6	<0.001*
Poor Diet	8	22	2	6	1	3	

Note *significant (p<0.05)

Based on table 8, from 35 respondents whose mothers were pregnant, the majority of 21 respondents (60%) experienced moderate anemia, 11 respondents (31%) experienced mild anemia, and 3 respondents (9%) experienced severe anemia. Most pregnant women experienced mild anemia for the excellent diet category, namely, 3 respondents (9%). Most of the adequate diet category experienced moderate anemia; 19 respondents (54%) and 2 respondents (6%) experienced severe anemia. Meanwhile, in the poor diet category, the majority experienced mild anemia; 8 respondents (22%), 2 respondents (6%) experienced moderate anemia, and 1 respondent (3%) experienced severe anemia. Moreover, it showed a significant association between dietary patterns and anemia in pregnant women at TPMB Rabiah, Am.Keb, Sentosa Village, Sebrang Ulu District, Palembang City, South Sumatra Province, 2023 (p-value <0.001).

DISCUSSION

Anemia is one clinical conditions that can be caused by a decreased in iron and folic acid in the body; this condition in pregnancy can result in abortion, premature birth, inhibited fetal growth and development, uncomplicated infection, and bleeding (Salunkhe et al., 2021). Anemia can be prevented with a government program through antenatal care. Antenatal care aims to check the maternal physical and mental health during pregnancy and

childbirth. Antenatal care should be carried out by pregnant women periodically, specifically twice in the first trimester, once in the second trimester, and thrice in the third trimester. Researchers concluded that visiting pregnant women at least 6 times during pregnancy is very important because these visits are helpful for pregnant women in knowing the development of the fetus in their womb and can minimize risks that could endanger the mother and fetus in her womb.

The government of Indonesia has made efforts to prevent and control this condition in pregnancy by providing free blood supplementation tablets (TTD) and folic acid supplementation programs. Expectant mothers in the first trimester are recommended to receive a minimum of 90 Fe tablets to be consumed during pregnancy. Expectant mothers are also advised to consume 60 mg of iron and 0.25 folic acid which also equal with 200 mg of *ferrosulphate* during pregnancy (Karyadi et al., 2023).

In our present study, the characteristics of subjects were dominated by women who aged 20 – 35 years old. This was in line with the previous study which showed that maternal age more than 25 years old can influence the incidence of severe anemia during pregnancy (Azmi and Puspitasari, 2022). Our recent study also showed that the education status of the subjects was vary. According to the previous study, education may also affect the incidence of anemia in pregnancy. The maternal education status can increase the risk of anemia doubled and showed significant results (p=0.02). Moreover, the education level is divided into two groups (low and high group). A low education level is mostly characterized as junior high school graduates or below. While the high education level is characterized by high school graduates or higher. In previous study, the low education level had eleven-times to increase the risk of anemia and showed a statistically significant result with p-value 0.002 (Astuti, 2016).

Although the amount of iron is relatively abundant in our environment, the inadequate intake of iron absorption may occur because iron can form highly insoluble oxides due to its exposure to oxygen. The human enterocytes have enzymes that can regulate the iron to reduce the insoluble ions (Fe^{3+}) to absorbable ferrous (Fe^{2+}) (Ems et al., 2024). This mechanism is correlated with histidine, which has an imidazole ring that can bind to divalent iron ions. Histidine is an amino acid and proximal ligand of heme iron, constituting hemoglobin. The hemoglobin primarily transfers the oxygen gas from the lungs to the tissues in the body (Vera-Aviles et al., 2018). Therefore, iron supplementation is essential to enhance oxygen transportation adequately.

Emesis gravidarum (morning sickness) is a condition that is characterized by nausea and vomiting that occur less than five times (Goyal et al., 2022). Most of the women experience nausea and vomiting during the pregnancy (70-85%). The symptoms that can occur are dizziness, bloated stomach, and weakness accompanied by the ejection of stomach contents through the mouth less than five times a day in pregnant women in the first trimester. Symptoms of nausea and vomiting usually start 2 to 4 weeks after fertilization, peaking between 9 and 16 weeks of gestation, and generally will be completed within 22 weeks (Solomon et al., 2023). Even though it looks mild, it is closely related to pregnancy—excessive nausea and vomiting risks causing various adverse effects for pregnant women and the fetus. Pregnant women can experience dehydration and loss of nutrition, which can have an impact on the growth and development of the fetus.

