



Live births of immigrant mothers in Brazil: A population-based study

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ABSTRACT

Introduction: Migration has become a major challenge for many countries, and women constitute half of the migrants in the world. Few studies have been conducted on migrant mothers in Brazil. We aim to identify differences in the pregnancies, childbirths, and live birth (LB) indicators of immigrant women, compared with those of Brazilian women living in the municipality of São Paulo (MSP), Brazil.

Methods: The LB characteristics of immigrant mothers from Bolivia (15,886), China (3861), Paraguay (1370), and Peru (1039) were compared with those of Brazilian mothers (967,921) living in the MSP between 2012 and 2017. Pearson's chi-square test was used to compare proportions with a significance level of 5%.

Results: Teenage pregnancy and low education were more frequent among Bolivian (13.1 and 31.7%, respectively) and Paraguayan mothers (13.1 and 36.2%). Bolivian women exhibited a high percentage of late-onset prenatal care (8.7%), few prenatal visits (14.3%), vaginal birth (77.0%), home delivery (1.6%), and postterm (3.6%). Bolivian (13.6%), Peruvian (10.6%), and Paraguayan (7.9%) women exhibited a higher prevalence of macrosomia than Chinese (4.3%) and Brazilian (4.0%) women. There was a high prevalence of preterm and low birth weights among Paraguayan (12.5 and 7.7%, respectively) and Brazilian mothers (11.0 and 9.7%) and a high rate of cesarean sections among Chinese (42.1%) and Brazilian (53.5%).

Conclusion: Differences were observed in the sociodemographic profiles for the pregnancies, childbirths, and LBs of immigrant mothers, in view of their increase and diversity in the MSP. There was greater vulnerability among immigrant mothers, compared with Brazilian mothers, particularly regarding access to prenatal care.

1. Introduction

International migration is a global reality, with estimates of one billion people on the move or having moved in 2018 (Abubakar et al., 2018). Mobility among different countries has become a major challenge in public policies, including health policies. This requires the host countries to make a constant effort of internal, political, and social reorganization to respond to the needs and expectations of migrant populations (Topa et al., 2013).

Brazil is an urbanized middle-income country and the largest and most populous country in South America, with over 207 million inhabitants (Brazilian Institute of Geography and Statistics (IBGE), 2017). The municipality of São Paulo (MSP) is the most populous in Brazil, with over 11 million inhabitants, with a gross domestic product (GDP) per capita of approximately US\$17,000 (Brazilian Institute of Geography and Statistics (IBGE), 2017). MSP has a diversified economy and is an

economic center with employment opportunities that attract immigrants. In recent decades, there has been a change in the characteristics of international flows and an increase in their volume. These processes are related to changes in the social division of labor at a global level, which end up reconfiguring the forms of organization of the metropolis, assigning new economic functions and changing the profile of international immigrants (Baeninger et al., 2020). Recently, Brazil has become home to the fourth largest foreign-born population in Latin America and the Caribbean (McAuliffe and Ruhs, 2017). The foundation of Mercosul (Southern Common Market) has contributed to the increase in the immigration of South Americans toward Brazil. Data from the 2010 population census on the period when the new wave of immigrants took up residence in the MSP showed that in 1999–2010, Bolivian natives constituted 39% of immigrants, followed by those from China (9.6%), Paraguay (5.2%), Lebanon (4.9%), and Peru (4.6%) (Yazaki et al., 2014). Recent data showed that approximately 3% of live births (LBs) in

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the MSP were children of non-Brazilians (Secretaria Municipal da Saúde, 2015).

In the immigration context, women play an important role because they are estimated to constitute half of the migrants in the world (Topa et al., 2010). Compared with men, immigrant women are more vulnerable to discrimination, with some being more vulnerable than others, in terms of ethnicity, social class, age, or nationality (Topa et al., 2013).

Thus, it is necessary to pay attention to the health conditions of immigrant women, particularly regarding reproductive health. Inequalities exist during pregnancy and at the time of birth, with disparities in maternal health and pregnancy outcomes. Studies have reported poor prenatal care, few visits, late access, and poor neonatal outcomes, such as low birth weight and preterm birth, among immigrant mothers, compared with those of native mothers (Vásquez-de kartzow and Castillo-durán, 2012; Mumtaz et al., 2014; Calderon-Margalit et al., 2015; Paz-Zulueta et al., 2015; Belihu et al., 2016).

