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Anemia in pregnant mothers and the apgar score of newborn babies at secondary refferal hospital, Bali

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ABSTRACT

Low hemoglobin levels due to anemia in pregnancy can affect the baby's APGAR score. The purpose of this study was to determine the relationship between anemia in pregnant women and the APGAR score of newborns at the Sanjiwani Hospital, Gianyar. This research is an analytic observational study with a cross sectional research design. This study used medical records data of patients who gave birth vaginally and had normal births, did not have low birth weight, had normal first and second stages of labor, and had complete laboratory data on hemoglobin levels and APGAR scores. Data on mothers experiencing obstetric complications other than anemia were excluded from this study. Data were analyzed by univariate and bivariate using Chi-square hypothesis test. From 140 samples of pregnant women, there were 78 (55,7%) samples of pregnant women who had anemia and 62 (44,3%) samples of pregnant women was not had anemia. Bivariate analysis showed that there was a significant relationship between anemia in pregnant women and the APGAR score of newborns with p value = 0.001 (p <0.05). We concluded that there was a relationship between anemia in pregnant women and the APGAR score of newborns at the Sanjiwani Hospital, Gianyar.

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INTRODUCTION

Anemia is a problem that is often found throughout the world, especially during pregnancy(Dewvi et al., 2020; Nurdin et al., 2020). According to the World Health Organization (WHO), anemia is defined as a condition in which the number of erythrocytes or the level of hemoglobin in erythrocytes is below normal(World Health Organization, 2017). Center for Disease Control (CDC) defines anemia in pregnancy as a condition in which hemoglobin levels are lower than 11 g/dl in the first and third trimesters of pregnancy, and 10.5 g/dl in the second trimester (Kanu et al., 2022). WHO

reports that the prevalence of pregnant women worldwide who experience anemia is quite high, namely 41.8%(World Health Organization, 2017).

In Indonesia, the rate of anemia in pregnant women is still high at 48.9%. Pregnant women who experience anemia will increase their risk of maternal mortality and make a big contribution to the Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR). The Maternal Mortality Rate (MMR) in Indonesia is still relatively high, which is around 305 per 100,000 live births, and IMR at 24 per 1000 live births. This has not yet reached the 2015-2030 Sustainable Development Goals (SDGs) with a commitment to reduce the MMR by 70 per 100,000 live births and the IMR of 12 per 1000 live births (Kementerian Kesehatan Republik Indonesia, 2020). According to the Health Profile of Gianyar Regency in 2019, the MMR in Gianyar Regency experienced a significant increase reaching 103.58 per 100,000 live births compared to 2018 which only reached 30 per 100,000 live births. and IMR of 8.8 per 1000 live births. This indicates an increase in MMR and IMR in Gianyar Regency which requires a solution from the government (Dinas Kesehatan Kota Gianyar, 2019).

Anemia in pregnant women affects the baby being born. According to a study by Beckert et al (2018), anemia in pregnancy will create a greater risk of preterm birth, and peripartum, intrapartum, and postpartum complications in pregnant women(Beckert et al., 2019). The APGAR score is an assessment to see signs of neonatal emergencies in newborns. APGAR itself is an abbreviation of Appearance, Pulse, Grimace, Activity, and Respiration whose assessment includes clinical signs such as cyanosis, bradycardia, depression of reflex response to stimulus, hypotonia, and disturbed breathing or apnea. Each of these components will be assigned a value of 0, 1, or 2 and will be concluded by adding up all of its components. The score will be reported in the first minute and fifth minute after birth(Committee on Obstetric Practice, 2015). According to research conducted by Bano et al (2017), anemia in pregnancy is closely related to poor APGAR scores in babies born. Pregnant women with anemia will produce a lower APGAR score, with an average of 6.5 ± 0.2 when compared to pregnant women without anemia with an average of 8.7 ± 0.5(Bano et al., 2018). Astria & Windasari (2021) also stated in their research at the Sanjiwani Hospital, Gianyar that neonatal asphyxia and low birth weight (LBW) are risk factors associated with neonatal mortality. (Astria & Windasari, 2021). But unfortunately, this previous research didn't examine the cause of neonatal asphyxia or low APGAR scores. Based on that situation and considering the problem of anemia in pregnancy which is still quite high, the author wants to know whether anemia in pregnant women and APGAR score is related. The results of this study can be used as a basis for efforts to reduce infant mortality rate (IMR), in relation with neonatal asphyxia and anemia in pregnant women, especially in Gianyar Regency.

