



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

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## ABSTRACT

**Objective:** To determine the association between anemia in pregnant women with maternal age at risk and low birth weight. **Methods:** A non-experimental, retrospective, cross-sectional, analytical, case-control study was carried out. In the period from October to December 2019, a total of 312 pregnant women with maternal age at risk (adolescent and elderly pregnant women) were registered, of which 72 were anemic (Hb <11 g / dl), this being the number of cases, and to improve the statistical power, the relationship between cases and controls was established as 1: 2, with the number of controls or non-anemic pregnant women with maternal age at risk 142. General characteristics were analyzed by a group of anemic pregnant women and not anemic, and its association with maternal age at risk. The association of anemia in adolescent and elderly pregnant women with low birth weight was determined using the Chi-square test and Odds ratio. **Results:** Among the variables studied, anemic pregnant women had a higher frequency of nulliparity and vaginal delivery, and a lower frequency of a history of abortion and adequate prenatal control. Adolescent pregnant women with anemia were not associated with a higher risk of low birth weight ( $p = 0.056$ ). Elderly pregnant women with anemia were associated with 6 times higher 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 low birth weight products.

**Key words:** Anemia in adolescent pregnant women; Anemia in elderly pregnant women; Low birth weight (source: MeSH NLM).

## RESUMEN

**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%: 2,22 a 18,03;  $p=0,000$ ). **Conclusión:** Las gestantes añosas tienen mayor riesgo de presentar productos con bajo peso al nacer.

**Palabras clave:** Anemia en gestante adolescente; Anemia en gestante añosa; Bajo peso al nacer (fuente: DeCS BIREME).

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**Cite as:** Jose L. Villalva-Luna, Jhonattan J. Villena-Prado. Relationship between pregnant women with anemia in maternal age at risk and low birth weight in a hospital of social security of the Peru. Rev. Fac. Med. Hum. October 2020; 20(4):581-588. DOI 10.25176/RFMH.v20i4.3192

## INTRODUCTION

The World Health Organization (WHO) has defined anemia in pregnancy as serum hemoglobin  $<11$  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 is decreased 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 the final outcome of maternal hemoglobin, leading to alterations in fetal growth, such as low birth weight and pre-term delivery<sup>(2-6)</sup>.

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

Regarding the maternal age at risk, made up of elderly pregnant women, according to FIGO  $\geq 35$  years of age<sup>(2)</sup>, and pregnant adolescent. The age of pregnant adolescents is important because they are associated with perinatal pathologies such as growth restriction intrauterine, prematurity and low birth weight<sup>(8,9)</sup>.

To allow the economic and social progress of our country, the Peruvian Government 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 with maternal age at risk and low birth weight at the Guillermo Almenara Irigoyen National Hospital, for this analysis, it has been considered to take the main maternal variable as anemia status and low birth weight as a neonatal variable, even more so this 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 Guillermo Almenara Irigoyen National Hospital. The information was collected based on the laboratory history of the Hospital Management System and the

birth record book of the High-Risk Obstetrics Service in the period from October to December 2019. The data collected were: Maternal age at risk (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 product.

A total of 312 pregnant women with maternal age at risk (adolescents and old women) were registered, of which, 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, and to improve the statistical power, a case-control ratio of 1: 2 was used, requiring 144 controls, but the use of 142 controls was spared. not anemic.

The following inclusion and exclusion criteria are taken according to groups of cases and controls.

### Group of cases

**Inclusion criteria:** Anemic pregnant women with maternal age at risk who have completed their pregnancy in the period from October to December 2019 at the Hospital National Guillermo Almenara Irigoyen in Lima.

### Exclusion criteria:

1. Patients with multiple gestations and/or use of assisted reproductive techniques.
2. Patients with a history of chronic diseases: pre-gestational diabetes mellitus, chronic arterial hypertension, morbid obesity (BMI  $> 40$ ), chronic kidney disease, infection by the acquired immunodeficiency virus, heart disease, or lung disease.
3. Patients with an incomplete history.

### Control group

**Inclusion criteria:** Non-anemic pregnant women with maternal age at risk who have completed their pregnancy in the period from October to December 2019 at the Guillermo Almenara Irigoyen National Hospital in Lima.

### Exclusion criteria:

1. Patients with multiple gestations and/or use of assisted reproductive techniques.
2. Patients with a history of chronic diseases: pre-gestational diabetes mellitus, chronic arterial



hypertension, morbid obesity (BMI > 40), chronic kidney disease, infection by the acquired immunodeficiency virus, heart disease, or lung disease.