Immigrant women typically face difficulties in accessing healthcare because of cultural, language, and communication barriers, as well as illegality because the fear of deportation or discrimination can influence a migrant's willingness to seek medical care (Madi et al., 2009). Few studies have addressed the reproductive health of immigrant women in Brazil (Yazaki et al., 2014; Madi et al., 2009; Sass et al., 2010; Yajahuanca, 2015), which suggest the presence of inequalities in health care use and poorest outcomes among immigrants. A case-control study showed failure to attend prenatal care or its completion with an inadequate number of consultations, and the higher number of cases of congenital syphilis observed among the Bolivian women in the MSP (Sass et al., 2010).

To face these inequities and propose improvements in the health conditions of immigrant women, it is essential to identify their profile and needs. Thus, this perinatal epidemiologic study aimed to identify differences in the profile of LBs among the main groups of immigrant women, compared with those of native mothers living in the MSP, from 2012 to 2017.

2. Material and methods

2.1. Data

A epidemiological descriptive population study was conducted on LBs from January 1, 2012 to December 31, 2017, for mothers living in the MSP. The source of data was the Live Birth Information System (SINASC), made available by the Municipal Health Department. The variable mother's birthplace was employed to identify the two groups, Brazilian and immigrant mothers, and to separate them according to country of origin.

From 2012 to 2017, there were 1037,633 LBs of resident mothers registered in the SINASC. The LBs in the municipality were selected, and those that occurred in any other municipality were excluded (39,428). Therefore, 998,205 LBs were selected (30,284 LBs of immigrant mothers and 967,921 of Brazilian mothers). A total of 136 nationalities were identified, and the four most frequent were selected for the analysis of profile differences. The variables were grouped as follows.

Sociodemographic mother characteristics: age (10–19, 20–34, and 35+ years); education (none, complete elementary school, complete high school, complete college); marital status (without a partner, single/divorced/widow; with a partner, married/cohabiting/registered partnership); place of birth (hospital/other health establishments, home, others/ignored); and type of birth hospital (Sistema Único da Saúde (SUS) - public health system, private) identified from the National Register of Health Establishments.

Maternal obstetric history, pregnancy, and delivery: parity (nulliparous, multiparous, highly multiparous); fetal loss (no, yes); mode of delivery (vaginal, cesarean); month of onset of prenatal care (1st to 3rd, 4th to 6th, 7+ month); number of prenatal visits (0–3, 4–6, 7+); and

adequacy of prenatal care, according to the number of visits appropriate for gestational age (no or yes, according to 3 visits for LBs between 22 and 27 weeks of gestation, 4 visits for LBs between 28 and 33 weeks, 5 visits for LBs between 34 and 36 weeks, and 6 visits for LBs after 37+ weeks) (Ministério da, 2006).

Newborn characteristics: gestational age (preterm < 37, early term 37–38, term 39–40, postterm 41+ weeks); birth weight (< 2500 g; 2500–3999 g; 4000+ g); and 1st minute Apgar index (≤ 7 , > 7);

2.2. Statistical analysis

Descriptive analyses were performed to summarize the participants' characteristics. Pearson's chi-square test was used to test for differences among the groups. We estimated the prevalence ratios (PR) and 95% confidence intervals (95% CI). The statistical significance level was set at 5%. The test was conducted with reference to Brazilian mothers who were compared with each studied nationality. All analyses were conducted using the statistical software, SPSS version 17.0.

3. Results

Among 30,284 LBs from immigrant mothers born in 2012–2017, 52.5% were Bolivian and represented over 50% of LBs from immigrant women, from 2012 to 2015. The second most frequent nationality was Chinese (12.7%), which exhibited an important reduction from 14.7% in 2012 to 9.7% in 2017. The LBs of Paraguayan (4.5%) and Peruvian mothers (3.4%) increased from 3.9% in 2012 to 4.9% in 2017 and from 3.3% in 2012 to 4.0% in 2017, respectively. The nationalities studied represented 73.2% of the LBs from immigrant mothers within this period (Table 1).

Practically all deliveries (98%) occurred in a hospital, with no statistically significant differences for the Paraguayan ($p = 0.340$) and Peruvian mothers ($p = 0.835$). Most admissions were in public hospitals, although the percentage of Chinese mothers who used private hospitals was high (34.3%), similar to Brazilian mothers (37.0%). Latin American mothers had a prevalent use of the public system approximately 50% higher than that of Brazilian mothers (Tables 2 and 3).

Home births were more frequent (1.6%) for Bolivians, compared with those of other nationalities, indicating that the PR was virtually four times higher than that for Brazilians (0.4%) (Tables 2 and 3).