RESEARCH METHOD

This research is an analytic observational study with a cross-sectional approach. The instrument used was secondary data in the form of medical records of mothers who gave birth at Sanjiwani Hospital, Gianyar, and selected using simple random sampling. Sanjiwani Hospital Gianyar is secondary referral hospital located in Gianyar regency which is the center of tourism and art in Bali. The inclusion criteria of this study were mothers who gave birth vaginally and had normal births, did not have low birth weight, had normal first and second stages of labor, and had complete laboratory data on hemoglobin levels and APGAR scores. Data on mothers experiencing obstetric complications other than anemia were excluded from this study.

Anemia in pregnant women is the independent variable and the newborn's APGAR score is the dependent variable of this study. The data that has been collected will be processed and analyzed using the SPSS version 23 application. Data analysis was conducted by using univariate and bivariate analysis. The univariate analysis is presented in the form of distribution of frequency, proportion, mean, and standard deviation of the variables of age, parity, normal pregnancy, pregnancy with anemia, and APGAR score. Bivariate analysis was intended to determine whether there was a relationship between anemia in pregnant women and the APGAR score of newborns. The hypothesis

test used is the Chi-square and the basis for making the decision to accept the research hypothesis is based on the p-value. If the p-value > 0.05, then H0 is accepted and Ha is rejected, which means that there is no significant relationship between the independent variable and the dependent variable. If p < 0.05, then H0 is rejected and Ha is accepted, which means that there is a significant relationship between the independent variable and the dependent variable.

RESULTS AND DISCUSSIONS

Table 1. Sample Distributions Based on Mother Characteristics

Characteristic (N=140)	Frequency	Percentage	Mean	Standar Deviation	Min	Max
Age (years old)						
15-20	22	15,7				
21-25	34	24,2				
26-30	30	21,4	28	6,2	15	42
31-35	25	17,9				
36-40	26	18,6				
41-45	3	2,1				
Parity						
Primipara	53	37,9				
Multipara	67	47,9				
Grande Multipara	20	14,3				

In this study, the research sample used was 140 samples through simple random sampling. The distribution of the sample based on the characteristics is described in Table 1. Most of the pregnant women who gave birth at the Sanjiwani Hospital, Gianyar was 21-25 years old (24.2%). The average age of pregnant women is 28 years with the youngest age being 15 years and the oldest being 42 years. This shows that most of the samples are of reproductive age and are not at risk. Judging from the number of live births, most of them fall into the multiparous (47.9%) and are followed by 53 samples with primiparous status (37.9%). This study is in accordance with that studied by Masrudin et al. (2017) and Nurdin et al. (2020) where most of the research samples are multiparous (Masrudin et al., 2017; Nurdin et al., 2020). The number of parity is one of the factors a pregnant woman has anemia or not. In accordance with research by Amallia et al (2017), primiparous and grande multipara have a higher risk of developing anemia in pregnancy(Amallia et al., 2017). This is because women with primiparous are more difficult to adapt to pregnancy and knowledge of the importance of nutritional status is still low (Permatananda & Pandit, 2023). Meanwhile, women with grande multipara are more at risk of experiencing anemia in pregnancy because their health status declines with high parity numbers, making them susceptible to anemia in subsequent pregnancies. In addition, every labor that occurs will cause changes in the structure of the uterine muscle fibers into connective tissue, thereby reducing the elasticity of the uterus(Amallia et al., 2017).

