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Epidemiological and clinical characteristics in pregnant women diagnosed with SARS-CoV-2 in a hospital in northern Peru

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Abstract. Introduction: SARS-CoV-2 is affecting the world population, not exempting the obstetric population, who, due to their health vulnerability in Peru, deserve special attention. *Objective: To* determine the epidemiological and clinical characteristics of pregnant women diagnosed with SARS-CoV-2. *Materials and methods:* Descriptive, retrospective, cross-sectional study with a sample of 244 pregnant women hospitalized during the year 2020; a data collection form was applied. *Results:* mean age of the pregnant women was 24 years, 72.4% were cohabitants, and 40% had some degree of high school education; 74.6% were from the province of Cajamarca and 95.5% had SIS insurance. Sixty-four percent were multigestational; 85.7% had prenatal control and52% had a Body Mass Index greater than 29. A total of 37.3% presented complications during pregnancy, predominantly premature rupture of membranes (15.2%), premature delivery (7.4%), hypertensive disorder (5.3%), threatened abortion (4.5%) and others. As for the serologic test, 87.7% were IgG IgM and 12% IgM. A total of 33.6% presented symptoms; 74.6% had vaginal delivery; 18% ended in cesarean section; 4.1% did not end in institutional delivery and 3.3% of the pregnant women ended in abortion. Of all the pregnant women investigated, one died (0.41%). *Conclusion:* Most of the pregnant women presented an IgG IgM serologic result; the most frequent obstetric complications were premature rupture of membranes and preterm delivery.

Keywords: Epidemiological and clinical characteristics, pregnant women, SARS-CoV-2.

Introduction

The impact of SARS-CoV-2 has been visible in all areas, such as economic, social, and health, especially in Latin America and the Caribbean, increasing the number of cases worldwide. One of the most affected populations is pregnant women who, due to physiological changes, are susceptible to serious infection by SARS-CoV-2 (1) (2); they also face other vulnerability factors such as poverty, malnutrition and the low level of education in Peru (3), which further aggravate their condition.

It is essential to prioritize the investigation of SARS-CoV-2 in pregnant women since the complications generated by the disease can be avoided. There are reports such as a study from Spain, where 76 hospitals were evaluated with 16,308 screening tests, of which 338 asymptomatic pregnant women were positive (2.07%) (95% CI: 1.86-2.30); however, approximately one-third of pregnant women were symptomatic cases (4).

In Peru, the Ministry of Health reported 40,968 pregnant and puerperal women confirmed with SARS-CoV-2 by the end of 2020; increasing mortality by 45.7% for the same year, which is equivalent to 440 cases of maternal deaths, 81 of which culminated in maternal death with COVID-19 infection, translated into a rate of 14.1 per 100,000 live births (6). This is a commitment for the health sector to establish regulations and protocols for obstetric management of pregnant women diagnosed with SARS-CoV-2 to ensure quality care with minimal risk to protect the mother-child binomial.

The COVID Hospital was considered the Simón Bolívar Hospital in the Cajamarca region. All pregnant women and postpartum women confirmed with SARS-CoV-2 were admitted for delivery care or any complication; the first symptomatic pregnant woman confirmed with a SARS-CoV-2 diagnosis was reported on April 9, 2020. As of December 2020, the National Center for Epidemiology, Disease Control and Prevention reported that 2,445 pregnant and postpartum women had been infected with COVID-19, placing Cajamarca in fourth place nationally, and 3 of them died with a diagnosis of COVID-19 infection (6). The pandemic increased the risk of morbidity and

mortality in pregnant women and newborns, not only because of its uncertain behavior but also because it significantly affected care in health posts and health centers of the first and second levels of care.

In this sense, the purpose of the study was to know the epidemiological and clinical characteristics of pregnant women diagnosed with SARS-CoV-2 as a scientific contribution and updated information for health professionals responsible for conducting care protocols that contributed to the sustainable fight against the pandemic from primary care to specialized care and focused on vulnerable groups.

