MATERNITY HEMOGLOBIN VERSUS NEWBORN HEMOGLOBIN

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Abstract
Background: The community has developed the assumption that if the mother has anemia, the baby born will also experience anemia. The condition is very detrimental to the mother and baby. Therefore, preventing and overcoming anemia is crucial.
Objective: The purpose of this study is to determine whether there is a relationship between the hemoglobin levels of maternity mothers and the hemoglobin levels of newborns.
Methods: The research design was a quantitative correlation. Data were collected at the Midwife Independent Practice in Bantul, Yogyakarta Special Region, in June–July 2023, totaling 84 laboring mothers. The sampling technique used was total sampling. Examination of maternal hemoglobin levels was carried out when the mother was in the first stage of labor. Examination of hemoglobin levels in infants was carried out within < 48 hours after the newborn. Data analysis using Fisher's exact test analysis.
Results: Of the 84 maternity mothers, 11 (13.1%) had anemia. Of the eleven mothers, none of the babies she gave birth to had anemia. However, there was one (1.2%) baby who had anemia, but the mother did not have anemia; her hemoglobin level was 14.2 g/dl.
Conclusion: There is no relationship between the hemoglobin levels of pregnant mothers and newborns.
Keywords: Hemoglobin, anemia, newborn, pregnant woman, maternity mother

INTRODUCTION

Anemia is a nutritional problem that cannot be considered mild. The prevalence of anemia of pregnant women in developing countries is 33-75% (1). Another study states that the prevalence of anemia is around 37.2-41.8% (2–4). The WHO estimates that pregnant women who are anemic are more than 30%. Based on Riskesdas 2018, the anemia rate in pregnant women in Indonesia is 48.9% (5). The incidence of anemia is one of the important indicators of public health because anemia is associated with morbidity and mortality, especially in vulnerable groups such as pregnant women and toddlers (3,6–8).

Therefore, anemia cannot be considered mild considering the impact it has is very large. The impact of anemia on mothers includes postpartum infection and decreased resistance to infection, while the impact of anemia on the fetus includes miscarriage, premature birth, low birth weight, perinatal death, and fetal growth retardation (2,6,9,10). Anemia is also a cause of antepartum and postpartum hemorrhage (11). Newborns of anemic mothers are at high risk of iron deficiency, so the cycle of anemia between generations will continue (12). Pregnant women are said to have anemia if their hemoglobin level is less than 11 g/dl (13,14).

The incidence of anemia does not only occur in pregnant women; it can also occur in the baby they give birth to. The prevalence of anemia in infants is as high as 44-66% in developing countries (15). Research conducted in one region of Indonesia found that anemia in newborns was as high as 14.5%. Normal hemoglobin levels in full-term newborns average 17 g/dl. Normal hemoglobin levels for newborns are 13–20 g/dl, and babies are said to be anemic if the hemoglobin level is <13 g/dl (14). The impact of anemia on infants includes a decrease in resistance to infection (10).

To prevent the impact of iron deficiency, it is recommended to give iron supplements to pregnant women (16). Hemoglobin levels in pregnant women will continue to decrease with increasing gestational age. This happens because, in the mother's body, hemodilution occurs so that the blood needs of the mother and fetus are met. Therefore, pregnant women need enough iron so that when hemodilution occurs, the mother's hemoglobin level remains at normal levels. Anemia in newborns occurs due to pregnant women who have anemia (15). This can occur, possibly because the nutritional status of the mother is lacking, so the assumption is that the intake for the fetus is less.

Research on the relationship of anemia in pregnant women with anemia in infants has been carried out by several researchers. It's just that the baby's hemoglobin levels taken are not in newborn hemoglobin levels but in babies aged 6–12 months, so the incidence of anemia in infants has been influenced by various factors. However, it was found that there was one study that assessed newborn hemoglobin levels by taking blood samples from the baby's umbilical cord, and as far as the search for studies carried out, no anemia examination was found in newborns at the age of infants less than three days, or indeed the newborn period. It is known that the circulatory systems of the fetus and newborn are different. If a hemoglobin examination uses blood samples from the umbilical cord with blood samples from infants whose circulatory systems have switched to the infant blood radar system, the results may be different. Based on this, the purpose of this study was to determine the relationship between the hemoglobin levels of maternity mothers and the

hemoglobin levels of newborns by taking blood samples from the heels of newborns.

METHOD

This study used a correlational quantitative research design. Data were collected at the Midwife Independent Practice in Bantul, Yogyakarta Special Region, in June–July 2023, totaling 84 mothers in labor. The sampling technique used was total sampling. Examination of maternal hemoglobin levels was carried out during the first stage of labor. Examination of hemoglobin levels in infants was carried out within < 48 hours after the newborn.

