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## Relationship between pregnant women with anaemia of maternal age at risk and low birth weight in a social security hospital in Peru

José Villalva Luna

*Hospital Nacional Guillermo Almenara Irigoyen, Lima-Perú.,* [Joselo.villa.luna@gmail.com](mailto:Joselo.villa.luna@gmail.com)

Jhonattan Villena Prado

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# THE RELATIONSHIP BETWEEN PREGNANT WOMEN WITH ANEMIA OF HIGH-RISK MATERNAL AGE AND LOW BIRTH WEIGHT IN A HOSPITAL OF THE SOCIAL SECURITY OF PERU

RELACIÓN ENTRE GESTANTES CON ANEMIA EN EDAD MATERNA DE RIESGO Y BAJO PESO AL NACER EN UN HOSPITAL DE LA SEGURIDAD SOCIAL DEL PERÚ

Jose L. Villalva-Luna<sup>1</sup>, Jhonattan J. Villena- Prado<sup>1</sup>

## ABSTRACT

**Introduction:** Anemia and low birth weight are very important public health problems. **Objective:** To determine the association between anemia in pregnant women with risk maternal age and low birth weight in the Obstetrics-Gynecology service of the Guillermo Almenara Irigoyen Hospital, in the period from October to December of the year 2018. **Methods:** A study of non-experimental, retrospective, cross-sectional, analytical, case-control type. In the period from October to December 2018, a total of 312 pregnant women with maternal age at risk (teenage and elderly pregnant women) were registered, of which 72 were anemic (Hb <11 g / dl), being the number of cases, and in order to improve statistical power, the relationship between cases and controls of 1: 2 was established, with the number of controls or non-anemic pregnant women with risk maternal age 142. The general characteristics are analyzed by group of anemic pregnant women and non-anemic, and its association with risk maternal age. The association of anemia in separately pregnant adolescents and elderly women with low birth weight is determined by Chi-square test and Odds ratio. **Results:** Among the variables studied anemic pregnant women, the highest frequency of nulliparity and vaginal delivery, and the lowest frequency of a history of abortion and adequate prenatal control. Teenage pregnant women with anemia were not associated with an increased risk of low birth weight ( $p = 0.056$ ). Pregnant women who were anemic were associated with a 6-fold increased risk of low birth weight (95% CI: 2,219 to 18,026;  $p = 0.000$ ). **Conclusion:** Elderly pregnant women have a higher risk of presenting products with low birth weight.

**Key words:** Anemia; Pregnancy in adolescence; Maternal age; Birth weight (source: MeSH NLM).

## RESUMEN

**Introducción:** La anemia y el bajo peso al nacer son importantes problemas de salud pública. **Objetivo:** Determinar la asociación entre anemia en gestantes con edad materna de riesgo y bajo peso al nacer. **Métodos:** Se realizó un estudio de tipo no experimental, retrospectivo, transversal, analítico, de casos y controles. En el periodo de octubre a diciembre del 2019, se registraron un total de 312 gestantes con edad materna de riesgo (gestantes adolescentes y añosas), de los cuales 72 eran anémicas (hb < 11 g/dl), siendo este el número de casos, y con el fin de mejorar la potencia estadística se estableció la relación entre casos y controles de 1:2, siendo el número de controles o gestantes no anémicas con edad materna de riesgo 142. Se analizaron características generales por grupo de gestantes anémicas y no anémicas, y su asociación con edad materna de riesgo. Se determinó mediante prueba de Chi-cuadrado y Odds ratio la asociación de anemia en gestantes adolescentes y añosas por separado con bajo peso al nacer. **Resultados:** Entre las variables estudiadas las gestantes anémicas presentaron mayor frecuencia de nuliparidad y parto vaginal, y en menor frecuencia antecedente de aborto y control prenatal adecuado. Las gestantes adolescentes que cursaron con anemia no se asociaron a mayor riesgo de bajo peso al nacer ( $p=0,056$ ). Las gestantes añosas que cursaron con anemia se asociaron a 6 veces mayor riesgo de bajo peso al nacer (IC:95%: 2,219 a 18,026;  $p<0,001$ ). **Conclusión:** Las gestantes añosas tienen mayor riesgo de presentar productos con bajo peso al nacer.

**Palabras clave:** Anemia; Embarazo en adolescencia; Edad materna; Peso al nacer (fuente: DeCS BIREME).

<sup>1</sup> Hospital Nacional Guillermo Almenara Irigoyen, Lima-Perú.

