Sains Medika: Jurnal Kedokteran dan Kesehatan

journal homepage: http://jurnal.unissula.ac.id/index.php/sainsmedika/

RESEARCH ARTICLE

The association between Hb levels in placenta previa patients with apgar scores

Herlin Ajeng Nurrahma[1*], Yulice Soraya Nur Intan[2], Andreanyta Meliala[3], Paramita Narwidina[4]

[1] Departement of Physiology, Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Indonesia
[2] Departement of Obstetrics and Gynecology, Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Indonesia
[3] Departement of Physiology, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta 55281, Indonesia
[4] Clinical Nutrition Research Group, Yogyakarta 55132, Indonesia
[*] Corresponding author, email: herlinajengn@unissula.ac.id

ARTICLE INFO

Keywords:
Pregnancy
Hemoglobin
Low-lying Placenta
APGAR Score

ABSTRACT

Hemoglobin (Hb) level is a biochemical indicator of the nutritional status of pregnant women, and a low Hb level reduces blood supply to the placenta, which influences the incidence of placenta previa. A placenta previa develops in the lower portion of the uterus, completely or partially expanding to cover the entire birth canal and the internal uterine ostium. The APGAR score is commonly used as a predictor of infant mortality and long-term disability and as an indicator of infant health at birth. The risk of maternal and infant mortality ath inadequate vascularization, which can be caused by low Hb levels. This study aimed to determine the relationship between Hb levels and APGAR scores in patients with placenta previa at Sultan Agung Islamic Hospital in Semarang. This analytic observation study is a cross-sectional analysis with purposive sampling method. From January 2017 to January 2018, all placenta previa patients hospitalized at Sultan Agung Hospital in Semarang were included in this study. In this study, we used subject data that met the criteria for inclusion. The *p*-value derived from the chi-square analysis is 0.041 ($p< 0.05$). A test of association was conducted. This test revealed that the OR was 11.5 (OR > 1). Low Hb levels (11 g/dl) could significantly increase the risk of a lower APGAR score at 5 min in patients with placenta previa who have a low Hb level.

1. Introduction

Low Hb levels in pregnant women are one of the health issues that are almost certain to happen during pregnancy (Hasegawa *et al.*, 2012; Rahmati *et al.*, 2017). Possibility of bleeding before, during, and in extreme cases, resulting in the deaths of gravida patients and their children. Indonesia has the third-highest maternal mortality rate in Southeast Asia, at 177 per 100,000 births (The World Bank Data, 2019).

Due to the extensive bleeding, placenta previa increases the risk of maternal and infant mortality as well as morbidity (Gibbins *et al.*, 2018). Placenta previa can cause significant bleeding during pregnancy and after cesarean delivery (Swarup & Anand, 2021). The primary placenta previa complication that causes heavy and fatal bleeding and necessitates hysterectomy is placenta accreta (Rajuddin *et al.*, 2019), which develops when the placenta is in the lower uterine segment and causes trophoblast tissue to invade the myometrium and then the perimetrium (Ali *et al.*, 2018). Reduced placental vascularity is another factor that could affect how often placenta previa occurs (Jansen *et al.*, 2020).

Preliminary data from the Sultan Agung Islamic Hospital in Semarang's medical records section indicates that there has been an increase in the prevalence of placenta previa, with 114 cases reported in 2017 compared to 48 the year before. This description says

https://doi.org/10.30659/sainsmed.v13i2.26623

• pISSN: 2085-1545 • eISSN: 2339-093X/

that placenta previa is less likely to happen if pregnancy checks are done at least four times a month starting early in the pregnancy, especially to check the Hb level.

Additionally, expectant gravida patients who have a chance of developing placenta previa will be closely watched and transferred to hospitals with more advanced equipment. Support pregnant women's health by reducing the risk of placenta previa, one of which is caused by reduced vascularity in the placenta (Delli Pizzi *et al.*, 2019; Firmansyah, 2017) that can be caused by a lack of Hb levels in pregnant women (Gebremeskel *et al.*, 2020; Rai & Cross, 2014).

The APGAR score is the most commonly used measure of neonatal health in the min following birth. Multiple evaluations are typically performed within the first ten min of birth, typically at 1, 5, and 10 min (Iliodromiti *et al.*, 2014). APGAR Score stands for "Appearance, Pulse, Grimace, Activity, and Respiration". The APGAR score at 5 min has received the most attention in research, especially the association between the APGAR score at 5 min and subsequent neonatus and infant outcomes. Premature, perinatal mortality, congenital abnormalities, and APGAR scores < 7 are more common in neonates born to moms with placenta previa (King *et al.*, 2020).

