

## The relationship between a history of iron deficiency anemia and headaches in third trimester pregnant women at Gading public health center Surabaya

Satila Zalianty Zen <sup>1,\*</sup>, Hanik Badriyah Hidayati <sup>2</sup>, Budi Prasetyo <sup>1</sup> and Lilik Herawati <sup>3</sup>

<sup>1</sup> Midwifery Study Program, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.

<sup>2</sup> Department of Neurology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.

<sup>3</sup> Department of Physiology and Biochemistry, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.

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### Abstract

**Introduction:** The relationship between hemoglobin (Hb) in pregnancy is still unclear. Therefore, the purpose of this study was to discuss the relationship between Hb and headaches in the third trimester of pregnancy.

**Method:** This study design used correlational analytic with a cross-sectional approach. The sample in this study used total sampling with the results of 41 pregnant women in the third trimester who visited the Gading Surabaya Health Center from July to August 2024. The independent variable in this study was Hb. The dependent variable in this study was headache. This data collection was carried out by distributing questionnaires and then analyzed using Spearman's rho.

**Results:** The results of the Spearman's rho test showed that Hb levels had a strong relationship with headaches in pregnant women in the third trimester who underwent ANC at the Gading Surabaya Health Center ( $p=0.001$ ;  $r=0,607$ ).

**Conclusion:** The relationship between history of iron deficiency anemia in pregnant women in the third trimester at Gading Public Health Center Surabaya.

**Keywords:** Hemoglobin Levels; Headaches; Pregnant Women in the Third Trimester; Iron Deficiency; Pregnancy Complication

### 1. Introduction

Headache according to the International Association for the Study of Pain is the most common, painful, and disabling neurological condition, presenting in various forms such as migraine, tension-type headache, cluster headache, primary stabbing headache, secondary headache, or rarer conditions like persistent idiopathic facial pain. Headaches are more common in women than in men, particularly among women of reproductive age [1]. Hemoglobin levels below 11 g/dL represent a serious public health problem, estimated by WHO to affect around 40% of pregnant women worldwide [2].

A research study conducted in India reported that anemia and headaches were prevalent in 64 patients (64%), with severe anemia observed in 25% (16/64), moderate anemia in 53.1% (34/64), and mild anemia in 21.8% (14/64) (3). Similarly, a study conducted in the United States on the relationship between hemoglobin levels and headaches found that 76 out of 100 women experienced migraines due to low hemoglobin levels [4].

\* Corresponding author: Satila Zalianty Zen

Iron in erythrocytes plays an important role in transporting oxygen from the lungs to be distributed throughout the body and carrying carbon dioxide (CO<sub>2</sub>) to be returned to the lungs and then exhaled out of the body, a lack of red blood cells can reduce oxygen supply and this is what causes headaches.

This study is important to conduct because, in Indonesia, no research has yet examined the relationship between a history of iron deficiency anemia and headaches in pregnant women during the third trimester, particularly in Surabaya. Based on data from the Surabaya City Health Office, the Gading Health Center is one of the health centers with the largest number of pregnant women. Therefore, the researchers are interested in studying the relationship between a history of iron deficiency anemia and headaches among pregnant patients at the Gading Health Center, Surabaya.

## 2. Material and methods

This type of research is quantitative correlational analytic with a cross-sectional design, sampling using the total sampling method. The respondents of the study were 41 pregnant women in their third trimester who visited the maternal and child Polyclinic of the Gading Surabaya Health Center in the period July-August 2024. Hb data was obtained from the maternal and child health book a maximum of 6 months since data collection. Other data were obtained through distributing questionnaires. The collected data were recorded for entry and processed using Microsoft Excel. Quantitative data analysis used the Statistical Product and Service Solution (SPSS) 27.0 for Windows and then analyzed using Spearman's rho.

## 3. Results and discussion

This section presents the main findings of the research after analyzing the data presented in tabular form. This section helps readers to understand the research data and explain its meaning.

**Table 1** Demographic characteristics of respondents who have complaints of headaches based by age

Variable	Frequency	Percentage
<25	7	17.1%
26-30	23	56.1%
31-35	3	7.3%

Based on Table 1, it shows that 23 (56.1%) of pregnant women are 26-30 years old. Based on the characteristics of research data, it was found that the majority of pregnant women experiencing headaches were aged 26-30 years, with 23 individuals (56.1%). This was followed by mothers aged <25 years with 7 individuals (17.1%) and those aged 31-35 years with 3 individuals (7.3%). This finding aligns with research conducted which showed that 76.3% of pregnant women aged >16 years experienced headaches, concluding that there is a relationship between age and headaches during pregnancy [5]. Similarly, research indicated that headache disorders among individuals aged 15-49 rank second after gynecological diseases, with depressive disorders in third place [6]. Among young adults, while gynecological diseases account for only half of the cases, headache disorders remain the leading cause of disability.