Table 2. Overview of Anemia in Pregnant Women Who Gave Births in Sanjiwani Hospital, Gianyar

Characteristic (n=140)	Frequency	Percentage
Anemia	78	55,7
Not Anemia	62	44,3

Source: Secondary data, 2022

Table 3. Distribution of Anemia in Pregnant Women Based on Age in Sanjiwani Hospital, Gianyar

Age	Frequency	Percentage
15-20	19	24,3
21-25	10	12,9
26-30	11	14,1
31-35	12	15,4
36-40	23	29,5
41-45	3	3,8
Total	78	100

Source: Secondary data, 2022

Based on table 2 and 3, 55.7% of pregnant women suffer from anemia and the rest are not anemic. Anemia in pregnancy was dominated by 23 people (29.5%) aged 36-40 years and 19 people (24.3%) followed by 15-20 years old. Anemia is defined as a condition in which the number of erythrocytes or the level of hemoglobin in erythrocytes is below normal, as evidenced by laboratory results(Aryastuti et al., 2021; Cahyawati et al., 2018). According to WHO, pregnancy is said to be anemic if it has a hemoglobin level of <11gr/dl(World Health Organization, 2017). Laboratory examinations were carried out before labor began. The results in this study are not in line with the research by Masrudin *et al* (2017) which had a sample dominated by pregnant women who did not experience anemia(Masrudin et al., 2017). This is because the other study was using the total sampling method.

According to the distribution of anemia in pregnancy by age, 45 samples were at low-risk age (20-35 years), and 33 samples were at high-risk age (<20 years and >35 years). In addition, the sample with an age range of 36-40 years is the largest number of samples who experience anemia in pregnancy. This study is not in accordance with research by Masrudin et al (2017) and Nurdin et al (2020) which had a sample with most of them being at a low-risk age(Masrudin et al., 2017; Nurdin et al., 2020). According to the researchers, this was due to differences in the age characteristics of the entire sample. Based on research by Kumalasari (2017), maternal age is associated with the incidence of anemia in pregnancy(Kumalasari, 2017). Women aged 20 to 35 years have a lower risk of anemia during pregnancy because they have better physical and mental readiness. Pregnant women under the age of 20 have iron reserves which are divided between the fetus in the womb and for themselves, which of course still requires a lot of iron intake. Pregnant women aged over 35 years have entered the beginning of the degenerative phase, so body functions are not as good as in other ages, and thus experience various health problems(Supanji et al., 2022; Wiadnjana et al., 2020). In addition, according to *Riskesdas* (Basic Health Research) 2018, women who are pregnant under 20 years or over 35 years have a higher incidence of anemia than pregnant women aged 20 to 35 years in both urban and rural areas(Kementerian Kesehatan RI, 2018).

Table 4. Overview of Newborn APGAR Scores in Sanjiwani Hospital, Gianyar

Characteristic (n=140)	Frequency	Percentage
APGAR Score		
Normal	102	72,9
Abnormal	38	27,1

Source: Secondary data, 2022

Table 4 shows that 72.9% of newborns had a normal APGAR score (vigorous baby) and 38 samples (27.1) had an abnormal APGAR score. The APGAR score is an assessment to assess the newborn's response and see signs of the need for emergency assistance such as resuscitation. There are five components that are assessed in the APGAR score, namely Appearance (A), Pulse (P),

Grimace (G), Activity (A), and Respiratory (R). Each component is given a value of 0.1, and 2. Assessment of the APGAR score can be done in the first minute and the fifth minute after the birth of the baby(Committee on Obstetric Practice, 2015; Sari et al., 2018). In this study, the APGAR score assessment data used was the fifth-minute score. The APGAR score is said to be good (vigorous baby) if it gets a score of 7. There is a match between this study and research by Masrudin et al (2017) and Rahayu et al (2020) where the percentage of samples with normal APGAR scores is greater than those with abnormal(Masrudin et al., 2017; Rahayu et al., 2020).