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## INTRODUCTION

The World Health Organization (WHO) has defined anemia in pregnancy as serum hemoglobin less than 11 g / dL, with its respective variations according to altitude and geographic space<sup>(1)</sup>.

The most common cause of anemia in pregnancy is iron deficiency. Anemia is a disorder in which the number of erythrocytes decreases, and consequently, the oxygen transport capacity in the blood is insufficient to meet the body's needs. Physiological changes in pregnancy associated with the inadequate intake of foods rich in iron can worsen maternal hemoglobin's final result, leading to alterations in fetal growth, such as low birth weight and pre-term delivery<sup>(2-6)</sup>.

The WHO has defined low birth weight as a weight below 2500 grams, whose weight is important because it is associated with greater perinatal morbidity, deficits in cognitive development and chronic diseases in the future<sup>(7)</sup>.

Regarding the maternal age at risk, consider it as the group made up of elderly pregnant women, according to the International Federation of Gynecology and Obstetrics (FIGO), 35 years of age and older,<sup>(2)</sup> pregnant adolescents. These are important ages because they are associated with perinatal pathologies such as intrauterine growth restriction, prematurity and low birth weight<sup>(8,9)</sup>.

The Peruvian Government, to allow the economic and social progress of our country, has the objective of improving the state of health and development, prioritizing vulnerable populations such as pregnant women and infants under 3 years of age<sup>(10)</sup>.

Therefore, this work aims to determine the association between anemia in pregnant women of high-risk maternal age and low birth weight at the Hospital Guillermo Almenara Irigoyen National. This analysis has taken the main maternal variable as the anemia status and low birth weight as a neonatal variable, because it is an important cause of perinatal morbidity and mortality.

## METHODS

### Design and study area

A non-experimental, retrospective, cross-sectional, analytical, case-control study was carried out at the Hospital Guillermo Almenara Irigoyen National.

### Population and sample

A total of 312 pregnant women with high risk maternal age (adolescents and the elderly) were registered during October to December 2019. After reviewing the laboratory history, a total of 72 anemic pregnant women were obtained.

Based on the above, no sample size calculation was performed as our population was small for the time proposed by this study. Thus, the number of anemic cases or pregnant women is 72. To improve the statistical power, a case-control ratio of 1: 2 was used, requiring 144 controls, but only 142 controls were used.

Patients with maternal age at risk who have completed their gestation in October to December 2019 were included at the Hospital Guillermo Almenara Irigoyen National in Lima. They excluded patients with multiple pregnancies and/or use of assisted reproduction techniques, patients with history of chronic diseases: diabetes mellitus pregestational, chronic hypertension and obesity (BMI > 40), chronic kidney disease, infection acquired immunodeficiency virus, heart or lung disease, and patients with incomplete history.

### Variables and instruments

The variables considered were age, gestational age in weeks, maternal hemoglobin level, history of abortion, adequate prenatal control, nulliparity, marital status, delivery route, and birth weight of the product. The instrument used was a data collection sheet because medical records were reviewed.

### Procedures

The information was collected based on the laboratory history of the Hospital Management System and the birth record book of the High-Risk Obstetric Service from October to December of 2019. The data collected were: high-risk maternal age (maternal age <19 years and > 35 years), gestational age by weeks, maternal hemoglobin level, history of abortion, adequate prenatal control, nulliparity, marital status, method of delivery and birth weight of the offspring.

### Statistical analysis

The information obtained was recorded in Excel tables and transferred to a database of the SPSS version 25 program; where the different variables



were tabulated, summarized and represented in frequency distribution tables, proceeding to the statistical analysis, comparing the results of the "anemic pregnant women" and the "non-anemic pregnant women", determining the Odds Ratio (OR) for the variables raised in our study, as well as the limits of the 95% confidence interval (CI) and its statistical significance (value p).

**Ethical aspects**

This research complied with all the ethical precepts of the Declaration of Helsinki. Patient data was kept in the strictest confidence.

