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Overview of Hemoglobin and Hematocrit Levels in Pregnant Women in the First, Second, and Third Trimesters at Kraton Pekalongan Regional General Hospital

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ABSTRACT

Background & Objective: Pregnancy is the union of spermatozoa and ovum followed by implantation. Pregnancy with certain signs may indicate the occurrence of dangers that can occur during pregnancy, which if not reported or detected early can cause death to the mother and fetus. One way to keep mothers and babies healthy during pregnancy is by conducting pregnancy checkups. This study aims to determine the levels of hemoglobin and hematocrit in pregnant women in their first, second, and third trimesters at the Kraton Regional General Hospital in Pekalongan Regency. **Method:** This study used a descriptive design with 30 samples taken using total sampling from pregnant women in their first, second, and third trimesters at the Kraton Regional General Hospital in Pekalongan Regency. Hemoglobin levels were measured using a spectrophotometer, and hematocrit levels were measured using a microhematocrit method. **Result:** The results showed that pregnant women in the first trimester had hemoglobin levels of 9.18% and hematocrit levels of 31.4%, pregnant women in the second trimester had hemoglobin levels of 12.8% and hematocrit levels of 35.3%, and pregnant women in the third trimester had hemoglobin levels of 13.28% and hematocrit levels of 37.1%. **Conclusion:** It can be concluded that in the first trimester, there is a decrease in HB and HT levels due to plasma volume increasing faster than the number of red blood cells, and in the second and third trimesters, there is a greater increase in plasma volume than in red blood cell volume.

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Introduction

Pregnancy is a condition that occurs when an egg meets sperm. During pregnancy, the body undergoes physical and psychological changes that can affect the mother (Herman, 2020). Pregnancy with certain signs can indicate dangers that may occur during pregnancy, which, if not reported or detected early, can cause death to the mother and fetus. One way to keep the mother and baby healthy during pregnancy is to undergo pregnancy checkups (Reyes, 2013). Common laboratory tests performed on pregnant women include hemoglobin, Hepatitis B (HBsAg), HIV, Syphilis, and urine protein tests (Wati, 2021). Pregnancy can affect hemoglobin and hematocrit levels in the blood, such as a decrease in hemoglobin levels during pregnancy due to an increase in blood volume that is faster than the increase in erythrocyte production and a decrease in hematocrit levels in pregnancy due to an increase in blood plasma volume that is faster than the increase in erythrocyte production. Hemoglobin and hematocrit are very important for pregnant women because they help transport oxygen from the lungs to body tissues, including the fetus, and support fetal growth so that the fetus gets the oxygen and nutrients it needs to grow and develop, as well as preventing anemia caused by fatigue, weakness, and other health problems in pregnant women.

Hemoglobin testing in pregnant women aims to determine whether someone is anemic or not. Anemia is a condition of low hemoglobin, while high hemoglobin is called polycythemia. Both conditions will affect overall health and vitality (Dewi Y, 2017). There are various methods of hemoglobin testing, such as manual methods (e.g., Tallquist, Cu-sulfate, Sahli), colorimetric methods (e.g., Cyanmet Hb, Oxy Hb, and Alkali Hematin), and automatic methods (e.g., Cell Dyn) (Gandasoebrata, 2010).

Hematocrit in pregnant women also aims to calculate the number of red blood cells in the body, whether they are insufficient or excessive, which is used to identify disorders or diseases. Diseases caused by a decrease in hematocrit include bleeding anemia, red blood cell failure, and nutritional deficiencies in the body. There are various types of hematocrit tests, such as macrohematocrit (Wintrobe) and microhematocrit (Hidayah, 2018).