The lowest average ages were for Bolivian mothers (25.6 years; CI, 19.9–31.3) and Paraguayan mothers (25.7; CI, 19.9–31.4), while the highest were for Chinese mothers (28.3; CI, 23.1–33.4) and Peruvian mothers (28.4; CI, 22.2–34.5). Majority of the women were in the 20–34 age group, for the four nationalities; however, there was a high percentage of 10–19-year old among Brazilians (reference), Bolivians, and Paraguayans and a low percentage among Chinese (1.6%), with statistically significant differences (Table 2).

Although over half of the immigrant mothers declared complete high school, Bolivian and Paraguayan women had high percentages of incomplete elementary school or even no schooling, showing a PR of 80 and 60% higher than that of other nationalities. Peruvian mothers exhibited a high percentage of complete higher education (20.4%), similar to Brazilian women (22.4%), followed by Chinese women (15.9%) (Tables 2 and 3). Regarding marital status, there was a higher frequency of mothers without a partner among the Chinese (53.0%) and Paraguayan (50.5%) women, compared with that among Brazilians (45.7%) (Tables 2 and 3).

Both Brazilians and immigrants were inclined to be multiparous. There were no statistically significant differences in the parity between Paraguayan ($p = 0.495$) and Peruvian mothers ($p = 0.264$), compared with the reference. The percentage of highly multiparous mothers (4+ LBs and dead births) was 31% higher among Bolivians (7.5%), compared with that for Brazilians (5.7%) (Tables 2 and 3).

The proportion of mothers with fetal losses for previous pregnancies was similar for Brazilian, Bolivian, and Paraguayan mothers, and this

Table 1
Live births, according to mother's nationality and year of birth. Municipality of São Paulo, 2012–2017.

Nationality	2012 N (%)	2013 N (%)	2014 N (%)	2015 N (%)	2016 N (%)	2017 N (%)	Total N (%)
Bolivian	3057 (58.7)	2812 (57.6)	2736 (53.2)	2663 (51.4)	2248 (45.3)	2370 (48.3)	15,886 (52.5)
Chinese	765 (14.7)	586 (12.0)	756 (14.7)	644 (12.4)	634 (12.8)	476 (9.7)	3861 (12.7)
Paraguayan	205 (3.9)	215 (4.4)	211 (4.1)	243 (4.7)	255 (5.1)	241 (4.9)	1370 (4.5)
Peruvian	173 (3.3)	166 (3.4)	167 (3.2)	173 (3.3)	165 (3.3)	195 (4.0)	1039 (3.4)
Others	1004 (19.3)	1104 (22.6)	1269 (24.7)	1460 (28.2)	1662 (33.5)	1629 (33.2)	8128 (26.8)
Total	5204 (100.0)	4883 (100.0)	5139 (100.0)	5183 (100.0)	4964 (100.0)	4911 (100.0)	30,284 (100.0)

Table 2
Distribution of live births, according to maternal, pregnancy, delivery and childbirth characteristics, by selected nationalities. Municipality of São Paulo, 2012–2017.

