Original Article

Pregnancy Complications among Postpartum Women with Anemia: A Retrospective Study

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ABSTRACT

OBJECTIVE: To analyze pregnancy complications in postpartum mothers with anemia.
METHODOLOGY: This retrospective observational study used a purposive sampling technique in 86 postpartum mothers with a history of cesarean section with available Hb levels due to pregnancy complications during January to March 2024. Data were obtained from medical records at Dr. Zainoel Abidin Regional General Hospital, Banda Aceh. Statistical analysis was performed using IBM SPSS for descriptive analysis of data.
RESULTS: Most respondents were aged 21–35 years (75.6%), had secondary education (62.8%), were unemployed (65.1%), and were in their third trimester (77.9%). More than half of respondents (55.8%) experienced anemia. The most common pregnancy complication was premature rupture of membranes (25.6%), followed by preeclampsia (15.1%) and bleeding (14.0%). Anemia was the main factor causing various obstetric complications, particularly premature rupture of membranes, hemorrhage, postpartum infection, preterm labor, and abortion.
CONCLUSION: These findings confirm that anemia in pregnancy increases the risk of serious complications for both the mother and the fetus. Preventive efforts, including early detection, nutrition education, and iron and folic acid supplementation from preconception to postpartum, need to be strengthened to reduce the incidence of anemia and related complications.

KEYWORDS: Anemia, pregnancy, obstetric complications, postpartum

INTRODUCTION

Anemia is a decrease in the concentration of red blood cells or hemoglobin (Hb), resulting in a reduced oxygen-transport capacity. Pregnant women are categorized as anemic if the Hb value is <11.0 g/dl in the first and third trimesters, and <10.5 g/dl in the third trimester [1]. Anemia is the most common problem experienced by adolescent girls during pregnancy, preconception, and postpartum. An estimated 37% of pregnant women and 30% of women aged 15–49 suffer from anemia. Anemia caused 50 million healthy life years lost to disability in 2019 globally. The main causes are dietary iron deficiency, thalassemia and sickle cell trait, and malaria in Ethiopia[2]

In 2024, research found that malaria infection, hookworm infection, pregnancy spacing of less than 2.5 years, and a history of unsafe abortions were factors associated with anemia in pregnant women[3]. Other data indicate that pregnant women with secondary or higher education and pregnancies at a non-risk age are less likely to experience anemia. Meanwhile, the parity, second and third trimesters of pregnancy, and lower economic status are at greater risk of anemia [4].

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A literature review of retrospective studies found that the incidence of postpartum hemorrhage, premature rupture of membranes (PROM), preterm delivery, low birth weight (LBW), cesarean section, gestational hypertension, and neonatal asphyxia was higher in pregnant women with anemia, thus concluding that anemia is associated with these seven conditions in pregnant women [5].

Southeast Asia also shows a high percentage of women experiencing anemia during pregnancy, at around 48.2%. Data from the 2018 Regional Health Research (Riskesda) in Indonesia recorded a prevalence of anemia among pregnant women of 48.9%, with iron consumption among pregnant women still at 38.1% [6].

Research on health cadres in Aceh, Indonesia, showed that the community-as-partner approach has been effective in preventing anemia and stunting among pregnant women. Therefore, regular education by nurses is necessary to maintain the effectiveness of this intervention[7]. Anemia prevention can be initiated early, starting with nutritional support from preconception and early pregnancy, particularly iron and folic acid [8]. Maternal knowledge about anemia is a focus for health workers, as research at the Community Health Centre (Puskesmas) in Aceh Besar showed a significant increase in maternal knowledge after anemia counselling[9]. Based on this phenomenon, research related to pregnancy complications in mothers with anemia is very important as one of the main factors in preventing anemia during pregnancy and postpartum.

METHODOLOGY

Study Design

This retrospective observational study was conducted on postpartum women treated in the obstetrics ward of Dr. Zainoel Abidin General Hospital, a government hospital in Aceh, Indonesia. Data were collected from medical records from January to March 2024. The data acquisition process begins with data searches in the medical records room, then data on postpartum mothers who underwent cesarean section are selected with with available Hb levels and pregnancy complications requiring cesarean section; all required data are recorded on the research observation sheet.