The physical and psychological changes in early pregnancy cause changes in the body which can cause various symptoms such as nausea, vomiting, and emotional instability in pregnant women. Nausea and vomiting experienced by pregnant women can reduce appetite and

result in malnutrition in pregnant women. Malnutrition during pregnancy due to emesis gravidarum carries the risk of poor nutritional status and pregnancy complications. Emotional changes are unstable and tend to increase during pregnancy, which can increase the incidence of nausea and vomiting, which can worsen the health condition of pregnant women (Grammatikopoulou et al., 2023).

Danger signs to watch out for include weight loss, malnutrition or changes in nutritional status, dehydration, electrolyte imbalance, and ketosis. In addition, there is also another term, such as hyperemesis gravidarum, which is a condition that can be characterized by excessive and continuous nausea and vomiting. This condition can cause an imbalance of body fluid and electrolytes and may also cause the loss of body weight by more than 5% during pregnancy. Furthermore, it can have dire consequences for the fetus, such as abortion, IUFD, premature parturition, LBW, and IUGR (Sanders et al., 2023).

Researchers concluded that there is a significant association between emesis gravidarum and anemia in expectant mothers. This study also in line with previous study that was conducted in Pandeglang District in 2022. The previous study showed there is a significant result of association between emesis gravidarum and the incidence of anemia during pregnancy (p=0.002) (Susnaningtyas and Lisca, 2024). Similar to the present study, earlier study revealed a significantly correlation between emesis gravidarum and anemia. The study revealed that the higher frequency of emesis gravidarum had 3.7 times bigger risk of having anemia compared with the pregnant women who had smaller frequency of emesis gravidarum (Tatik et al., 2021).

Prolonged nausea and vomiting may cause the pregnant women to have low nutritional status and lead to anemia. Emesis gravidarum may cause a decrease of appetite and then lead the pregnant women to an electrolyte imbalance (potassium, calcium, and sodium). This condition leads the women to have a change in body metabolisms and anemia during pregnancy (Susnaningtyas and Lisca, 2024).

Emesis gravidarum is caused by hormonal changes in pregnant women in the form of an increase in the estrogen and progesterone hormones and the release of human chorionic gonadotropin from the placenta. These hormonal changes also cause physiological symptoms, such as mild anemia, nausea, and vomiting during pregnancy. While in psychological aspect, this condition may cause the women to feel uncomfortable and affect their quality of life. Furthermore, if nausea and vomiting worsen than before, it is recommended to seek medical help from the midwife or medical personnel to ascertain the condition of the mother and the fetus and obtain an optimal treatment. Previous research shows a reduction in nausea and vomiting in first-trimester pregnant women after they are educated on how to consume food and maintain food consumption patterns. The study showed that most respondents appeared more relaxed and calm. However, nausea and vomiting were still present because the mothers rarely wanted to eat and consume the recommended foods (Asrade et al., 2023).

Anemia is one of the hematological disorders that commonly can be found disorder in pregnant women. Several factors cause anemia in pregnant women, including the regularity of consumption of blood supplementation, and diet. In our present study, diet is significantly correlated with the risk of anemia in pregnancy. The dietary pattern in pregnancy consists of the consumption of blood supplementation. According to the previous study, the usage of blood supplementation in expectant mothers can be influenced by the compliance to consume the tablets. Furthermore, the lack of compliance to consuming iron tablets in expectant mothers can be influenced by some factors, such as the side effects that can be felt after consuming the tablets, an insufficient

amount of ANC visits to the health workers, and the poor socioeconomic status of the women (Noptriani and Simbolon, 2022). The women may feel certain side effects after consuming the tablets, such as nausea and vomiting, constipation, and diarrhea. This inconvenience may affect the pregnant women to not consume the tablets regularly. It may cause a decrease amount of iron and folic acid in the body and cause anemia. Thus, the government recommend the mothers to consume iron and foods containing iron (Noptriani and Simbolon, 2022). The willingness to consume the blood supplement tablets regularly influences the anemia in expectant mothers. In a previous study, compliance of consuming blood supplements also correlated with other factors such as ANC visits. It was found that the expectant mothers who had insufficient antenatal care visits had a two times increasing risk of blood supplement consumption that was not as much as recommended compared with the women who had sufficient antenatal care at the healthcare facilities (Noptriani and Simbolon, 2022).