Materials and methods

The study design was descriptive, observational, and cross-sectional. The universe consisted of 2154 pregnant women confirmed with SARS-CoV-2 in the Cajamarca region (according to the regional nominal register); of which 338 pregnant women confirmed with COVID -19 and hospitalized at the Hospital Simón Bolívar II-E (Hospital Referential COVID- 19) during the year 2020 were considered as the study population. Of these, a sample of 244 pregnant women was selected who met the inclusion criteria such as: infected and hospitalized pregnant women diagnosed with SARS-CoV-2; with positive serological test results (IgM and IgG/IgM); medical records with complete information and having been discharged according to the protocol established by MINSA for COVID-19.

The researchers prepared the data collection instrument based on the epidemiological surveillance form to identify the study variables. For the analysis, the information was collected from the medical records and contrasted with information from the epidemiological surveillance system COVID-19, the regional nominal database of pregnant women COVID-19 and the National Death System (SINADEF). The IBM-SPSS v 26 application was used to process and analyze the information. For the descriptive data, frequency distribution and summary statistical measures such as percentages and averages were used; for the inferential analysis, confidence intervals and the Chi-square statistical test were used, with significance levels of 0.05 to establish the relationship between variables.

For the study, the ethical considerations and approval of the Ethics Committee of the Hospital Regional Docente de Cajamarca were taken into account.

Results

The present investigation included 244 pregnant women confirmed with SARS-CoV-2 by rapid test in addition to being hospitalized, who were included in the present analysis. It was found that 50% (CI: 43.68, 56.32) were young pregnant women with a mean age of 24 years; pregnancy at risk stages corresponded to 20.1% of elderly pregnant women (CI: 15.02, 25.14) with a mean age of 38 years and 9.8% (CI: 06.07, 13.60) were adolescents with a mean age of 16 years. Regarding marital status, 74.2% (CI: 68.65, 79.71) were cohabitants; 40% (CI: 34.37, 46.78) had some secondary education; 74.6% (CI: 69.09, 80.09) were from the province of Cajamarca; and 95.5% (92.87, 98.11) had comprehensive health insurance.

Regarding obstetric history, it was found that 64% (CI: 58.29, 70.40) were multigestational and 59% (CI: 53.22, 65.63) multiparous; 85.7% (CI: 81.23, 90.08) of the pregnant women had prenatal control; 52% (CI: 45.74, 58.36) had a body mass index (BMI) greater than 29. In addition, the parity variable was significantly associated with the diagnosis of SARS-CoV-2 (p=0.034).

Regarding comorbidities, 1% of asymptomatic pregnant women reported hypertension and obesity, respectively, and no cases were found in those who presented symptoms of SARS-CoV-2. Complications predominated in 37.3% of pregnant women (CI: 31.18, 43.41); of which 15.2% (CI: 10.63, 19.70) presented premature rupture of membranes; 7.4% (CI: 04.07, 10.68) preterm labor; 5.3% (CI: 02.49, 08.17) hypertensive disorder; 4.5% (CI: 01.89, 07.13) threatened miscarriage; 4.1% (CI: 01.59, 06.60) anemia and 3.7% (CI: 01.31, 06.07) threatened preterm labor.

Table 1. Epidemiological characteristics of pregnant women diagnosed with SARS-CoV-2.

Variables	Symptomatic n=82 (%)	Asymptomatic n=162 (%)	Total n=244 (100%)	CI: 95%.	p-value
Average maternal age	28				
Maternal Age					
≤17 years	9(3,7)	15(6,1)	24 (9,8)	(06,07; 13,60)	
18-29	40(16,4)	82(33,6)	122 (50,0)	(43,68; 56,32)	0,970
30-34 years	17(7,0)	32(13,1)	49 (20,1)	(15,02; 25,14)	
≥ 35	16(6,6)	33(13,5)	49 (20,1)	(15,02; 25,14)	
Marital Status					
Single	5(2,0)	14(5,7)	19 (7,8)	(04,61, 11,69)	
Cohabitant	61(25,0)	120(49,2)	181 (74,2)	(68,65, 79,71)	0,427