Population and Sample

The population in this study consisted of all women treated in the Obstetrics ward of Dr Zainoel Abidin General Hospital, Aceh, Indonesia. The sample was selected using a purposive sampling technique. Inclusion criteria included medical record data from postpartum women with cesarean sections and all of pregnancy complications. Exclusion criteria included medical record data from women with normal postpartum periods and those admitted to the intensive care unit (ICU). The sample size based on Cohen's (1988) table for the t-test with power (p) = 0.80, significance level (α) = 0.05 and effect size (d) = 0.40, in accordance with the provisions in nursing research, with a range of 0.20-0.40 amounted to 78 people. To avoid dropouts during the study, the sample was increased by 10%, resulting in a total of 85.8 or 86 respondents.

Instrument

The method used was a retrospective observational study. Data were extracted from medical records, including patient characteristics, such as age, education, occupation, gestational age, obstetric history, pregnancy spacing, history of abortion, anemia, Body Mass Index (BMI), and laboratory results.

Data Analysis

Data were obtained in Excel spreadsheets. Statistical analysis was performed using IBM SPSS. Categorical variables were expressed as percentages and numbers (descriptive analysis). Numeric variables were then presented graphically.

Ethical Statement

Ethical approval for this study was obtained from the research committee and the Ethics Board of Dr. Zainoel Abidin General Hospital, Aceh, under Ethics No. 319/ETIK-RSUDZA/2024, dated June 5, 2024.

RESULTS

Demographic Data of Respondents

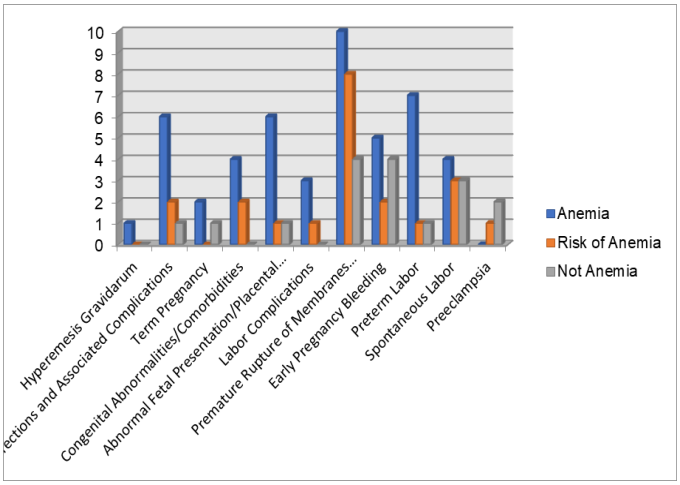
Data collection was carried out on 86 respondents using secondary data, according to the criteria; the following characteristics were obtained.

Based on **Table I**, the majority of respondents were aged 21–35 (75.6%). Almost all respondents were Muslim (98.8%), and most resided in the Banda Aceh –Aceh Besar area (69.8%). In terms of education, the majority had a secondary education (62.8%), majority were unemployed (65.1%), and the third trimester (77.9%). The obstetric histories indicated that most were multiparous (62.8%), parity was in the ideal range (79.1%) between 2 and 5 years. Majority mothers have not abortion history (72.1%). The most common pregnancy complication was PROM (25.6%), preeclampsia (15.1%) and bleeding (14.0%). Other fairly frequent complications were abortion (12.8%), postpartum infection (10.5%), and preterm labor (10.5%). Based on BMI status, the majority of respondents were obese (55.8%). This fact indicates a tendency towards excess weight among the pregnant women studied. Based on anemia status, more than half of the respondents were anemic (55.8%), while 24.4% were at risk for anemia, and only 19.8% were not anemic. This indicates that anemia is a dominant health problem among pregnant women in this population.

Table I: Frequency Distributions of Demographic Data of Respondents

Characteristics	F	%
Age		
21-35	65	75,6
≥35	21	24,4
Religion		
Islam	85	98,8
Budha	1	1,2
Address		
Banda Aceh-Aceh Besar	60	69,8
West Aceh-South Aceh	10	11,6
East Aceh-North Aceh	13	15,1
Non-Aceh	3	3,5
Education		
Junior High School	2	2,3
Senior High School	54	62,8
Bachelor's Degree	30	34,9
Occupation		
Work	30	34,9
House hold	56	65,1
Gestational Age		
Trimester I	13	15,1
Trimester II	6	7,0
Trimester III	67	77,9
Obstetrical History		
Primipara	21	24,4
Multipara	54	62,8
Grandemultipara	11	12,8
Pregnancy Spacing		
Ideal (2-5 years)	68	79,1
<2 years	15	17,4
>5 years	3	3,5