Previous research by Hoo Swit Tjiong (1996) in a series of investigations on 21 women suspected of having anemia at Dr. Cipto Mangunkusumo Hospital in Jakarta, from 8 weeks of pregnancy to delivery and 40 days postpartum (a few days after giving birth), found that Hb, erythrocyte, and hematocrit levels decreased during pregnancy and 40 days postpartum. Dr. Cipto Mangunkusumo Hospital in Jakarta, from 8 weeks of pregnancy until delivery and 40 days postpartum (several days after giving birth), found that Hb, erythrocyte, and hematocrit levels decreased during pregnancy until 7 days postpartum. After that, all three values increased, and at 40 days postpartum, they reached levels approximately equal to normal values. These findings are supported by another study of 3,531 pregnant women conducted at the same time and location (hospital) (Wiknjosastro, 1999).

Based on research conducted by Tsikouras in 2018, it was found that during pregnancy, the average hematocrit was significantly lower in the first trimester (37.4 +/- 24%) compared to non-pregnant women (39.0 +/- 2.7%) and in the second trimester (34.4 +/- 3.0%) compared to the first trimester. An increase was then found during the third trimester (35.6 ± 2.9%), while the average value remained significantly lower than that of non-pregnant women. Hemoglobin and hematocrit

levels decreased in the first and second trimesters, while red blood cell production began to increase in the third trimester of pregnancy (Tsikouras, 2018).

Based on the results of Irdayanti's (2017) study, approximately 57.1% of pregnant women had below-normal hemoglobin levels, and 42.8% of pregnant women had normal hemoglobin levels. In this study, there were differences in hemoglobin levels between pregnant women in the first, second, and third trimesters. According to the Department of Health, anemia in pregnancy is a condition where the hemoglobin level in pregnant women is < 11.0 g/dL in the first and third trimesters and < 10.5 g/dL in the second trimester. Anemia in pregnancy is also referred to as a "potential danger to mother and child," meaning it is potentially harmful to both the mother and the child. Pregnant women with anemia may experience miscarriage, premature labor, stunted fetal growth, postpartum hemorrhage, premature rupture of membranes (PROM), and decreased nutrition in breast milk. (Willy, 2017)

Based on the above description, the researcher was interested in conducting research on hemoglobin and hematocrit levels in pregnant women in the first, second, and third trimesters.

Objective

The purpose of this study was to determine hemoglobin and hematocrit levels in pregnant women in their first, second, and third trimesters at Kraton Pekalongan Regional General Hospital.

Method

This study used a descriptive design with 30 samples taken using total sampling from pregnant women in their first, second, and third trimesters at the Kraton Regional General Hospital in Pekalongan Regency. Hemoglobin levels were examined using a spectrophotometer, and hematocrit levels were examined using a microhematocrit method. Samples were taken by selecting subjects based on certain characteristics that were considered to be related to the characteristics of the population that were known beforehand. The criteria for the samples taken are as follows:

1. Inclusion criteria:
   a. Pregnant women aged 20-35 years
   b. Pregnant women who routinely undergo blood tests (hemoglobin and hematocrit in the first, second, and third trimesters
2. Exclusion criteria:
   a. Miscarriage
   b. Pregnant women who do not undergo regular blood tests (hemoglobin and hematocrit) in the first, second, and third trimesters.
   c. Withdrawal from the study

This study was conducted from May 2025 at the Kraton Pekalongan Regional General Hospital. Sample testing was performed using the cyanmethemoglobin and microhematocrit methods. The data in this study came from primary and secondary sources. Primary data was obtained by the researcher from direct examinations of pregnant women in the first, second, and third trimesters at the Keraton Pekalongan Regional General Hospital. Secondary data was obtained from existing and available data sources used as supporting data by the researcher, such as data from research

journals. The data obtained was then processed, presented in tabular form, and narrated.