Based on the overall sample of pregnant women with anemia, 61.5% had newborns with normal APGAR scores, and 87.1% of pregnant women who did not have anemia had newborns with normal APGAR scores. The results of the chi-square statistical test analysis showed a p-value of 0.001 with a significant level of 0.05, which means that there is a relationship between anemia in pregnant women and the APGAR score of newborns at the Sanjiwani Hospital, Gianyar ($p<0.05$). This result is in line with the research by Masrudin et al. (2017) which also had a cross-sectional research design and also used chi-square analysis, the aforementioned study showed p-value = 0.002 ($p <0.05$)(Masrudin et al., 2017). Research by Ahmad & Kalsoom (2015), and Shah et al (2022) which compared the APGAR score between pregnant women with anemia and non-anemia also got the same results, namely chi-square of $p = 0.012$ (Ahmad & Kalsoom, 2015; Shah et al., 2020). However, the results of this study are not in line with research by Rahayu et al (2020) that there is no relationship between anemia in pregnant women and the APGAR score of newborns with the acquisition of the chi-square of $p = 0.088$ ($p < 0.05$)(Rahayu et al., 2020). This study is also contrary to research by Azhari *et al* (2016) which examined the comparison of fetal outcomes in anemic and nonanemic pregnant women, that there was no difference in APGAR scores between anemic and nonanemic pregnant women with p-value = 0.483 ($p <0.05$)(Azhari et al., 2016).

Table 5. Results of Chi Square Test Analysis of Anemia in Pregnant Women with Newborn APGAR Scores at Sanjiwani Hospital, Gianyar

Anemia	APGAR Score		Total n (%)	p value
	Normal	Abnormal		
	n (%)	n (%)		
Anemia	48 (61,5)	30 (38,5)	78 (100)	0,001
Non-Anemia	54 (87,1)	8 (12,9)	62 (100)	
Total	102 (72,9)	38 (21,7)	140 (100)	

Source: Secondary data, 2022

During pregnancy, there will be physiological changes in almost every organ system to accommodate the growing fetoplacental unit. The volume of red blood cells (RBC) will increase by about 30%, while the volume of plasma will increase from 45% to 55%. This disproportionate increase in volume will occur starting at week 6 and peaking at week 32. This condition is called the hemodilution effect which is a normal physiological change in pregnancy. This effect will also cause a decrease in hemoglobin concentration(Chandra et al., 2012). Hemoglobin is a protein part of red blood cells that has an oxygen binding capacity of up to 1.34 mL O2/g. If the low hemoglobin concentration is not treated, anemia will occur and affect the fetal outcome later(Azhari et al., 2016). In conditions of anemia, the supply of oxygen and other nutrients will be reduced so that the fetus can experience hypoxia, fetal distress, and stunted growth(Lestarini & Ariwangsa, 2020). Prolonged fetal hypoxia can lead to neonatal asphyxia. This theory is supported by research by Subriah (2018) and research by Aprilia et al (2019) in Bali with the results that anemia in pregnancy increases the incidence of asphyxia neonatorum with p-value = 0.000. If the baby has asphyxia neonatorum, it will affect the APGAR score, especially in the Respiratory (R) component(Aprilia et al., 2019; Subriah & Ningsi, 2018). In addition, asphyxia neonatorum is the highest risk factor for neonatal death in the Sanjiwani Hospital, Gianyar.

Of course, this research still has weaknesses and limitations. The limitation of this study is that the researchers did not match the sample between anemic and non-anemic pregnant women, thus allowing for bias. In addition, researchers also did not analyze other factors that can affect the APGAR score of newborns.