Married	10(4,1)	23(9,4)	33 (13,5)	(09,20; 17,85)	
Level of education					
None	3(1,3)	4(1,8)	7 (3,1)	(0,76; 04,98)	
Primary	28(12,3)	49(21,5)	77 (33,8)	(25,68 ;37,43)	0.712
Secondary	29(12,7)	70(30,7)	99 (43,4)	(34,37 ;46,78)	
Superior	14(6,1)	31(13,6)	45 (19,7)	(13,54 ;23,34)	
Source					
Province of Cajamarca	63(26,0)	119(49,2)	182(75,2)	(69,09; 80,09)	0,511
Other Provinces	18(7,4)	42(17,4)	60(24,8)	(19,15; 30,03)	
Occupation					
Housewife	70(32,0)	139(63,5)	209(95,4)	(81,23; 90,08)	0,573
Others	2(0,9)	8(3,7)	10(4,6)	(4,10; 1,59)	
Type of Insurance					
SIS	79(33,5)	154(65,3)	233(98,7)	(92,87; 98,11)	0,983
ESSALUD	1(0,4)	2(0,8)	3(1,3)	(0,00; 2,62)	
Obstetric History					
Gestation					
Primigesta	23(9,4)	64(26,2)	87(35,7)	(29,60; 41,71)	0,78
Multigesta	59(24,2)	98(40,2)	157(64,3)	(58,29; 70,40)	
Parity					
Nulliparous	4(1,6)	3(1,2)	7(2,9)	(00,76; 04,98)	
Primiparous	22(9,0)	63(25,8)	85(34,8)	(28,82; 40,86)	
Multiparous	51(20,9)	94(38,5)	145(59,4)	(53,22; 65,63)	**0,034**
Abortion	5(2,0)	2(0,8)	7(2,9)	(00,76; 04,98)	
Prenatal Care					
YES	70 (29,7%)	139 (58,9%)	209 (88,6%)	(81,23; 90,08)	
NO	10(4,2)	17(7,2)	27 (11,4%)	(7,10; 15,030)	0,714
Body Mass Index (BMI)					
Lower 19.8	2(0,8)	1(0,4)	3(1,3)	(0,00; 02,62)	
19,8 a 26	12(5,0)	31(13,0)	43(18,0)	(12,8; 22,44)	0,217
26 a 29	27(11,3)	39(16,3)	66(27,6)	(21,44; 32,66)	
Major 29	38(15,9)	89(37,2)	127(53,1)	(45,74; 58,36)	
Comorbidities					
Hypertension	-	1(0,6)	1(0,4)	(0,0; 1,19)	0,312
Obesity	-	1(0,6)	1(0,4)	(0,0; 1,19)	
Gestation complications	31(12,7)	60(24,6)	91(37,3)	(31,18; 43,41)	
Premature rupture of membranes	14(5,7)	23(9,4)	37(15,2)	(10,63; 19,70)	
Premature delivery	11(4,5)	7(2,9)	18(7,4)	(03,75; 10,18)	
Hypertensive disorder	3(1,2)	10(4,1)	13(5,3)	(02,49; 08,17)	
Abortion	3(1,2)	9(3,7)	12(4,9)	(02,19; 07,65)	
Anemia	2(0,8)	8(3,3)	10(4,1)	(01,59; 06,60)	0,907
Threat of premature delivery	1(0,4)	8(3,3)	9(3,7)	(01,31; 06,07)	
Óbito	-	1(0,4)	1(0,4)	(0,0; 1,19)	
Oligohydramnios	2(0,8)	1(0,4)	3(1,2)	(0,0; 2,56)	
Fetal distress	-	1(0,4)	1(0,4)	(0,0; 1,19)	
RCIU	2(0,8)	3(1,2)	5(2,0)	(0,0; 3,75)	
Hyperemesis gravidarum	-	1(0,4)	1(0,4)	(0,0; 1,19)	
Hemorrhage	-	1(0,4)	1(0,4)	(0,0; 1,22)	

Regarding the clinical characteristics, 93.9% of confirmed cases corresponded to pregnant women in the third trimester; they found that most positive pregnant women were in the first trimester (66.6%). Regarding the cases confirmed with SARS-Cov-2 by serological test, 87.7% (CI: 83.56, 91.85) had IgG / IgM and 12.3% (CI: 08.15, 16.44) only IgM. Regarding the days of hospital stay of the pregnant women, it was found that 81.1% remained hospitalized between 1 and 2 days with an average of 1 day; in addition, regarding the symptoms of COVID-19 present in the pregnant women, 33.6% (CI: 27.64;39.58) presented some type of symptomatology, of which the highest percentage reported was: general malaise with 18.4% (CI: 13.54;23.34); cough 11.9% (CI: 07.80;15.97) and 10.2% presented sore throat (CI: 06.41;14.08).