Results

Research results on hemoglobin and hematocrit levels in pregnant women in their first, second, and third trimesters at Kraton Pekalongan Regional General Hospital:

TABLE 1. Hemoglobin and hematocrit levels in the first trimester

Sample Number	Kadar Hematokrit (%)	Hemoglobin Level (%)
S1	35	11,8
S2	35	11,1
S3	33	8,6
S4	35	9,8
S5	32	10,5
S6	30	6,5
S7	30	9,7
S8	29	9,0
S9	25	8,1
S10	30	6,7

	Normal Value	Abnormal Value	Average
Hemoglobin	20%	80%	9,18%
Hematocrit	40%	60%	31,4%

Based on the results of hemoglobin and hematocrit levels, the average results were 9.18% and 31.4%.

TABLE 2. Hemoglobin and Hematocrit Levels in the Second Trimester

Sample Number	Hematocrit Level (%)	Hemoglobin Level (%)
S1	40	10,6
S2	40	13,9
S3	34	11,8
S4	30	11,6
S5	38	15,4
S6	35	14,1
S7	31	10,4
S8	34	11,8
S9	33	8,9
S10	38	12,3

	Normal Value	Abnormal Value	Average
Hemoglobin	80%	20%	12,8%
Hematocrit	80%	20%	35,3%

Based on the results of hemoglobin and hematocrit levels, the average results were 12.8% and 35.3%.

TABLE 3. Hemoglobin and Hematocrit Levels in the Third Trimester

Sample Number	Hematocrit Level (%)	Hemoglobin Level (%)
S1	40	13,6
S2	40	14,7
S3	35	11,7
S4	37	11,9
S5	33	12

S6	36		13,2
S7	39		15,3
S8	33		12,6
S9	38		12,7
S10	40		15,1
	Normal Value	**Abnormal Value**	**Average**
Hemoglobin	100%		13,28%
Hematocrit	100%		37,1%

Based on the hemoglobin and hematocrit levels, the results obtained were an average of 13.28% and 37.1%.

Discussion

In pregnant women in the first trimester, normal physiological changes occur in hemoglobin (HB) and hematocrit (HT) levels, with normal HB ranging from 11-14 g/dL and normal HT ranging from 33-45%. Therefore, monitoring HB and HT is very important for detecting anemia and preventing pregnancy complications that can affect the health of the mother and fetus. Starting at 8 weeks of age, normal physiological changes occur in hematocrit (HT) and hemoglobin (HB) levels, namely a decrease in HT and HB levels due to an increase in blood plasma volume that is faster than the increase in red blood cell count. Therefore, monitoring HT and HB levels is very important for detecting anemia and preventing pregnancy complications.

In pregnant women in the second and third trimesters, normal physiological changes occur in hemoglobin (HB) and hematocrit (HT) levels. Normal HB levels in the second trimester range from 10.5-14 g/dL and in the third trimester range from 10-13.5 g/dL. Meanwhile, normal HCT levels in the second trimester range from 33-45% and in the third trimester range from 32-44%. Monitoring HB and HT is very important for detecting anemia and preventing pregnancy complications.

Monitoring HB and HT is very important for detecting anemia and preventing pregnancy complications that can affect the health of the mother and fetus. By monitoring HB and HT levels, doctors can identify potential health problems and take appropriate action to ensure the health of the mother and fetus.

Anemia in pregnant women is common. This condition is caused by an increase in blood volume during pregnancy. Factors that influence Hb levels in pregnant women include the knowledge of the pregnant woman, socio-cultural factors, bleeding, blood disorders, chronic diseases, and other factors such as exposure to toxic substances and the condition of the immune system (Wati, 2021). However, these Hb factors were not intended and were not studied in the research. Nevertheless, severe cases of anemia can put the mother and baby at risk. Some effects of anemia in pregnant women are a lack of nutrients in the first trimester, especially as anemia will cause organogenesis failure, which will interfere with fetal development in the next stage. In the second trimester, anemia will cause hypoxia and reduced blood flow to the uterus, which will disrupt the flow of oxygen and nutrients to the fetus, causing asphyxia, which will inhibit fetal growth and development, resulting in low birth weight and premature birth. In the third trimester, pregnant women with severe anemia have a higher risk of premature delivery. In addition, blood loss during childbirth is also more likely to occur (Maretdiyani, 2013).