CONCLUSION

Based on the results of this study, it can be concluded that there is a relationship between anemia in pregnant women and the APGAR score of newborns at the Sanjiwani Hospital, Gianyar. This research is expected to be able to support and strengthen the theory about anemia in pregnancy is closely related to the incidence of neonatal asphyxia. The result of this study reflect the need to increase nutritional screening in pregnant women and provide iron supplementation or additional food to prevent anemia in pregnant women.

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References

Ahmad, M. O., & Kalsoom, U. (2015). Effect of Maternal Anaemia on APGAR Score of Newborn. *Journal of Rawalpindi MEdical College*, *19*(3), 239–242.

Amallia, S., Afriyani, R., & Utami, S. P. (2017). Faktor Risiko Kejadian Anemia pada Ibu Hamil di Rumah Sakit BARI Palembang. *Jurnal Kesehatan*, *8*(3), 389–395.

Aprilia, N. P. D., Surinati, I. D. A. K., & Suratiah. (2019). Anemia pada Kehamilan dengan Tingkat Asfiksia Neonatorum pada Ibu Bersalin. *Jurnal Gema Keperawatan*, *12*(2), 121–126.

Aryastuti, S. A., Dewi, S., & Masyeni, S. (2021). High Prevalence of Anemia among Human Immunodeficiency Virus-Infected Patients : A Cross-sectional Study in Bali- Indonesia. *Biomedical and Pharmacology Journal*, *14*(1), 329–334.

Astria, N. K. R., & Windasari, M. A. C. (2021). Faktor-faktor yang berhubungan dengan kematian neonatus di RSUD Sanjiwani Gianyar. *Intisari*, *12*(2), 468–472. https://doi.org/10.15562/ism.v12i2.1065

Azhari, D., Yusrawati, & Rofinda, Z. D. (2016). Fetal Outcome pada Kehamilan Aterm Anemia dan Tidak Anemia di RS Achmad Mochtar Bukittinggi. *Jurnal Kesehatan Andalas*, *5*(1), 158–164.

Bano, T., Nazar, B., & Tahir, M. R. (2018). APGAR Score of Neonates Born to Anemic Mothers versus Non-Anemic Mothers. *JIMDC*, *7*(4), 246–249.

Beckert, R. H., Baer, R. J., Anderson, J. G., Jelliffe-pawlowski, L. L., & Rogers, E. E. (2019). Maternal anemia and pregnancy outcomes : a population-based study. *Journal of Perinatology*. https://doi.org/10.1038/s41372-019-0375-0

Cahyawati, P. N., Aryastuti, A. A. S. A., Ariawan, M. B. T., Arfian, N., & Ngatidjan, N. (2018). Statin and anemia in chronic kidney disease (CKD): an experimental study. *MATEC Web of Conferences 197*, *07003*, 1–4.

Chandra, S., Tripathi, A. K., Mishra, S., Amzarul, M., & Vaish, A. K. (2012). Physiological Changes in Hematological Parameters During Pregnancy. *Indian J. Hematol. Blood Transfus.*, *28*(3), 144–146. https://doi.org/10.1007/s12288-012-0175-6

Committee on Obstetric Practice. (2015). The Apgar Score. *The American College of Obstetricians and Gynecologist*, *644*.

Dewvi, P. A. S., Permatananda, P. A. N. K., & Wandia, I. M. (2020). Relationship between Upper Arm Circumstances and Mother's Hemoglobin Levels with The Event of Low Birth Weight Babies at Several Public Health Services in North Bali. *Jurnal Bidan Komunitas*, *5*(1), 1–6.

Dinas Kesehatan Kota Gianyar. (2019). *Profil Dinas Kesehatan Kota Gianyar Tahun 2019*. https://www.diskes.baliprov.go.id/download/profil-kesehatan gianyar2019/?wpdmdl=4187&refresh=601f878d4f3461612679053

Kanu, F. A., Hamner, H. C., Scanlon, K. S., & Sharma, A. J. (2022). Anemia Among Pregnant Women Participating in the Special Supplemental Nutrition Program for Women , Infants , and Children — United States , 2008 – 2018. *Morbidity and Mortality Weekly Report*, *71*(25), 813–819. who.

int/vmnis/indicators/haemoglobin/en/.