Vital signs were the first record on admission to the hospital; it was found that 91% (CI: 87.36-94.60) showed blood pressure of 90/50 mm Hg to 135/72 mm Hg; as for the respiratory rate of 86% (CI: 81.69, 90.44) registered between 16 to 20 breaths per minute; and in oxygen saturation and the presence of symptomatology or not in the pregnant women, a relationship was found (p=0.005) with a mean of 95% (without O2 flow); a higher percentage of asymptomatic patients was also found in those with SaO2 between 96% and 98% who did not show symptoms.

Table 2. Clinical characteristics of SARS-CoV-2 in pregnant women.

Diagnosis COVID-19	**Symptomatic n=82 (%)**	**Asymptomatic n=162 (%)**	**Total n=244(100%)**	**CI: 95%.**	**p-value**
Quarter tested					
I Quarter	1(0,4)	5(2,0)	6(2,5)	(00,50; 04,42)	
II Quarter	4(1,6)	5(2,0)	9(3,7)	(01,31; 06,07)	0,536
III Quarter	77(31,6)	152(62,3)	229(93,9)	(90,82; 96,89)	
Test Result					
IgM	13(5,3)	17(7,0)	30(12,3)	(08, 15; 16,44)	0,228
IgG IgM	69(28,3)	145(59,4)	214(87,7)	(83,56; 91,85)	
Symptoms			82(33,6)	(27,64 ;39,58)	
General malaise.	45(18,4)	-	45(18,4)	(13,54 ;23,34)	
Cough	29(11,9)	-	29(11,9)	(07,80 ;15,97)	
Sore throat	25(10,2)	-	25(10,2)	(06,41 ;14,08)	
Headache	20(8,2)	-	20(8,2)	(04,73 ;11,66)	
Dyspnea	16(6,6)	-	16(6,6)	(03,43 ;09,69)	
Fever	15(6,1)	-	15(6,1)	(03,11 ;09,18)	
Nasal congestion	12(4,9)	-	12(4,9)	(02,19 ;07,65)	
Diarrhea	7(2,9)	-	7(2,9)	(00,76 ;04,98)	
Nausea	6(2,5)	-	6(2,5)	(00,50 ;04,42)	
Muscle pain	6(2,5)	-	6(2,5)	(00,50 ;04,42)	
Chest pain	1(0,4)	-	1(0,4)	(00,40 ;01,22)	
Joint pain	1(0,4)	-	1(0,4)	(00,40 ;01,22)	
Others	4(1,6)	-	4(1,6)	(00,03 ;03,24)	
Days of hospitalization					
Less than 1 day	6(7,3)	21(13,0)	27(11,1)	(07,10-15,03)	
From 1- 1 - 2 days	71(86,6)	127(78,4)	198(81,1)	(76,21-86,09)	0,291
From 3 to more	5(6,1)	14(8,6)	19(7,8)	(04,40-11,17)	
Blood pressure on admission					
PA from 70/40 to 80/50	1(0,4)	1(0,4)	2(0,8)	(0,00 ;01,96)	0,889
PA from 90/50 to 135/72	75(31,0)	147(60,7)	222(91,7)	(87,36 ;94,60)	
BP greater than 130/90	6(2,4)	12(5,0)	18(7,4)	([04,07 ;10,68)	
Respiratory frequency (average)					

16 - 20	72(87,8)	138(85,7)	210(86,1)	(81,69; 90,44)	0,653
21 - 24	10(12,2)	23(14,3)	33(13,5)	(09,20; 17,85)	
SaO2 (without O2 flow) (mean)			95.43		
91 - 95	18(24,0)	19(25,3)	37(49,3)	(15,16; 19,70)	**0,005**
96 - 98	7(9,3)	31(41,3)	38(50,7)	(10,99; 20,16)	

For the completion of delivery, 74.6% (CI: 69.09, 80.09) were delivered vaginally; 18% (CI: 13.17, 22.89) by cesarean section; 3.3% (CI: 01.03, 05.53) of pregnant women had an abortion and 4.1% (CI: 01.59, 06.60) were discharged without completing delivery. The 86.1% of newborns (CI: 81.69, 90.44) had an Apgar at one minute of 7-10, and 89.8% (85.92, 93.59) had an Apgar at 5 minutes of 7-10.