Conclusion

Based on the results of a study conducted on 30 samples of pregnant women in their first, second, and third trimesters at the Kraton Pekalongan Regional General Hospital, the following conclusions can be drawn:

1. In the first trimester, the average number of women with normal Hb was 2, while the number with abnormal Hb was 8, representing 9.18%. The average Ht in the first trimester was 31.4%, with 4 women having normal Ht and 6 women having abnormal Ht. This is because pregnant women in the first trimester experience a decrease in Hb and Ht levels due to plasma volume decreasing faster than the increase in red blood cell count.
2. In the second trimester, the average Hb normal for 8 people and Hb abnormal for 2 people is 12.08%. The average Ht in the second trimester with Ht normal for 8 people and Ht abnormal for 2 people is 35.3%. This is because pregnant women in the second trimester experience an increase in Hb and Ht levels.
3. In the third trimester, the average Hb for 10 people with normal Hb is 13.28%. The average Ht in the third trimester with 10 people with normal Ht is 37.1% because pregnant women in the third trimester experience a greater increase in blood plasma volume than red blood cell volume.

A limitation of this study is that the samples were not examined directly. A suggestion for future researchers is to use blood samples that are examined directly or to use a hematology analyzer to speed up the examination process.

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References

Dewi, Y. 2017.Penuntun Hematologi Dasar. Bandung.

Gandasoebrata, R. (2010). Penuntun Laboratorium Klinik. Penerbit Dian Rakyat. Jakarta Timur

Herman, I. Identifikasi Potensi Bahaya, Penilaian Dan Pengendalian Penyakit Anemia Pada Ibu Hamil di Wilayah Kerja Puskesmas Puuwatu Kota Kendari. J. Ilm. Karya Kesehat., (2020).

Hidayah, N., 2018. PERBEDAAN NILAI HEMATOKRIT DARAH KAPILER MENGGUNAKAN HEMATOLOGI ANALIZER DENGAN MANUAL MIKROHEMATOKRIT (Doctoral dissertation, Universitas Muhammadiyah Semarang).

Irdayanti. identifikasi kadar hemoglobin (Hb) pada ibu hamil trimester I, II, dan III terhadap kejadian anemia di puskesmas poasia. Karya Tulis Ilmiah Poltekkes Kendari (2017).

Maretdiyani, Ari. 2013. Perbedaan kadar hemoglobin pada pasien persalinan normal dan setelah mendapat perawatan pengobatan di RSUD Banyumas. Semarang: Universitas Muhammadiyah.

Reyes, G. & Enrique, L. Konsep Dasar Kehamilan. J. Chem. Inf. Model. 53, 1689–1699 (2013).

Sjahriani T, F. V. Faktor-faktor yang Berhubungan dengan Kejadian Anemia Pada Ibu Hamil. J. Kebidanan J. Med. Sci. Ilmu Kesehatan. Akad. Kebidanan Budi Mulia Palembang 9, 161–167 (2019).

Wati, W. Gambaran Kondisi Ibu Hamil Menurut Pemeriksaan Laboratorium Di Puskesmas Sungailiat. J. Ilm. STIKES Citra Delima Bangka Belitung 4, 136–142 (2021).
Wati, W. Gambaran Kondisi Ibu Hamil Menurut Pemeriksaan Laboratorium Di Puskesmas Sungailiat. J. Ilm. STIKES Citra Delima Bangka Belitung 4, 136–142 (2021).
Wiknjosastro, Hanifa. 1999. Ilmu Kebidanan. Jakarta: Yayasan Bina Pustaka Sarwono Prawirohardjo

Willy, A. Kejadian Anemia Pada Ibu Hamil Ditinjau dari Paritas dan Usia. J. Aisyah J. Ilmu Kesehat. 8 (2017).