**RESULTS**

Table 1 shows the general characteristics of the group distribution (categorized as anemic and non-anemic pregnant women). The group of cases with 72 pregnant women corresponds to 33.64% of the total sample, while the group of controls has 142 pregnant women (66.36%). With respect to gestational age, the mean gestational age of anemic pregnant women ( $38.46 \pm 1.1$  weeks) is higher than the mean age of non-anemic pregnant women ( $37.75 \pm 2.5$  weeks), being that the difference between both groups is statistically significant ( $p = 0.025$ ). The mean in the group of anemic pregnant women was  $10.4 \pm 0.7$  g / dl regarding the serum hemoglobin level. In comparison, in the group of non-anemic pregnant women, it was  $12.5 \pm 0.9$  g / dl, being this difference was statistically significant ( $p < 0.001$ ). There was no significant difference in terms of the history of abortion, adequate prenatal check-ups, and nulliparity.

In Table 2, it is observed that, in the group of anemic and non-anemic pregnant women, the marital status of cohabiting predominated (44.4% and 38.7%, respectively); in the marital status of single and cohabiting, anemic pregnant women predominated (31.9% and 4.4%, respectively), while in the marital status of married women predominated in non-anemic pregnant women. (36.6%). However, there was no statistically significant difference between the two groups ( $p = 0.259$ ).

In Table 3, shows that in the group of non-anemic pregnant women, a slight predominance of cesarean delivery compared to anemic pregnant women (69.7% vs. 68.1%). Pregnant Anemic women show a slight predominance of vaginal delivery compared to non-anemic pregnant women (31.9% vs. 30.3%). However, there was no statistically significant difference between both groups ( $p = 0.803$ ).

Table 4 shows the distribution of anemic and non-anemic pregnant women with maternal age at risk according to the diagnosis of low birth weight, which was present in 72.5% of anemia cases. Through statistical analysis using the chi-square test, it was found that anemic pregnant women are associated with a 6,476 times greater risk of their babies having low birth weight (95% CI: 2,410 to 17,403), compared to the control group ( $p < 0.001$ ).

In the analysis according to the degree of anemia, it was observed that pregnant women with mild anemia are associated with a 9,240 times higher risk that their babies have low birth weight (95% CI: 3.407 to 25.061), compared to the control group ( $p < 0.001$ ). On the other hand, the moderate and severe degree of anemia did not show an association with low birth weight.

Table 5 shows the distribution of anemic and non-anemic adolescent pregnant women according to the diagnosis of low birth weight, which was 100% of anemia cases. Through statistical analysis using the chi-square test, no association was found that anemic pregnant adolescents have the risk of presenting low-birth-weight babies compared to the control group ( $p = 0.056$ ).

Table 6 shows the distribution of anemic and non-anemic elderly pregnant women according to the diagnosis of low birth weight, which was present in 66.7% of anemia cases. Through statistical analysis using the chi-square test, it was found that anemic elderly pregnant women are associated with 6,324 times greater risk of their products having low birth weight

(95% CI: 2,219 to 18,026), compared to the group control ( $p < 0.001$ ).

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**Table 1.** General characteristics of the sample by groups of anemic and non-anemic.

General characteristics	Distribution of the sample (N = 214)		
	Anemic pregnant woman (N <sub>1</sub> =72)	Pregnant woman not anemic (N <sub>2</sub> =142)	value p-
Gestational age (mean in weeks)	38.46 ± 1.1	37.75 ± 2.5	0.025*
Hemoglobin level (mean serum hemoglobin in g / dl)	10.4 ± 0.7	12.5 ± 0.9	<0.001*
History of abortion	26 (36.1%)	112 (40.8%)	0.046
Adequate NPC (≥6)	40 (55.6%)	96 (67.6%)	0.084
Nulliparity	28 (38.9%)	25 (26.1%)	0.054

Source: Own elaboration. Data collection sheet

**Table 2.** General characteristics of the sample by groups of anemic and non-anemic pregnant women.

Marital status	Anemia			value p-
	Anemic	Non-anemic	Total	
Single	23 (31.9%)	33 (23.2%)	56 (26.2%)	0.259
Cohabiting	32 (44.4%)	55 (38.7%)	87 (40.7%)	
Married	17 (23.6%)	52 (36.6%)	69 (32.2%)	
Separated	0 (0.0%)	1 (0.7%)	1 (0.5%)	
Widow	0 (0.0%)	1 (0.7%)	1 (0.5%)	
<b>Total</b>	72 (100.0%)	142 (100.0%)	214 (100.0%)	

Source: Own elaboration. Data collection sheet.