The primary distinction between the APGAR assessments at 1 and 5 min is that the APGAR assessment within the first min of birth indicates intrapartum health and the neonates' reaction to the "trauma" of birth (Kattwinkel *et al.*, 2010). The difference between the 1st and 5th min APGAR scores for neonates with an initially low APGAR score suggests the ability to recover and the probable need for continuous treatment. Variation in recovery rates between the first and fifth min gives critical clinical information and may also provide insight into intrapartum health system difficulties (Jeganathan *et al.*, 2017).

Based on the preceding description and the requirement for newborns born with patient placenta previa to be screened using the APGAR score technique, neonates who experience abnormalities or crises can be identified and treated as soon as possible. As a result, this study is essential for validating this hypothesis and providing scientific insight into the relationship between Hb levels and the APGAR score in patients with placenta previa.

2. Materials and Methods

2.1. Study design

This study is an analytic observation using medical record data, which is then analyzed using a cross-sectional design to obtain a correlation between the independent and dependent variables.

2.2. Population and samples

The population in this study were all gravida patients who had placenta previa diagnosed and hospitalized at Sultan Agung Islamic Hospital, Semarang, from January 2017 to January 2018, as recorded in medical record documents for 61 gravida patients with placenta previa. Purposive sampling was used as the methodology. In this study, we used subject data that met the criteria for inclusion.

The medical record, which will serve as the data source for analysis, contains the following information: number of medical, record document registration, gravida patients' age Hb level, incidence of placenta previa and APGAR score. The relevant outcome measure was a binary variable representing APGAR recovery at 5 min. APGAR scores of 7 or higher were deemed acceptable. If neonates with an APGAR score of 7 received a 5-min APGAR score of >7, they were classified as recovered; otherwise, they were not recovered.

2.3. Data Analysis

After collecting data from the inpatient poly obstetrics medical record at Sultan Agung Islamic Hospital, editing, coding, and data entry were performed. The Chi-Square test was used to analyze the data, and when p is less than alpha (p<0.05) and the significance level is 95%, Ho is rejected and Ha is accepted, indicating that the dependent variable and

Table 1. Frequency distribution of respondent characteristics

Characteristics	Number (%)
Age (years)*	
• 15-20	3 (3.75)
• 20-25	7 (8.75)
• 26-30	18 (22.50)
• 31-35	15 (18.75)
• 36-40	15 (18.75)
• 41-45	1 (1.30)
• 45-50	1 (1.30)
Levels of Hb	
• < 11 mg/dl (Anemia)	15 (18.80)
• ≥ 11 mg/dl (No anemia)	46 (59)
Neonates's APGAR Scores	
1 min APGAR	
• <7	4 (5)
• ≥7	57 (71.30)
5 min APGAR	
• <7	3 (3.75)
• ≥7	58 (72.50)
10 min APGAR	
• <7	1 (1.30)
• ≥7	60 (75)

* Two subjects had no age data in the medical record

Table 2. Correlation of Hb levels and 1, 5 and 10 min APGAR score in placenta previa

Hb levels	Asphyxia	Normal	*p*	OR	CI
APGAR score 1 min					
• **Anemia** (Hb<11 mg/dl)	3 (20)	12 (80)	0.051	5.625	0.842-37.576
• No Anemia (Hb≥11 mg/dl)	2 (4.3)	45 (95.7)			
APGAR score 5 min					
• Anemia (Hb<11 mg/dl)	3 (20)	12 (80)	0.041*	11.50	1.096-120.663
• No Anemia (Hb≥11 mg/dl)	1 (2.1)	46 (97.9)			
APGAR score 10 min					
• Anemia (Hb<11 mg/dl)	1 (6.7)	14 (93.3)	0.386	3.286	0.193-55.992
• No Anemia (Hb≥11 mg/dl)	1 (2.1)	46 (97.9)			

*p<0.05 based on Pearson Chi-Square

the independent variable are significantly associated.

3. Results

3.1. Characteristics of women with placenta previa respondents

Table 1 shows that of the 61 babies delivered with the gravida patient's condition having placenta previa, as many as 4, 3, and 1 neonate had an APGAR score 7 of 1, 5, and 10 min. Fifteen pregnant women had placenta previa with anemia, and 43 did not. The majority (18 women, 22.50%) of moms treated for placenta previa at Sultan Agung Islamic Hospital between January 2017 and January 2018 were between the ages of 26 and 30. There were 15 pregnant women with placenta previa and anemia (18.80%) and 46 people (59%) who were not anemic.