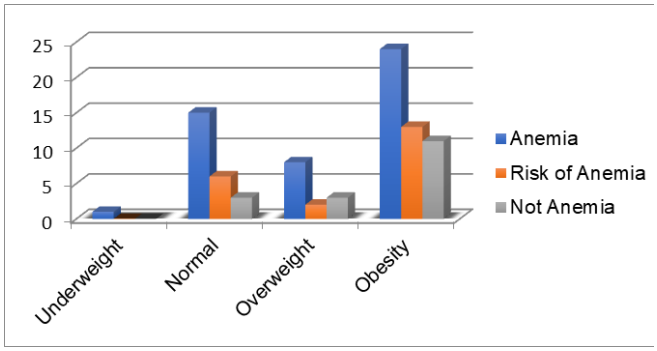
Abortion History		
0	62	72,1
1	21	24,4
2	2	2,3
3	1	1,2
Pregnancy Complication		
Abortus	11	12,8
Hyperemesis Gravidarum	4	4,7
Postpartum Infection	9	10,5
Congenital Disorders	6	7,0
PROM	22	25,6
Bleeding	12	14,0
Preterm Labor	9	10,5
Preeklamsia	13	15,1
Anemia Occurrence		
Anemia	48	55,8
Risk of anemia	21	24,4
Not anemia	17	19,8
Body Mass Index (BMI)		
Underweight	1	1,2
Normal	24	27,9
Overweight	13	15,1
Obesity	48	55,8



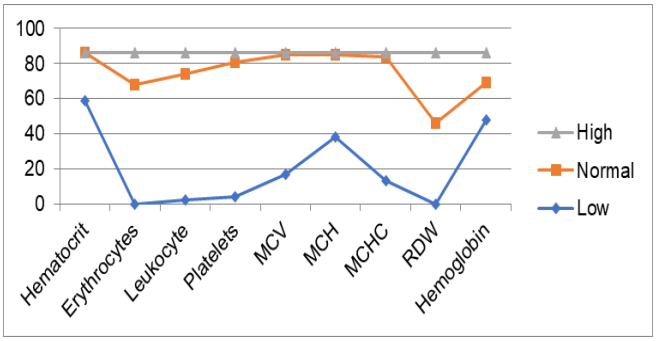
Graph 1: Medical Diagnosis and Incidence of Anemia

Based on **Graph 1**, it is clear that most respondents who experienced pregnancy complications also tended to be anemic. In the case of PROM, more than half of the respondents with this complication were anemic. Similarly, in the case of bleeding complications, the number of anemic pregnant women was significantly higher than that of those without anemia.

Graph 2 shows that the majority of anemia cases were found in pregnant women with an obese BMI. This suggests that while obesity is typically associated with overnutrition, in the context of pregnancy, it can be accompanied by deficiencies in important micronutrients, such as iron, which is involved in haemoglobin formation. In the normal BMI category, the number of anemia cases was also quite significant, although lower than in the obese group.



Graph 2: BMI and Incidence of Anemia



Graph 3: Blood Laboratory Results

Based on **Graph 3**, the majority of respondents (48%) had haemoglobin levels below the normal range, indicating anemia. The number of respondents with normal Hb levels was relatively smaller, it's only 21 %, and only a small proportion were at risk for anemia. This graph reinforces the notion that anemia is a major health problem among pregnant women in this study. Other laboratory results were mostly within the normal range: erythrocytes 68%, leukocytes 72%, platelets 77%, MCV 61%, MCHC 71%, and RDW 46%. Meanwhile, the erythrocyte count was low at 59%, which was closely correlated with Hb levels.

Pregnancy Complications and Anemia Incidents

Table II shows that the most common pregnancy complications were PROM (25.6%) and preeclampsia (15.1%). In PROM cases, the majority of respondents (11.6%) experienced anemia, whereas in preeclampsia, the distribution among anemia, risk of anemia, and no anemia was relatively balanced. Bleeding complications also contributed significantly to the incidence of anemia, with 10.5% of respondents experiencing anemia.

Other complications such as postpartum infection (7.0% anemia), preterm labor (8.1% anemia), abortion (5.8% anemia), congenital abnormalities (4.7% anemia), and hyperemesis gravidarum (3.5% anemia) also showed an association with anemia, although in fewer cases. Overall, more than half of respondents with pregnancy complications experienced anemia, indicating that obstetric complications play a

Table II: Pregnancy Complications in Postpartum Women with Anemia

Pregnancy Complications	Anemia incidents						Total	
	Anemic		Risk Anemic		Not Anemic			
	n	%	n	%	n	%	n	%
Abortus	5	5,8	2	2,3	4	4,7	11	12,8
Hyperemesis Gravidarum	3	3,5	0	0	1	1,2	4	4,7
Postpartum infection	6	7,0	2	2,3	1	1,2	9	10,5
Congenital disorders	4	4,7	2	2,3	0	0	6	7,0
PROM	10	11,6	8	9,3	4	4,7	22	25,6
Bleeding	9	10,5	2	2,3	1	1,2	12	14,0
Preterm Labor	7	8,1	1	1,2	1	1,2	9	10,5
Preeklamsia	4	4,7	4	4,7	5	5,8	13	15,1

significant role in increasing the risk of anemia in pregnant women.