**Table 2** Demographic characteristics of respondents who have complaints of headaches based by employment

Variable	Frequency	Percentage
Housewife	12	29.3%
Private employment	16	39.0%
Civil Servants	3	7.3%
State-owned enterprises	2	4.9%

Based on table 2, it shows that 16(39.0%) pregnant mothers work in the private sector. This finding aligns with research which reported that 72.3% of female workers stated that work could trigger headaches, with contributing factors including authoritarian leadership, overtime work, high effort coupled with low wages [6]. Similarly found that workers experiencing headaches tend to have higher rates of metabolic disorders and poorer mental health compared to those

without headaches. This makes them more vulnerable to stress and workplace violence than their coworkers. The study also highlights the importance of interventions targeting lifestyle, health, and worker-related factors through health promotion programs initiated by many companies to improve workers' quality of life. Additionally, while stress is believed to contribute to headache episodes, migraine attacks, and chronification, its exact pathophysiological mechanisms remain unclear [7]

**Table 3** Demographic characteristics of respondents who have complaints of headaches based by final education

Variable	Frequency	Percentage
Junior High School	1	2.4%
Senior High School	20	48.8%
Civil Servants	1	2.4%
Associate Degree	11	10.5%
Bachelor's Degree	13	13.0%

Based on table 3, it shows that 20 (48.8%) pregnant mothers had a final education of senior high school. In this study, the majority of pregnant women who experienced headaches were those with a high school education, totaling 20 individuals (48.8%). This finding aligns with research conducted, which, outside the context of headaches, demonstrated that individuals with lower education levels tend to experience higher stress in daily life and are more vulnerable to its effects, increasing the risk of chronic stress [8]. Additionally, obesity and depression are more common among women with lower education levels compared to those with higher education. This is closely related to the level of health literacy accessible to women.

**Table 4** Demographic characteristics of respondents who have complaints of headaches based by haemoglobin

Haemoglobin	Headache			Total	P value	r
	No pain	Mild pain	Moderate pain			
Normal	12	0	2	14	0,001	0,607
Abnormal	2	18	7	27		
<b>Total</b>				41		

Based on Table 4, hemoglobin levels in pregnant women are shown to have a significant relationship with headaches. The statistical analysis yielded a p-value of 0.001 and a correlation coefficient of 0.607, indicating a strong correlation. These results demonstrate a highly significant positive relationship between Hb levels and headaches in the third trimester of pregnancy. Several mechanisms are thought to underlie headaches related to hemoglobin levels. One mechanism involves decreased serotonin levels in the central nervous system and increased levels in the peripheral nervous system, leading to reduced activity in the nervous system [9].

In this study, headaches were found in 27 pregnant women who experienced hemoglobin deficiency. This finding is consistent with research in Iran, which showed a relationship between headaches and hemoglobin levels. Researchers monitored the occurrence of headaches in pregnant women, which were reported with moderate intensity. Headaches are more common and severe during the third trimester compared to other trimesters. Several factors contribute to this, including hormonal changes, increased blood volume, and high blood pressure [10]. Headaches and iron deficiency anemia have an interrelated relationship. Iron deficiency anemia is more prevalent in migraine sufferers than in non-migraine sufferers. Additionally, women whose migraine conditions worsen during pregnancy are 13 times more likely to develop hypertension compared to women whose migraines improve or resolve during pregnancy [11].

Iron plays a critical role in the synthesis of serotonin, dopamine, and norepinephrine. Brain serotonin levels, as a mediator, decrease during headaches, and serotonin itself is a neurotransmitter that plays a key role in the neurobiology of headaches. Another perspective suggests that hemoglobin, a metal protein containing iron in erythrocytes, is responsible for transporting oxygen from the lungs to the entire body and returning carbon dioxide (CO<sub>2</sub>) to the lungs for exhalation. A lack of red blood cells can reduce oxygen supply, which in turn causes headaches. This study can be

supported by observations showing that lower hemoglobin levels lead to increased cerebral blood flow (CBF) velocity, as measured by transcranial Doppler (TCD). Other mechanisms linking hemoglobin levels to headaches include abnormal erythrocytes, vaso-occlusion, tissue ischemia, altered blood flow, and increased blood viscosity. Additionally, some headaches may be caused by vaso-occlusive events involving the skull [12].

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#### 4. Conclusion

The results of the analysis showed a highly significant positive relationship between hemoglobin (Hb) levels and headaches in pregnant women during the third trimester. This is evidenced by a p-value of 0.001, indicating a high level of significance. The correlation coefficient of 0.607 suggests a strong correlation, where a history of iron deficiency anemia is associated with increased headache intensity, and vice versa.

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#### Compliance with ethical standards

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##### *Disclosure of Conflict of interest*

All authors declare that no competing interests were disclosed.

##### *Statement of ethical approval*

Ethical clearance was approved by the Ethics Committee of the Faculty of Medicine Universitas Airlangga, Surabaya, Indonesia Number 80/EC/KEPK/FKUA/2024.

##### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study

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