3. Patients with an incomplete history.

**Statistical analysis**

The information obtained was recorded in Excel tables and transferred to a database of the SPSS version 25.0 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 (p-value). For this analysis, it

was considered to take the main maternal variable as the state of anemia and as a neonatal variable low birth weight, even more so this variable because it is an important cause of perinatal morbidity and mortality. The respective institutional permissions were obtained to obtain the file information and the identity of the people was respected at all times.

**RESULTS**

At the Guillermo Almenara Irigoyen National Hospital in Lima, during the period from October to December 2019, approximately 312 childbirth care was performed by pregnant women with maternal age at risk, of which 72 care corresponded to anemic pregnant women. For the study, all anemic pregnant women were taken as a group of cases, after which the selection criteria were applied, obtaining a final sample of 72 cases and 142 controls.

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

General characteristics	Sample distribution (N = 214)				p-value
	Anemic pregnant woman (N <sub>1</sub> = 72)		Non-anemic pregnant woman (N <sub>2</sub> = 142)		
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		0.000*
History of abortion	26	36.1%	112	40.8%	0.456
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.

In table1, the general characteristics of the group distribution are observed (categorized as anemic and nonanemic pregnant). 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%). Concerning gestational age, the mean gestational age of anemic pregnant women (38.46 ± 1.1 weeks) is higher than the mean age of non-anemic pregnant women (37.75 ± 2.5

weeks), being the difference between both groups statistically significant (p = 0.025). Regarding the serum hemoglobin level, the mean in the group of anemic pregnant women was 10.4 ± 0.7 g / dl, while in the group of non-anemic pregnant women it was 12.5 ± 0.9 g / dl, being this statistically significant difference (p = 0.000). There was no significant difference in terms of the history of abortion, adequate prenatal check-ups, and nulliparity.

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

			Anemia		
			Anemic	Non-anemic	Total
Marital status	Single	Count	23	33	56
		%	31.9%	23.2%	26.2%
	Cohabitant	Count	32	55	87
		%	44.4%	38.7%	40.7%
	Married	Count	17	52	69
		%	23.6%	36.6%	32.2%
	Separate	Count	0	1	1
		%	0.0%	0.7%	0.5%
	Widow	Count	0	1	1
		%	0.0%	0.7%	0.5%
Total		Count	72	142	214
		%	100.0%	100.0%	100.0%
		p-value			0.259

**Source:** Own elaboration. Data collection sheet.

In table 2, it is observed that, in the group of anemic and non-anemic pregnant women, the marital status of cohabitation 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 ( $p = 0.259$ ).

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

			Anemia		
			Anemic	Non-anemic	Total
Route of delivery	Cesarean delivery	Count	49	99	148
		%	68.1%	69.7%	69.2%
	Vaginal delivery	Count	23	43	66
		%	31.9%	30.3%	30.8%
		Count	72	142	214
		%	100.0%	100.0%	100.0%
		p-value			0.803

**Source:** Own elaboration. Data collection sheet.



In Table 3, it is observed 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%), while anemic pregnant women were observed slightly predominance of

vaginal delivery in contrast 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.** Relationship between anemia and low birth weight in pregnant women with maternal age at risk.

			Low birth weight		OR	CI (95%)		p-value
			Present	Absent				
Anemia	Anemic Pregnant women	Count	16	56	6.5	2.41	17.40	0.000
		%	72.7%	29.2%				
	Mild anemia	Count	16	43	9.2	3.41	25.06	0.000
		%	27.6%	22.4%				
Moderate anemia	Count	0	13	-	-	-	0.208	
	%	0.0%	6.8%					
Severe anemia	Count	0	0	-	-	-	-	
	%	0.0%	0.0%					
Non-anemic pregnant women	Count	6	136					
	%	27.3%	70.8%					
<b>Total</b>	Count	22	192					
	%	100.0%	100.0%					

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**Source:** Own elaboration. Data collection sheet.

In Table 4, the distribution of anemic and nonanemic pregnant with maternal age at risk is shown by a diagnosis of low birth weight to the, which was present in 72.5% of cases of anemia. 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 products having low birth weight (95% CI: 2,410 to 17,403), compared to the control group ( $p = 0.000$ ). 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 greater risk that their products have low birth weight (95% CI: 3.407 to 25.061), compared to the control group ( $p = 0.000$ ). On the other hand, the moderate and severe degree of anemia did not show an association with low birth weight.

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

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

**Source:** Own elaboration. Data collection sheet.



In Table 5, the distribution of anemic and nonanemic pregnant adolescents shown by a diagnosis of low birth weight to the, which was in 100% of cases of anemia. Through statistical analysis using the chi-

square test, no association was found that anemic pregnant adolescents have the risk of presenting low-birth-weight products compared to the control group ( $p = 0.056$ ).