A balanced diet resulting good nutritional status. Exceeding food intake will cause excessive weight and other diseases caused by extra nutrients. On the other hand, food intake that is less than required will cause the body to become thin and susceptible to disease (Koeryaman et al., 2019). The previous study showed respondents who eat an unhealthy diet are more at risk of experiencing anemia than people who eat a healthy diet. Research results show a relationship between diet and anemia in pregnant women. Antenatal care is one of the programs from the government to reduce anemia and improve family nutrition. It aims to prevent and motivate pregnant women to consume nutritious food, especially spinach leaves. The folic acid content in spinach leaves makes the coenzyme tetrahydrofolic acid (FH_4) available as a temporary carrier for 1-carbon groups such as methyl ($-CH_3$), methylene ($-CH_2-$), methenyl (-CH=), formyl (-CHO), and forming. (-CHNH) in a complex enzymatic reaction to produce mature red blood cells (erythrocytes) (Majid et al., 2018).

One of the factors that influences pregnant women to experience anemia is unhealthy eating patterns. An adequate diet during pregnancy help the body cope with the unique demands of pregnancy and positively affect the fetus's health. Pregnant women must adopt a healthy lifestyle so their baby has a good nutritional intake. Efforts to prevent and control anemia during pregnancy can be made by increasing the consumption of nutritious foods. The dish composition which contains lots of iron from animal-based meals such as meat, fish, chicken, liver, and eggs, as well as plant-based meals such as dark green vegetables, nuts, and tempeh is highly recommended. Seafood, eggs, and meat are sources of vitamin B-12 (cobalamin), so the body's metabolic need for the coenzyme 5'-deoxyadenosylcobalamin as a transfer of hydrogen atoms from one carbon atom to the next as a replacement for alkyl, hydroxyl, carboxyl or amino groups various biochemical reactions can take place so that it can prevent the occurrence of pernicious anemia, which is a complex and fatal type of anemia that causes death.

Our recent study also obtains a statistically significant relationship of antenatal care visits and anemia in pregnancy. Antenatal care is one of the efforts to maintain the good progress of fetal development and preparation to childbirth. The previous study showed that the completeness of antenatal care visits was correlated significantly with the incidence of anemia ($p=0.000$) (Laturake et al., 2023). Similar with the previous results, other study that was conducted in Soppeng District in 2022 also showed an association between antenatal care visits and anemia ($p=0.049$) (Adriana, 2022). Another study conducted in Pandeglang also showed similar results with the present study which showed that ANC visits were correlated significantly with the incidence of anemia

in pregnancy (p=0.000) (Susnaningtyas and Lisca, 2024). In line with these studies, study that was conducted in Probolinggo in 2019 showed that the regularity of doing ANC visits was correlated significantly with the incidence of anemia (p=0.001). This study showed that pregnant women who did not do regular ANC visits had anemia (80%) while those who did regular ANC visits did not have anemia (80%). The irregularity of ANC visits may happen because pregnant women start to examine their pregnancy in their second and third trimesters. According to the previous study, the irregularity of ANC visits was four times higher to have anemia compared with the pregnant women who had regular ANC visits (Nurmasari and Sumarmi, 2019). One of the programs that can be used to reduce the incidence of anemia during pregnancy from the government is to apply antenatal care. The ANC can provide better information to expectant mothers and their partners through certain steps, for instance, physical examinations, any kind of supplementations during pregnancy, and any of medical advice from health workers. During ANC visits, the health workers will help the women to detect any of the risk factors related to pregnancy, one of which is anemia. The routine ANC visits may help to reduce the psychological aspects, such as anxiety of anemia because the women will receive the iron elemental supplements to overcome the anemia condition (Azmi and Puspitasari, 2022) Our present study also has some limitations. First, our study only presented a small study size. However, it also can provide information regarding to anemia in pregnancy in further studies with related topic.

CONCLUSIONS

This study showed a relationship of ANC visits, emesis gravidarum, and diet against anemia in pregnant mothers, which can be used as additional information for expectant mothers With these results, we suggest to the stakeholders to give some actual actions to reduce the risk of anemia in expectant mothers.

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