**Table 3.** General characteristics of the sample by groups of anemic and non-anemic.

Delivery route	Anemia			value p-
	Anemic pregnant women	Non-anemic pregnant women	Total	
Cesarean birth	49 (68.1%)	99 (69.7%)	148 (69.2%)	0.803
Vaginal delivery	23 (31.9%)	43 (30.3%)	66 (30.8%)	
<b>Total</b>	100.0%	100.0%	100.0%	

Source: self made. Data collection sheet.

**Table 4.** Relationship between anemia and low birth weight in pregnant women with high-risk maternal age.

Anemia	Low birth weight		OR	CI (95%)	p-value
	Present	Absent			
Anemicwomen	16 (72.7%)	56 (29.2%)			<0.001
Mild anemia	16 (27.6%)	43 (22.4%)	9.240	3.407 - 25.061	<0.001
Moderate anemia	0 (0.0%)	13 (6.8%)	-	-	0.208
Severe anemia	0 (0.0%)	0 (0.0%)			
Non-anemic pregnant women	6 (27.3%)	136 (70.8%)			
<b>Total</b>	22 (100.0%)	192 (100.0%)			

Source: Own elaboration. Data collection sheet

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**Table 5.** Relationship between anemia and low birth weight in adolescent pregnant women.

	Low birth weight		OR	CI (95%)	p-value
	Present	Absent			
Anemic women	4 (100%)	19 (50.0%)	-	-	0.056
Non-anemic women	0 (0.0%)	19 (50.0%)			
<b>Total</b>	<b>4 (100.0%)</b>	<b>38 (100.0%)</b>			

**Table 6.** Ratio of anemia and low birth weight in elderly pregnant women.

	Low birth weight		OR	CI (95%)	p-value
	Present	Absent			
Anemic pregnant women	12 (66.7%)	37 (24.0%)	6.324	2.219 - 18.026	<0.001
Non-anemic pregnant women	6 (33.3%)	117 (76.0%)			
<b>Total</b>	<b>18 (100.0%)</b>	<b>154 (100.0%)</b>			

## DISCUSSION

The present study was carried out at the Hospital Guillermo Almenara Irigoyen National in Lima. It is a complex hospital that serves as a national reference, with an exclusive service for high-risk pregnant women, which can shed some light on our country's problems, since the pregnant women come from various regions of Peru.

Regarding the gestational age at the end of pregnancy, it was observed that the mean gestational age of anemic pregnant women ( $38.46 \pm 1.1$  weeks) is higher than the mean of non-anemic pregnant women ( $37.75 \pm 2.5$  weeks), the difference between both groups being statistically significant ( $p = 0.025$ ).

Results that differ from the study by Urdaneta et al.<sup>(11)</sup>, where the mean of anemic and non-anemic pregnant women were similar (38.4 weeks), so no statistically significant difference was found ( $p=1,000$ ). Our results show that anemic pregnant women have a higher gestational age at the end of pregnancy than non-anemic pregnant women, a fact that does not contrast with that found by Villegas<sup>(12)</sup>, where there is an association between anemia in third-trimester pregnant women and pre-term delivery with a probability ratio (OR) of 2.03 (95% CI: 1.30 to 3.17;  $p = 0.002$ ). Our results are probably influenced by the lower frequency of preterm deliveries in our study.

Regarding the serum hemoglobin level, the mean in the group of anemic pregnant women was

$10.4 \pm 0.7$  g/dl, while in the group of non-anemic pregnant women, it was  $12.5 \pm 0.9$  g / dl, this being a statistically significant difference ( $p < 0.001$ ). According to Urdaneta et al.<sup>(11)</sup>, hemoglobin values in anemic pregnant women was  $8.4 \pm 1$  g/dl and in pregnant women without anemia it was  $11.6 \pm 0.6$  g / dl ( $p < 0.001$ ). Average hemoglobin level data lower than that observed in our study. This suggests that the pregnant women included in our study probably have better control of their serum hemoglobin levels than other populations. The pregnant women who attend HNGAI generally come from economically stable families, so it can be thought that they receive adequate diets and supplements, causing hemoglobin during pregnancy, rarely to reach a considerable magnitude to generate symptoms<sup>(13)</sup>.