3.2. Correlation of Hb levels and 1 min APGAR score in placenta previa

Table 2 shows that there was no significant association between Hb levels and APGAR scores at 1 min ($p > 0.05$) with an an odds ratio (OR) of 5.625 and 95% confidence interval (95% CI) of 0.842-37.576. At 5 min APGAR score, the Hb levels is significantly correlated to placenta previa ($p < 0.05$) with an OR of 11.50 and 95% CI of 1.096-120.663 meaning that gravida patients with anemia are 11.50 times more likely to have infants with an APGAR score of 7 in the case of placenta previa than gravida patients without anemia.

4. Discussions

The placenta previa increases the risk of maternal and infant mortality and morbidity as a result of the excessive bleeding. In addition to occurring after a cesarean section, placenta previa can cause severe bleeding during pregnancy (Takeda *et al.*, 2020). The main complication that causes heavy and fatal bleeding due to placenta previa is placenta accreta, which occurs when the placenta is located in the lower uterine segment, causing trophoblast tissue to invade the myometrium and then the perimetrium, necessitating a hysterectomy (Ali *et al.*, 2018; Garmi & Salim, 2012).

Reduced placental vascularity is an additional factor that can influence the incidence of placenta previa (Delli Pizzi *et al.*, 2019; Firmansyah, 2017). The placenta with inadequate vascularization expands to cover the entire birth canal (DS & Bird, 2017; Woods *et al.*, 2018). In pregnant women, a deficiency of Hb levels can result in diminished placental vascularity (Gebremeskel *et al.*, 2020; Rai & Cross, 2014). Observing the results of the initial survey and the data from the obstetrical medical record section at Sultan Agung Islamic Hospital, Semarang, the incidence of placenta previa has increased. The incidence of placenta previa increased from 48 cases in 2016 to 114 cases in 2017. In this study, researchers discovered that 15 pregnant women (18.80%) had placenta previa and low hemoglobin levels, whereas 46 pregnant women (59%) did not. Lower Hb levels reduce placental vascularity, which may influence the incidence of placenta previa, according to a study (Jansen *et al.*, 2020).

Anemia occurs when a gravida patient's Hb levels fall below 11 mg/dl in the first or third trimester or below 10.5 mg/dl in the second trimester of pregnancy (Di Renzo *et al.*, 2015; Stephen *et al.*, 2018). Anemic pregnant women are more likely to experience bleeding before and during delivery, and in extreme cases, both the gravida patient and the unborn child can be lost. It has a substantial effect on maternal and infant mortality rates (Young, 2018). Survei Demografi Kesehatan Indonesia (SDKI) 2007 reported a maternal mortality rate (MMR) of 228 per 100,000 live births and an infant mortality rate (IMR) of 34 per 1,000 live births (Badan Pusat Statistik *et al.*, 2012). APGAR scores are an assessment of a newborn's condition based on a standardized, rapid procedure for infants after birth. When the APGAR score was developed, it was understood that very low APGAR scores at 5 min (0-6) were strongly associated with the risk of neonatal and infant mortality compared to APGAR scores 7-10 for early neonatal death (Iliodromiti *et al.*, 2014). The APGAR score at 5 min has received the most attention

 https://doi.org/10.30659/sainsmed.v13i2.26623

in research, particularly the relationship between this score and subsequent neonatal and infant outcomes. In this study, there was no association between Hb levels and APGAR scores at 1 min (p = 0.051) or 10 min (0.386); however, there was a significant association at 5 min (p = 0.041) with an odds ratio (OR) of 11.50. This means that gravida patients with anemia are 11.50 times more likely to have infants with an APGAR score of 7 in the case of placenta previa than gravida patients without anemia. According to previous research, premature birth, perinatal mortality, congenital abnormalities, and APGAR scores of 7 are more prevalent in neonates born to mothers with placenta previa (King *et al.*, 2020).

This study has several limitations, including the number of samples for data collection with a minimal sample size, although a larger sample size can still be found, which will impact the validity of the study. In addition, other risk factors for placenta previa incidence, such as a history of abortion, births at a distance, and multiple pregnancies, must be considered in this study.

5. Conclusions

In conclusion, this observational study demonstrated that pregnant women that diagnosed placenta previa with low level of Hb has a relatively high risk of delivering baby with lower apgar score at 5 min.

Acknowledgment

The authors would like to thank the Sultan Agung Islamic Hospital staff and Internal Grant 2018, Faculty of Medicine, Universitas Islam Sultan Agung whose support and collaboration made this study possible.

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