DISCUSSION

Research results showed that the most common pregnancy complication was premature rupture of membranes (PROM) (25.6%), with 11.6% at risk of anemia, 9.3% at risk of anemia, and 4.7% without anemia. These findings align with previous research indicating that maternal anemia is an important risk factor for PROM[14].

Maternal anemia is associated with an increased risk of adverse pregnancy outcomes, including PROM. Appropriate nutritional supplementation and anemia screening before and during pregnancy are recommended to improve maternal health and manage adverse pregnancy complications[5]. PROM is a serious complication during pregnancy that affects both the mother and the fetus[15,16]. Other research shows that pregnant women with anemia are approximately three times more likely to develop PROM than pregnant women without anemia[17]. Anemia worsens the prognosis of PROM through mechanisms such as tissue hypoxia and amniotic membrane weakness[18]. High levels of anemia in mothers with PROM may be caused by infection or inflammation resulting from premature rupture of membranes, which can affect iron metabolism.

The second major complication was preeclampsia. Research shows that anemia in pregnant women is associated with a 4.7% incidence of preeclampsia. Another research demonstrated a significant association between anemia and preeclampsia, with a p-value of 0.00 ($p<0.05$) and an OR of 2.794 (95% CI = 1.75–4.44)[29]. This indicates that pregnant women with anemia have a 2.794-fold greater risk of developing preeclampsia than pregnant women without anemia. Another study in Jember, Indonesia, found that 82.72% of mothers who died from preeclampsia had anemia[30]. Furthermore, placental hypoxia affects trophoblast cell differentiation and spiral artery remodeling. Hypoxia-stimulated secretion of antiangiogenic and inflammatory factors, such as sFlt-1, can lead to endothelial dysfunction and multiorgan injury, which are hallmarks of preeclampsia[31]. Other studies have shown that anemia can cause iron deficiency, folate deficiency, or other metabolic disorders. This may be associated with reduced levels of antioxidant micronutrients, resulting in vascular endothelial oxidative stress, endothelial dysfunction, and multiorgan damage, including preeclampsia[32].

The next major complication was bleeding or postpartum hemorrhage. This is bleeding that occurs during delivery and the postpartum period. The study results showed that 9 (10.5%) respondents with pregnancy complications involving bleeding had anemia, 2 (2.3%) were at risk of developing anemia, and 1 (1.2%) did not experience anemia. Mothers experiencing pregnancy complications can be identified by the warning signs they exhibit. Pregnancy complications can be detected early through a series of symptoms, such as anemia accompanied by dizziness and fatigue, and urinary tract infections, such as residual urine, pain during urination, and lower back pain[20].

Research by Bazirete in Rwanda explains that anemia during pregnancy is a risk factor for postpartum hemorrhage. Anemia indicates a reduction in red blood cells, which in turn affects the amount of hemoglobin in the blood. A decrease in haemoglobin reduces the amount of oxygen bound to haemoglobin, affecting oxygen delivery to vital organs. Low hemoglobin levels in the blood reduce oxygen transport to body cells and the brain, which can have adverse effects on both the mother and the fetus[21].

Furthermore, the study results showed that 6 (7.0%) respondents with postpartum infection had anemia, 2 (2.3%) were at risk of developing anemia, and 1 (1.2%) did not experience anemia. Anemia caused by bleeding can weaken the patient's condition, reduce their immune system, and predispose them to postpartum infection. Anemia during pregnancy makes the mother less able to cope with blood loss during delivery and makes her more susceptible to infection[22].

Meanwhile, other research stated that Age, education level, method of delivery, presence of episiotomy, anemia due to postpartum hemorrhage, intervention and manipulation during delivery, prenatal hygiene, use of Povidone Iodine before delivery for vaginal washing, antibiotic prevention, increased duration of labor, obesity, and the presence of bacteria are common symptoms that affect postpartum infection[23]. The risk factors for postpartum infection include ANC visits, cesarean delivery, vaginal examination, gestational diabetes mellitus, PROM, BMI > 25, placenta previa, placenta accreta, postpartum hemorrhage, anemia during pregnancy, vaginal examination, home delivery, preeclampsia and prolonged labor[24].