There were no significant differences regarding the route of delivery, history of abortion, nulliparity, marital status, and adequate prenatal controls. Regarding this last point, in the study by Soto<sup>(14)</sup>, it was observed that pregnant women with inadequate prenatal controls prevailed in the group of anemic pregnant women (64.9% vs. 2.6%), while in the group of pregnant women with adequate prenatal controls, the group of non-anemic pregnant women prevails (18.4% vs. 14%), this difference being statistically significant ( $p < 0.001$ ). These findings differ from what was found in our study. Although it is true, the pregnant women with adequate prenatal controls predominated in the group of non-anemic pregnant women, in contrast to the anemic group; however,

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this difference was not statistically significant ( $p = 0.084$ ).

It was found that anemic pregnant women are associated with 6,476 times greater risk of their baby having low birth weight (95% CI: 2,410 to 17,403), compared to the control group ( $p < 0.001$ ). An investigation carried out in Cuba found that mothers who present anemia during their pregnancy have a 3.6 times higher risk of having children with low birth weight than women who did not present it, and they also affirm that maternal anemia favors the simultaneous presence of anemia in the newborn, values that do not exceed the result found in our study<sup>(13)</sup>.

Urdaneta et al.<sup>(11)</sup>, determined that the weight of the newborn in anemic mothers was decreased by 12.39% (420 grams approx.) When compared with the weights of the neonates of mothers without anemia, also demonstrated a directly proportional and significant relationship between birth weight and hemoglobin values, however, anemic pregnant women presented higher birth weight. This difference was not significant. The same happens with the study by Tapia<sup>(15)</sup>, which concludes that maternal anemia during pregnancy was not a condition for low birth weight in the patients studied, and these results differ from our study. Due to the findings in our study, it should be taken into account that during third trimester hemoglobin is an important factor in determining birth weight because this trimester produces rapid fetal growth and storage rates of iron and other micronutrients are the highest<sup>(16)</sup>.

No association was found between anemic adolescent pregnant women, with the risk of presenting low birth weight compared to the control group ( $p = 0.056$ ). Results that are similar to those found by Zamudio<sup>(17)</sup>, where he states that there is no relationship between anemia in pregnant adolescents and newborn weight ( $p > 0.05$ ). In contrast, according to the study by Cisneros<sup>(18)</sup>, it concludes that there is a statistically significant relationship between anemia in pregnant adolescents and the weight of the newborn ( $p < 0.05$ ). In addition, according to the study by Cárdenas<sup>(19)</sup>, it concludes that anemia in pregnant women under 20 years of age is associated with low birth weight. However, this may not be the main risk factor in this age group. The results found in our study are to be expected, since there is less admission of adolescent

pregnant women to our service than other centers, so the data presented could not be definitive.

It was found that anemic elderly pregnant women are associated with 6,324 times higher risk of their products having low birth weight (95% CI: 2,219 to 18,026), compared to the control group ( $p < 0.001$ ). An exhaustive review has been carried out to search for related study. One indirectly related study was found, by Munares et al.<sup>(20)</sup> where elderly pregnant women treated in the facilities of the Ministry of Health of Peru, from 2009 to 2012, found that the frequency of anemia in 35-year-old pregnant women was 26.6% and higher in the third trimester (30.2%), concluding that maternal age and gestational age are inversely related to the hemoglobin level. As a result, we concluded in our study that at older maternal age, there were lower hemoglobin levels, and by the studies described above, lower maternal hemoglobin levels show more risk of low birth weight.

Within the limitations of the study, it is found that a multivariate analysis was not performed, which could limit the analysis of confounders; however, as it is a relevant topic in public health, the study presents an important contribution.

## CONCLUSION

In anemic pregnant women, nulliparity and vaginal delivery were found more frequently, and a history of abortion and adequate prenatal control was found less frequently. Cohabiting marital status predominated in both groups. Adolescent pregnant women with anemia were not associated with a higher risk of low birth weight at the Hospital Guillermo Almenara Irigoyen National in Lima. Elderly pregnant women with anemia were associated with 6 times higher risk of low birth weight, at the Hospital Guillermo Almenara Irigoyen National in Lima.

It is recommended to implement differentiated care at the Hospital Guillermo Almenara Irigoyen National to pregnant women of high-risk maternal age, especially in the group of elderly pregnant women. To implement strategies for the early detection of anemia and timely treatment of it, give counseling in a varied diet rich in iron; in turn, we recommend carrying out new related projects in other centers to establish the association found in this study.



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**Correspondence:** Jose L. Villalva Luna

**Address:** Urb. Bacigalupo. Calle Ticaco L-5. Tacna

**Telephone number:** 953277753

**E-mail:** Joselo.villa.luna@gmail.com

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