**Table 6.** Relationship between anemia and low birth weight in elderly pregnant women.

			Low birth weight		OR	CI (95%)	p-value	
			Present	Absent				
Anemia	Gestantes anemic	Count	12	37	6.3	2.21	18.03	0.000
		%	66.7%	24.0%				
	Non-pregnant women anemic	Count	6	117				
		%	33.3%	76.0%				
Total		Count	18	154				
		%	100.0%	100.0%				

Source: Own elaboration. Data collection sheet.

In Table 4, the distribution of anemic and nonanemic pregnant añosas shown by a diagnosis of low birth weight to the, which was present in 66.7% of cases of anemia. 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 ( $p = 0.000$ ).

## DISCUSSION

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

Table No. 1 - A, B, C. The general characteristics of the distribution of groups (categorized as anemic and non-anemic pregnant women) were observed. 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 was 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 ( $p = 0.000$ ). According to Urdaneta et al.<sup>(11)</sup>, hemoglobin values in anemic pregnant women were  $8.4 \pm 1$  g / dl and in pregnant women, without anemia, it was  $11.6 \pm 0.6$  g / dl ( $p = 0.000$ ). 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, since the pregnant women who attend HNGAI generally They 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 ( $p = 0.000$ ), 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, this difference was not statistically significant ( $p = 0.084$ ).

In Table 2, it was found that anemic pregnant women are associated with 6,476 times greater risk of their products having low birth weight (95% CI: 2,410 to 17,403), compared to the control group ( $p = 0.000$ ). 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, however, 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 the presence of low birth weight in the patients studied, apparently, results that differ from our study. Due to the findings in our study, it should be taken into account that 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 they are the highest<sup>(16)</sup>.

In Table 3, 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 ( $p < 0.05$ ). Also, 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.

In Table 4, it was found that anemic elderly pregnant women are associated with a 6,324 times greater risk that their products have low birth weight (95% CI: 2,219 to 18,026), compared to the control group ( $p = 0.000$ ). An exhaustive review has been carried out to search for related jobs, only one indirectly related job was found, such as the study by Munares et al, elderly<sup>(20)</sup> where pregnant women treated in the facilities of the Ministry of Health of Peru, during the period from 2009 to 2012, finding 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 they are inversely related to the hemoglobin level. This can then be translated into the higher the maternal age, the lower the hemoglobin levels and, due to the studies described above, the lower the maternal hemoglobin level, the higher the risk of low birth weight, a result that we concluded in our study.

## 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 National Guillermo Almenara Irigoyen in Lima ( $p = 0.056$ ).

Elderly pregnant women with anemia were associated with 6 times higher risk of low birth weight, at the Guillermo Almenara Irigoyen National Hospital in Lima (95% CI: 2.219 to 18.026;  $p = 0.000$ ).

**Recommendations:** Implement at the Guillermo Almenara Irgoyen National Hospital differentiated care to pregnant women with maternal age at risk, 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.

**Author's contributions:** The authors participated in the genesis of the idea, project design, development, collection and interpretation of data, analysis of results, and preparation of the manuscript.