Table 3. Characteristics of delivery completion in pregnant women diagnosed with SARS-CoV-2.

Variables	Symptomatic n=82 (%)	Asymptomatic n=162 (%)	Total n=244 (100%)	CI: 95%.	p-value
Childbirth					
Vaginal	57(23,4)	126(51,2)	183(74,6)	(69,53; 80,47)	
Cesarean section	18(7,4)	26(10,7)	44(18,0)	(13,17; 22,89)	0,557
Abortion	3(1,2)	5(2,0)	8(3,3)	(01,03; 05,53)	
No Partum	4(1,6)	5(2,0)	9(3.7)	(01,31; 06,07)	
Newborn One Minute Apgar					
0-3	1(0,5)	2(0,9)	3(1,4)	(19,62; 02,62)	
4-6	1(0,5)	7(3,1)	8(3,6)	(01,03; 05,53)	0,494
7-10	68(27,9)	42(58.2)	210(86,1)	(81,69; 90,44)	
Newborn Apgar 5 minutes					
0-3	1(0,4)	1(0,4)	2(0,8)	(19,62; 01,96)	0,576
7-10	69(28,3)	150(61,5)	219(89,8)	(85,92; 93,59)	
Pregnant woman died	1(1,2)	-	1(0,4)	(00,40; 01,22)	0,159

Regarding the survival of the pregnant women, one of them died, which represents 0.41% (CI: 0.40; 1.22); according to the clinical history, her severity was mild and she presented more than two symptoms; her death was 28 days after her first diagnostic test and 26 days after being discharged, her delivery was 32 weeks, with a live newborn; likewise, according to the death certificate the basic cause was *Acute Respiratory Distress* Syndrome.

Discussion

Coronavirus is transmitted by the SARS-Cov-2 virus, which causes respiratory problems; it produces symptoms from the mildest to the most severe, depending on the immunological conditions of the human being. Although the vulnerability is higher in males, it has been reported that pregnant women are at higher risk of morbidity and mortality than the general female population.

This emerging infection has a high transmission that may increase the risk of morbidity in pregnant women due to changes in maternal physiological and immune function during pregnancy, making them more vulnerable to infection and developing other gestational complications (11).

In the present study, it was observed that of the pregnant women confirmed with SARS-CoV-2 who were hospitalized, the highest percentage were young (50%), with an average age of 24 years; many of them were not

admitted to the hospital for severity directly related to COVID-19, but for obstetric care. These pregnant women were screened in the emergency department to interrupt the chain of SARS-CoV-2 transmission. In this regard, Barja et al. (12) indicate that the average age of pregnant women diagnosed with COVID-19 was 27 years, coinciding with the results of Urgellés et al. (10); on the contrary, other authors indicate that the average age fluctuates between 19 and 34 years (13, 14). Regarding comorbidity, a very low percentage of cases with hypertension and obesity (1% respectively) were found in asymptomatic pregnant women; different from what was reported by Urgellés et al. (10), who found that 16.6% of the pregnant women confirmed with SARS-CoV- 2 presented peptic ulcer, and no other additional comorbidity was diagnosed.

Regarding clinical characteristics, 93.9% of confirmed cases corresponded to pregnant women in the third trimester, in contrast to the study by Urguellés et al. (10), who found that most positive pregnant women were in the first trimester (66.1%). Regarding the symptomatology of pregnant women, the results of the present study showed that 66.4% of the pregnant women were asymptomatic at the time of hospitalization. For Guevara et al. (13), more than 91% of pregnant women with antiSARS-CoV-2 antibodies were asymptomatic; however, the presence of symptoms occurred in pregnant women with IgM antiSARS-CoV-2 results.