Kementerian Kesehatan Republik Indonesia. (2020). *Profil Kesehatan Indonesia 2020*. Kementerian Kesehatan Republik Indonesia.

Kementerian Kesehatan RI. (2018). *Laporan Nasional Riskesdas 2018*.

Kumalasari, A. (2017). *Hubungan Anemia Ibu Hamil dengan Kejadian Asfiksia Neonatorum di RSUD Wonosari Gunungkidul Tahun 2015*. Politeknik Kesehatan Kementerian Kesehatan Republik Indonesia.

Lestarini, A., & Ariwangsa, I. D. G. A. S. (2020). Factors That Influence The Event of Low Birth Weight Baby (LBW) in Mother at Payangan , Bali. *The Proceedings of the 1st Seminar The Emerging of Novel Corona Virus, NCov 2020, 11-12 February 2020, Bali, Indonesia*, *October*, 1–6.

Masrudin, R., Rahmawati, N. I., & Fatimah. (2017). *Hubungan Kadar Hemoglobin Ibu Saat Hamil dengan Apgar Skor pada Bayi Baru Lahir di RSUD Prambanan*. Universitas Alma Ata Yogyakarta.

Nurdin, M. A., Yusrawati, & Elmatris. (2020). Hubungan Kadar Hemoglobin Ibu Hamil Trimester 3 dengan Antropometri dan Skor APGAR di RSUP. DR. M.Djamil Padang. *JIKESI*, *1*(3), 255–261. https://doi.org/https://doi.org/10.25077/jikesi.v1i3.117

Permatananda, P. A. N. K., & Pandit, G. S. (2023). Nutritional Status of Children Age 4-6 Years Old in Local Village. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 850–855. https://doi.org/10.29303/jppipa.v9i2.3035

Rahayu, S., Nurdin, A., & Rahim, R. (2020). The Relationship of Anemia in Pregnant Women with Anthropometry and Apgar Score for Newborns in Dr. Tadjuddin Chalid Hospital, Makassar. *Green Medical Journal*, *3*(1), 13–22.

Sari, A. K., Sincihu, Y., & Ruddy, B. T. (2018). Tingkat Asfiksia Neonatorum Berdasarkan Lamanya Ketuban Pecah Dini pada Persalinan Aterm. *Jurnal Ilmiah Kedokteran Wijaya Kusuma*, *7*(1), 84–92.

Shah, N. J., Choudhary, R. S., Jangir, S. R., & Patel, D. (2020). Evaluation of surgical Apgar score in predicting post-laparotomy complications. *International Surgery Journal*, *7*(9), 2970–2975.

Subriah, & Ningsi, A. (2018). Hubungan Anemia pada Ibu Hamil yang Menjalani Persalinan Spontan dengan Angka Kejadian Asfiksia Neonatorum di RSDKIA Pertiwi Kota Makassar Tahun 2017. *Global Health Science*, *3*(2), 101–105.

Supanji, I. M. W., Budayasa, A. A. R., Permatananda, P. A. N. K., Cahyawati, P. N., & Aryastuti, A. A. S. A. (2022). Relationship Between Maternal Age, Education, and Parity in The Incidence of Spontaneous Abortion in Bali. *Science Midwifery*, *10*(4), 3091–3095.

Wiadnjana, I. G. P., Yanti, M. R. R., & Permatananda, P. A. N. K. (2020). *Nutritional Status of Reproductive Women Who Follow Vegetarian Diet in Badung Regency*. *November*. https://doi.org/10.4108/eai.11-2-2020.2302019

World Health Organization. (2017). *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity*. who. int/vmnis/indicators/haemoglobin/en/.