Characteristics	Brazilian		P-value	Paraguayan		Peruvian		Chinese	
	N (%)	N (%)		N (%)	P-value	N (%)	P-value	N (%)	P-value
Type of hospital			< 0,001		< 0,001		< 0,001		< 0,001
SUS (Public)	582,953 (62.0)	15,423 (98.9)		1281 (94.2)		908 (89.2)		2469 (65.1)	
Private	356,902 (38.0)	170 (1.1)		79 (5.8)		110 (10.8)		1322 (34.9)	
Birthplace			< 0,001		0,340		0,835		
Hospital/other health establishments	963,302 (99.5)	15,599 (98.2)		1367 (99.8)		1035 (99.6)		3856 (99.9)	0,008
Home	3847 (0.4)	248 (1.6)		3 (0.2)		3 (0.3)		4 (0.1)	
Other	772 (0.1)	39 (0.2)		0		1 (0.1)		1 (0.0)	
Maternal age (y)			< 0,001		< 0,001		< 0,001		< 0,001
10–19	125,642 (13.0)	2076 (13.1)		179 (13.1)		69 (6.6)		63 (1.6)	
20–34	664,412 (68.6)	12,519 (78.8)		1078 (78.7)		782 (75.3)		3282 (85.0)	
35 +	177,839 (18.4)	1291 (8.1)		113 (8.2)		188 (18.1)		516 (13.4)	
Level of education			< 0,001		< 0,001		< 0,001		< 0,001
None or primary school	187,261 (19.3)	5039 (31.7)		496 (36.2)		110 (10.6)		973 (25.2)	
High school	561,353 (58.0)	10,453 (65.8)		800 (58.4)		713 (68.6)		2077 (53.8)	
University education	216,482 (22.4)	316 (2.0)		70 (5.1)		212 (20.4)		613 (15.9)	
Marital status			0,015		< 0,001		0,215		< 0,001
Without partner	442,796 (45.7)	7281 (45.8)		692 (50.5)		502 (48.3)		2046 (53.0)	
With partner	523,816 (54.1)	8570 (53.9)		672 (49.1)		535 (51.5)		1482 (46.2)	
Parity			< 0,001		0,495		0,264		< 0,001
0	408,930 (42.2)	5164 (32.5)		561 (40.9)		412 (39.7)		1218 (31.5)	
1–3	502,917 (52.2)	9519 (59.9)		734 (53.6)		561 (54.0)		2506 (64.9)	
4 +	55,358 (5.7)	1194 (7.5)		75 (5.5)		66 (6.4)		136 (3.5)	
Fetal loss previous			0,597		0,524		< 0,001		< 0,001
No	786,497 (81.3)	12,905 (81.2)		1122 (81.9)		786 (75.6)		2876 (74.5)	
Yes	180,728 (18.7)	2973 (18.7)		248 (18.1)		253 (24.4)		984 (25.5)	
Mood of delivery			< 0,001		< 0,001		< 0,001		< 0,001
Vaginal	449,936 (46.5)	12,238 (77.0)		925 (67.5)		673 (64.8)		2237 (57.9)	
Cesarean	517,939 (53.5)	3646 (23.0)		445 (32.5)		365 (35.1)		1624 (42.1)	
Month of first prenatal care visit			< 0,001		< 0,001		< 0,001		< 0,001
1–3	806,254 (83.3)	8284 (52.1)		953 (69.6)		727 (70.0)		2848 (73.8)	
4–6	129,114 (13.3)	5779 (36.4)		327 (23.9)		241 (23.2)		784 (20.3)	
7 +	16,748 (1.7)	1376 (8.7)		69 (5.0)		53 (5.1)		168 (4.4)	
Prenatal care visits			< 0,001		< 0,001		< 0,001		< 0,001
0–3	48,588 (5.0)	2274 (14.3)		115 (8.4)		100 (9.6)		322 (8.3)	
4–6	167,607 (17.3)	5080 (32.0)		287 (20.9)		258 (24.8)		921 (23.9)	
7 +	746,369 (77.1)	8417 (53.0)		963 (70.3)		678 (65.3)		2603 (67.4)	
Inadequate prenatal			< 0,001		< 0,001		< 0,001		< 0,001
Yes	135,924 (14.0)	5407 (34.3)		278 (20.3)		257 (24.7)		864 (22.4)	
No	826,640 (85.4)	10,364 (65.2)		1087 (79.3)		779 (75.0)		2982 (77.2)	
Gestational age			< 0,001		< 0,001		< 0,001		< 0,001
Preterm	106,459 (11.0)	1224 (7.7)		171 (12.5)		87 (8.4)		245 (6.3)	
Early term	320,498 (33.1)	3364 (21.2)		362 (26.4)		246 (23.7)		1231 (31.9)	
Term	525,512 (54.3)	10,710 (67.4)		801 (58.5)		674 (64.9)		2317 (60.0)	
Postterm	12,174 (1.3)	571 (3.6)		33 (2.4)		29 (2.8)		60 (1.6)	
Birth weight (g)			< 0,001		< 0,001		< 0,001		< 0,001
<2500	93,493 (9.7)	498 (3.1)		106 (7.7)		46 (4.4)		194 (5.0)	
2500 - 3999	835,821 (86.4)	1226 (83.3)		1156 (84.4)		883 (85.0)		3502 (90.7)	
4000 +	38,583 (4.0)	2160 (13.6)		108 (7.9)		110 (10.6)		165 (4.3)	
1 - min Apgar Score			< 0,001		0,496		0,003		< 0,001
≤ 7	108,854 (11.3)	1398 (8.8)		165 (12.0)		83 (8.0)		347 (9.0)	
> 7	855,816 (88.4)	14,233 (89.6)		1202 (87.7)		954 (91.8)		3508 (90.9)	
Total	967,921 (100.0)	15,886 (100.0)		1370 (100.0)		1039 (100.0)		3861 (100.0)	

proportion was higher for Chinese (25.5%) and Peruvian mothers (24.4%), compared with that for Brazilian mothers (18.7%) (Tables 2 and 3).