The prospective study by Prabhu et al. (7) indicates that of 675 pregnant women accepted for delivery, 78.6% were asymptomatic. While the study by Delahoy et al. (8) indicates that out of 598 COVID-19-positive pregnant women, 54.5% were asymptomatic; likewise, another study carried out in Lima-Peru found that only 5% of pregnant women were symptomatic (16). However, the present study's percentages were similar to those conducted in Latin America and Equatorial Guinea, where 66% of COVID-19-positive pregnant women confirmed by RT-PCR were asymptomatic (15). The differences in the percentages presented in these studies are probably due to the different types of diagnostic tests used for COVID-19 (16). However, all studies show the predominance of asymptomatic positive pregnant women, whichconstitutes a risk for receiving timely care and strengthening the epidemiological surveillance in health services. Regarding symptomatic pregnant women, the study found that 33.6% presented general malaise, cough, sore throat and headache. These results present the same symptomatology as the general population (10, 16, 17).

The most frequent complications were premature rupture of membranes (15.2%); premature delivery (7.4%); hypertensive disorder (5.3%), and abortion (4.9%); similar to what was reported by Di Masio (9). Regarding premature rupture of membranes, the highest percentage predominated in symptomatic pregnant women (9.4%), followed by preterm labor with a higher incidence in symptomatic women (4.5%); in contrast, the hypertensive disorder was present in a greater number of asymptomatic cases (4.1%). Regarding preterm delivery, the values differ from those Di Masio (9), who indicated that 41.1% of the pregnant women presented this complication, which is higher than that found in the present study.

Regarding the culmination of labor, the majority of pregnant women ended in vaginal delivery, as indicated in some studies such as those of Zumalave et al. (16), who reported figures similar to those found in Cajamarca; however, it is necessary to highlight that in the present study 8 cases ended in abortion (3.3%); without determining that SARS-COV-2 increases the severity of ending gestation before 20 weeks, since the values are similar in pregnant women who did not present infection by COVID 19.

The study results show a significant association between symptomatology and oxygen saturation (p=0.005). It was found that pregnant women with higher saturation are usually asymptomatic and no pregnant woman in the study group showed a saturation lower than 90%. Similar percentage values were found in pregnant women with saturations of 91% - 95% and 96% - 98% (49.3% and 50.7% respectively).

Regarding the Apgar of the newborn, it was found that the severity was greater at one minute since 5% presented values lower than 7 of APGAR at one minute. There are studies such as that of the National Center for Epidemiology, Prevention and Disease Control of the United States which warns of an association between maternal SARS-CoV-2 and an increase in neonatal respiratory morbidity, as well as premature births (9); and the findings of Norman et al. (18) who in their research conclude that it is an important risk to consider in the increase of neonatal respiratory morbidity. Nevertheless, no newborn died until discharge; a similar situation was reported by Liu et al. (19), where the newborns obtained an Apgar equal to or greater than 8. In these circumstances, the risk of acquiring the virus according to the type of delivery, breastfeeding, or contact is low, and it could be transmitted by post-delivery drops (11). This is because placental membranes containing the fetus and amniotic fluid lack the messenger RNA (mRNA) molecule needed to make the ACE2 receptor, the main cell surface receptor used by the SARS-CoV-2 virus to cause infection (20).

No patient has required mechanical ventilation according to the data reported in the medical records; a similar situation was found in the study by Prabhu (7) in New York and Liu et al. (21) in China, in whose study 15 pregnant women were evaluated with computed tomography; concluding that pregnancy and delivery did

not increase the severity of COVID-19 pneumonia. However, in the present study, one maternal death was reported 28 days after being diagnosed with SARS-CoV-2, and it was found that pregnant women confirmed to have COVID-19 had three times the risk of death. Another study conducted in thirteen states in the United States during 2020 found that 1% of pregnant women died (22).

During the analysis of the present study, it can be concluded that pregnant women with epidemiological and clinical characteristics positive for SARS-CoV-2 had some type of complication that affected the pregnancy; however, further research is needed in this vulnerable group. It should be noted that despite the complications, none of them were admitted to the Intensive Care Unit.

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Conflict of interest

DIRESA (Regional Health Directorate) has collaborated in the financing of data collection.

Disclaimers of liability

The responsibility for the content of the article lies exclusively with the authors.

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