The hemoglobin examination procedure was carried out when the mother came with the condition of giving birth, namely at the first stage of labor. The hemoglobin examination method uses a stick. The hemoglobin measurement device used was the Easy Touch brand. Blood is taken from the mother's peripheral vein on one of the mother's fingers. For infants, blood was taken through the heel of the baby's foot. Data analysis used Fisher's exact test because there were 50% expected values that were less than 5. This study has obtained ethical clearance number 3066/KEP-UNISA/VII/2023.

RESULTS AND DISCUSSION

The findings in this study were presented univariately and bivariately. The findings are presented in the following tables:

Table 1. Description of the incidence of anemia in maternity and newborns

Information	No anemia	%	Anemia	%	Total	%
Maternal hemoglobin	73	86,9	11	13,1	84	100
Newborn hemoglobin	83	98,8	1	1,2	84	100

In Table 1, it can be seen that of the 84 mothers who gave birth, 11 had anemia (13.1%), while newborns who had anemia had as many as 1 baby (1.2%).

Table 1. Description of the incidence of anemia in maternity and newborns

Maternal hemoglobin levels	*Newborn hemoglobin levels*
11,3	21,8
13,2	17
12	21,4
13,9	17,5
9	18,8
12,9	19,3
13,1	21,4
13	23,4
9,7	23,4
13,5	22,2
12,7	21,2
15,1	20,9
13	22,2
12,6	23,8
13,1	21,6
11,5	21,1
12,6	25,6
11,1	25,3
13,2	21,7
10,8	22,3
12	21
12,3	20,7
13,6	24,2
15,2	22,5
11,9	22
12,6	23,5
11,6	16,4
16	21,4
8,7	24,3
11,3	17,7
15,5	18,8
11,6	21,4
12	25,7
15,1	23,1
11,7	20
12,2	19,1
14,2	20,4
10,9	19,1
14,6	23,5
10,9	21,1
12	21,1
14,3	21,8
12,4	21,6
12,7	22,5
10,7	21,2
13,8	19,4
11	18,8
11,9	21
11,4	17,5
13,8	21,5
12,5	24
12,1	21,7
11,1	19,9
10,5	21,7
11,9	17,1
12,1	22,5
14,5	21,2
11,9	23,2
11,2	20,4
14,3	22
10,7	20,3
14,9	21
10,6	22,8
14,6	22,3
11,6	22,2
13,7	20,4
14,2	12,3
11,9	23,2
14	21,6
13,7	22,2
12,8	19,6
14,3	21,4
14,5	22,6
9,6	23

13,3	19,3
15,5	20
15,1	21,2
11,9	25,9
15,8	21,9
17,1	22,9
16,6	22,9
16,6	21,7
15,1	25,1
14,3	24,8

Table 2 shows that maternity mothers have hemoglobin levels of <11 g/dl, as much as 13.1%, and there is 1 newborn who has hemoglobin levels < 13 g/dl. Table 2 illustrates the distribution of these hemoglobin levels in infants, clarifying Table 1.

Hemoglobin levels of pregnant women are influenced by various factors, which include an unhealthy lifestyle, pregnancy itself, alcohol consumption, smoking, malnutrition, blood loss, chronic diseases, and chronic infections (17). In addition, in developing countries, the high incidence of anemia in pregnant women is also caused by low socioeconomic status, rural residence, close birth distance, not immediately conducting pregnancy checks, many children, the third trimester of pregnancy, a lack of vitamin B12, vitamin A, folic acid, and iron (18,19).

In this study, it was found that maternity mothers experienced anemia as much as 13.1%. Third-trimester pregnancy is one of the causes of anemia (18,19). This condition is associated with the hemodilution process. Hemodilution is a physiological process that occurs in pregnant women, where hemoglobin levels can decrease by 1-2 g/dl. However, it is not a disease. The peak of hemodilution occurs at 32–34 weeks of gestation (20). Although the mother is anemic, the baby's hemoglobin level remains normal. Thus, the adverse effects of anemia on babies can be avoided. Babies who have anemia mean the baby is malnourished. Babies who experience this malnutrition, if it occurs for a long time and continuously, will have an impact on stunting (21–23).

Anemia is a very serious problem, especially for pregnant, maternity, and postpartum women and newborns. The incidence of anemia means that there has been a low level of hemoglobin in the body (12). Low hemoglobin levels mean that oxygen intake will most likely also decrease, considering that one of the functions of hemoglobin is to bind oxygen. Hemoglobin levels below normal will cause a decrease in the capacity of oxygen transport by red blood cells to the tissues (17). The body's need for oxygen must be sufficient so that the metabolism in the body can run properly. Lack of oxygen in the body can cause an anaerobic metabolism that will be harmful to the body (24). To find out the level of oxygen in the blood can be seen through the value of oxygen saturation. Normal expressed oxygen saturation values range from 95–100% (25).