The study showed that 8.1% of women with anemia during pregnancy had a preterm birth. The study showed that anemia during pregnancy can increase the risk of preterm birth by 3.46 times (OR = 3.46)[25]. A literature review also found a significant association between anemia during pregnancy and preterm birth (1.56 [95% CI: 1.25-1.95]). Mothers with anemia in the first trimester have a greater risk of preterm birth than mothers with anemia in the second trimester[26]. Study on The Relationship of Anemia in Pregnant Women and the Incidence of Premature Delivery: Systematic Review states that mothers with anemia during pregnancy have a 79.3 times greater risk of preterm birth[27]. Anemia in pregnancy can lead to fetal hypoxia, intrauterine growth retardation, and premature birth due to insufficient oxygen and nutrient supply to the placenta[28]. Therefore, proper prevention and treatment of anemia in pregnant women are crucial, as it can lead to various complications. Iron supplementation during pregnancy and evaluation are essential, along with integrated management of anemia during pregnancy.

From the results of this study, it was found that 5.8% of pregnant women with anemia experienced abortions. Anemia is one of the factors causing abortions, while 2.3% experienced the risk of abortion during pregnancy. One of the five leading causes of maternal death in low- and middle-income countries is abortion; Although the Sustainable Development Goals aim to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030[33]. The results of other studies obtained the incidence of abortion in pregnant women at Ananda Hospital and Children's Hospital Makassar in 2021-2022, with 102 respondents. The results yielded a p-value of 0.004 (p < 0.05) and an OR of 3.312. stated that anemia is significantly associated with the incidence of abortion[34]. Pregnant women with low Hb levels are at risk of spontaneous abortion[35].

Table II showed that anemia among mothers of babies with congenital anomalies is 4.7%, with a 2.3% risk of developing anemia. This condition may be related to the mother's nutritional status during pregnancy, which affects fetal development. Congenital anomalies affect 3–6% of births globally[10] which's influenced by genetic, socioeconomic, and environmental factors [11]. Previous research has shown that mothers who give birth to babies with Chronic Heart Disease (CHD) tend to have lower iron status and are more likely to experience iron deficiency than mothers of healthy babies and a potential risk factor for CHD[12]. Other research has shown a link between maternal anemia in early pregnancy and congenital heart disease in offspring, indicating a 47% higher risk of congenital heart disease in the child[1336].

A study of 44 pregnant women in their first and second trimesters revealed that 26 (59.1%) did not experience anemia, 18 (40.9%) did; 31 (70.5%) experienced emesis, and 13 (29.5%) did not. There was a significant association between emesis gravidarum and anemia in pregnant women in the Taman Sari 6 Primary Clinic working area, with a p-value of 0.02 (p < 0.05)[37]. Of the 232,476 pregnancies studied, 3,227 (1.4%) were complicated by hyperemesis gravidarum. Women with hyperemesis gravidarum were more likely to deliver a premature baby (adj. OR = 1.33, 95% CI: 1.18–1.50), a low birth weight baby (adj. OR = 1.52, 95% CI: 1.16–1.98, only if diagnosed in the second trimester), and to undergo a cesarean section. They were also less likely to deliver a small-for-gestational-age newborn (adj. OR = 0.82, 95% CI: 0.69–0.99) and less likely to experience perinatal death (adj. OR = 0.54, 95% CI: 0.31–0.93), except in very rare cases[38].

CONCLUSION

The results showed that the most common pregnancy complication was premature rupture of membranes (25.6%), followed by preeclampsia (15.1%) and bleeding (14.0%). Anemia was the main factor causing various obstetric complications, particularly premature rupture of membranes, hemorrhage, postpartum infection, preterm labor, and abortion. Healthcare providers need to be aware that various complications during pregnancy may affect the mother's health during the postpartum period, especially anemia.

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Conflict of interest: The authors declare no conflict of interest in the study.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Darmawati: Conceptualization, data curation, writing original draft preparation, writing, review and editing
Fitri A: Investigation, visualization, and administration
Mira Rizkia: Formal analysis, supervision and writing original draft preparation
Elka Halifah: Validation, data collection and writing original draft preparation
Fitri A: Methodology and validation
Juwita R: Data collection and writing original draft preparation
Zulkarnaini: Methodology and software
All authors have read and approved the published version of the manuscript.

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