**Financing:** Self-financed.

**Conflict of interest:** The authors declare no conflicts of interest in the publication of this article.

**Received:** April 26, 2020

**Approved:** August 06, 2020

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## BIBLIOGRAPHIC REFERENCES

1. Organización Mundial de la Salud [Internet]. Concentraciones de hemoglobina para diagnosticar la anemia y evaluar su gravedad. Ginebra: OMS; 2011 [citado 28 feb 2020]. Disponible en: [http://www.who.int/vmnis/indicators/haemoglob\\_in\\_es.pdf](http://www.who.int/vmnis/indicators/haemoglob_in_es.pdf)
2. Baranda B.M. Edad materna avanzada y morbilidad obstétrica. Evidencia Médica e Investigación en Salud. 2014; 7(3): 110-113
3. Corres Molina M. Morbilidad materno-fetal en adolescentes: Experiencia en un hospital suburbano de México. Centro Medico ABC. 2013; 58(2): 175-179
4. Ernst D. Recomendaciones para el diagnóstico y manejo de la anemia por déficit de hierro en la mujer embarazada. ARS Medica Revista de Ciencias Médicas. 2017; 42(1): 61-67
5. Figueiredo A. Maternal Anemia and Low Birth Weight: A Systematic Review and Meta-Analysis. Nutrients 2018, 10, 601; doi: 10.3390/nu10050601
6. Shoboo Rahman B. Maternal Anemia during pregnancy and infant low birth weight: A systematic review and Meta-analysis. Int J Reprod Bio Med. 2017; 15(3):125-134
7. United Nations Children's Fund and World Health Organization, Low Birthweight: Country, regional and global estimates. UNICEF, New York, 2004.
8. Ríos I, Vera R. Morbi-Mortalidad en adolescentes embarazadas atendidas en el Hospital "Victor Lazarte Echegaray". IV. EsSalud. Trujillo. 01 enero-2013 al 31 diciembre-2014. Rev Cienc Tecnol. 2016; 11(4): 53-72.
9. Baranda-Najera N y cols. Edad materna avanzada y morbilidad obstétrica. Evid Med Invest Salud 2014; 7(3): 110-113.
10. Documento Técnico – Plan Nacional para la Reducción y Control de la Anemia Materno Infantil y la Desnutrición Crónica Infantil en el Perú: 2017 – 2021. Depósito Legal en la Biblioteca Nacional del Perú N° 2017 - 1ra. Edición. MINISTERIO DE SALUD DEL PERU
11. Urdaneta Machado J.R. Anemia materna y peso al nacer en productos de embarazos a término. REV CHIL OBSTET GINECOL 2015; 80(4): 297 – 305
12. Villegas García RD. Anemia como factor de riesgo de parto pretermino en gestantes del tercer trimestre del servicio de Gineco-Obstetricia del Hospital Nacional Carlos Lanfranco La Hoz durante el periodo 2016 [thesis]. Universidad San Juan Bautista, Facultad de Ciencias de la Salud, Escuela Profesional de Medicina Humana; 2017 [citado 28 feb 2020]. Disponible en: <http://repositorio.upsjb.edu.pe/bitstream/handle/upsjb/925/T-TPMC-%20Roberth%20Danjelo%20%20Villegas%20Garcia.pdf?sequence=3&isAllowed=y>
13. Santillán AG, Amaya A. Prevalencia de bajo peso al nacer en niños de mujeres jóvenes y anémicas atendidas en el Hospital Pablo Arturo Suárez. Rev Fac Cien Med [Internet]. 2011 [citado 18 Sep 2017];36(1):61-62.
14. Soto Ramirez JS. Factores asociados a anemia en gestantes hospitalizadas en el servicio de gineco-obstetricia del Hospital San Jose Callao – Lima 2016. [thesis]. Universidad Ricardo Palma, Facultad de Medicina Humana; 2018 [citado 28 feb 2020]. Disponible en: <http://repositorio.urp.edu.pe/bitstream/handle/URP/1256/161%20SOTO%20RAMIREZ.pdf?sequence=1&isAllowed=y>
15. Miranda Tapia A.M. Anemia en Gestantes y Peso del Recién Nacido. Hospital Nacional Arzobispo Loayza 2014. Facultad de Medicina Humana Universidad San Martin de Porres. Lima. 2015
16. Wong Montoya EB, Salcedo Espejo EY. Anemia en el tercer trimestre de gestación como factor de riesgo de bajo peso al nacer en recién nacidos a término. Acta Méd Orreguiana Hampi Runa [Internet]. 2016 [citado 28 Feb 2020];16(1):33-59.
17. Camarena Zamudio O, Guerra Condor RS. Relacion entre anemia en gestantes adolescentes con el peso del recién nacido en el Hospital Departamental de Huancavelica durante el año 2015. [thesis]. Universidad Nacional del Centro del Peru, Facultad de Medicina Humana; 2016 [citado 28 feb 2020]. Disponible en: [http://repositorio.uncp.edu.pe/bitstream/handle/UNCP/451/TMH\\_13.pdf?sequence=1&isAllowed=y](http://repositorio.uncp.edu.pe/bitstream/handle/UNCP/451/TMH_13.pdf?sequence=1&isAllowed=y)
18. Solidoro Cisneros F.A. Relación entre Anemia en Gestantes Adolescentes con el Peso del Recién Nacido en el Hospital Nacional Arzobispo Loayza enero a junio 2015. Facultad de Medicina Humana Universidad San Martin de Porres. Lima. 2015
19. Icaza Cardenas. J.F. Anemia en embarazadas menores de 20 años y su relación con el bajo peso del recién nacido; hospital materno infantil Mariana de Jesús, segundo semestre de 2012. Rev. Med. FCM-UCSG, Año XX. 2014; 18(3): 145-148
20. Munares O, et al. Niveles de hemoglobina en gestantes atendidas en establecimientos del Ministerio de Salud del Perú, 2011. Rev Peru Med Exp Salud Publica Peru 2012; 29(3): 326-336