Hemoglobin cannot be separated from red blood cells. Red blood cells will be able to work well in carrying out their function as a transporter of gas in and out of cells if hemoglobin levels in red blood cells are sufficient, or, in other words, at normal levels. There are three types of hemoglobin, according to the stage of human development. First is embryonic hemoglobin produced before birth; second is fetal hemoglobin (HbF) produced during the fetal period; and last is adult hemoglobin (HbA). HbF will disappear about 6 months after the baby is born (26).

Table 3. Cross-tabulation of the incidence of anemia in maternity and newborns.

	Newborn hemoglobin						Fisher's Exact Test
Maternal hemoglobin	No anemia	%	Anemia	%	Total	%	
No anemia	72	85,7	1	1,2	73	86,9	1,00
Anemia	11	13,1	0	0	11	13,1	

Table 3 shows that none of the anemic mothers had anemia. Fisher's exact test shows that there is no relationship between the hemoglobin levels of maternity mothers and the hemoglobin levels of newborns.

In addition to the picture of hemoglobin levels in mothers and newborns, it was also found that there was no relationship between maternal hemoglobin levels and newborn hemoglobin levels. In contrast to the results of previous studies that found that maternal hemoglobin levels are related to infant hemoglobin levels (15), previous studies, it was found that pregnant women who experience anemia and their babies aged 6–36 months have the opportunity to experience anemia by 13.7 times compared to pregnant women who are not anemic (15). The difference between previous research and this study is that the baby's hemoglobin level that is examined is the hemoglobin level at the beginning of the baby's life, which means that newborns only get nutritional intake in the form of colostrum and may also not get any intake because colostrum has not come out. In previous studies conducted on infants aged 6–36 months, it could be that the baby has anemia not because the mother during pregnancy has anemia but may be caused by inadequate nutritional intake, considering that at that age the baby should have received food other than breast milk. In addition, during the exclusive breastfeeding period, the nutritional intake of breastfeeding mothers has an impact on the quality of breast milk consumed by babies. Giving the wrong nutrition to babies, especially in the first two years of life, can result in heavy weight loss and disruption of child growth (22). Thus, the occurrence of anemia in infants aged 6–36 months cannot be directly associated with the incidence of anemia in mothers during pregnancy, considering the possibility that the baby has been exposed to other factors that can also cause anemia. Of the 352 pregnant women who were not anemic, as many as 33 (9.4%) babies who had anemia had hemoglobin levels of <13 g/ddl. Blood samples for checking the baby's hemoglobin levels are taken from umbilical cord blood (14).

Babies who have normal hemoglobin levels even though the mother has anemia are most likely caused by low maternal hepcidin levels in the 2nd and 3rd trimesters. The rate of hepcidin in the mother is inversely proportional to the level of hepcidin in the fetus (16,27–29). Low levels of hepcidin in the mother cause a large amount of iron to enter the baby. In addition, because of the active transport process, the fetus still receives iron from its mother, even though the mother has anemia. Conversely, if the mother's hepcidin levels increase, the amount of iron that enters the baby will decrease. Maternal hepcidin levels increase, one of which is influenced by inflammation. Inflammation that occurs in mothers is caused,

among others, by hypertension in the mother, diabetes, placental insufficiency, and others (27–29).

When associated with the theory of hepcidin, there is a possibility that maternal hepcidin increases so that hemoglobin in the fetus decreases. This condition may be caused by something else, so the mother's hepcidin increases. However, the condition in this study is unknown because there is no data related to the possibility of a medical history of pregnant women that supports the possibility of inflammation or other diseases. By knowing things that can increase hepcidin levels in mothers, pregnancy checks can be done properly and correctly so that they can detect and find as early as possible things that might cause increased hepcidin levels in pregnant women.

The limitation of this study is the absence of data on the history of inflammation experienced by pregnant women, so it cannot directly assess things that may be experienced by mothers related to increased maternal hepcidin levels. Therefore, further research is needed on the relationship between maternal and infant hemoglobin. In addition, this study was conducted in the independent practice of midwives, which means that only normal maternity mothers are served, so complications accompany no maternity mothers.

CONCLUSION

The decrease in hepcidin in pregnant women means that high levels of hepcidin in the fetus cause an increase in the amount of iron entering the fetus. In addition, the active transport process also allows the fetus to continue receiving iron transfers even though the mother is anemic. Therefore, it was found that there was no relationship between the mother's hemoglobin level and the baby's hemoglobin level.

Suggestions

There needs to be more discussion about the relationship between maternal and newborn hemoglobin levels, including pregnant women who have a history of complicated pregnancies.

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Conflict of interest:

Between authors, there is no conflict of interest.

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