Regarding the mode of delivery, there were statistically significant

differences for all nationalities, with over half of the immigrant mothers having a vaginal delivery, dissimilar to the Brazilian women for whom cesarean sections were predominant (53.5%). However, Chinese mothers had the highest proportion of cesarean sections (42.1%).

Table 3

Prevalence ratio and confidential interval (95%), according to maternal, pregnancy, delivery and childbirth characteristics, by selected nationalities. Municipality of São Paulo, 2012–2017.

Characteristics	Brazilian	Bolivian		Paraguayan		Peruvian		Chinese	
		PR 95%(CI)	P-value	PR 95%(CI)	P-value	PR 95%(CI)	P-value	PR 95%(CI)	P-value
Type of hospital									
SUS (Public)	Ref.	1.60 (1.59; 1.60)	<0.001	1.52 (1.50; 1.54)	<0.001	1.44 (1.41; 1.47)	<0.001	1.05 (1.03; 1.08)	<0.001
Birthplace									
Home	Ref.	3.93 (3.46; 4.47)	<0.001	0.55 (0.17; 1.71)	0.207	0.73 (0.24; 2.25)	0.408	0.26 (0.10; 0.69)	0.001
Maternal age (years)									
< 19	Ref.	1.00 (0.97; 1.05)	0.373	1.00 (0.88; 1.15)	0.462	0.51 (0.41; 0.64)	< 0.001	0.13 (0.09; 0.16)	< 0.001
35+	Ref.	0.44 (0.42; 0.47)	<0.001	0.45 (0.38; 0.54)	<0.001	0.99 (0.87; 1.12)	0.408	0.73 (0.67; 0.79)	< 0.001
Maternal education									
None/primary schooling	Ref.	1.64 (1.61; 1.68)	<0.001	1.87 (1.74; 2.01)	<0.001	0.55 (0.46; 0.65)	< 0.001	1.37 (1.30; 1.45)	< 0.001
University education	Ref.	0.09 (0.08; 0.10)	<0.001	0.23 (0.18; 0.29)	<0.001	0.91 (0.81; 1.03)	0.133	0.75 (0.69; 0.80)	< 0.001
Marital status									
Without partner	Ref.	1.00 (0.99; 1.02)	0.377	1.11 (1.05; 1.17)	<0.001	1.06 (0.99; 1.13)	0.047	1.27 (1.23; 1.30)	< 0.001
Parity									
0	Ref.	0.77 (0.75; 0.79)	<0.001	0.97 (0.91; 1.03)	0.319	0.94 (0.87; 1.01)	0.043	0.75 (0.71; 0.78)	< 0.001
4 +	Ref.	1.31 (1.24; 1.39)	<0.001	0.96 (0.77; 1.19)	0.346	1.11 (0.88; 1.40)	0.191	0.62 (0.52; 0.73)	< 0.001
Fetal loss previous									
Yes	Ref.	1.00 (0.97; 1.04)	0.451	0.97 (0.87; 1.08)	0.290	1.30 (1.17; 1.45)	< 0.001	1.36 (1.29; 1.44)	< 0.001
Inadequate prenatal									
Yes	Ref.	2.43 (2.38; 2.48)	<0.001	1.44 (1.30; 1.60)	<0.001	1.76 (1.58; 1.95)	< 0.001	1.59 (1.50; 1.69)	< 0.001
Mode of delivery									
Vaginal	Ref.	1.66 (1.64; 1.67)	<0.001	1.45 (1.40; 1.51)	<0.001	1.40 (1.33; 1.46)	< 0.001	1.25 (1.21; 1.28)	< 0.001
Gestational age									
Preterm	Ref.	0.71 (0.67; 0.75)	<0.001	1.13 (0.99; 1.30)	0.041	0.76 (0.62; 0.93)	0.003	0.58 (0.51; 0.65)	< 0.001
Postterm	Ref.	2.85 (2.63; 3.10)	<0.001	1.91 (1.37; 2.68)	<0.001	2.22 (1.55; 3.18)	< 0.001	1.23 (0.96; 1.59)	0.050
Birth weight (g)									
<2500	Ref.	0.33 (0.30; 0.35)	<0.001	0.80 (0.67; 0.96)	0.008	0.46 (0.35; 0.61)	< 0.001	0.52 (0.45; 0.60)	< 0.001
4000 +	Ref.	3.41 (3.28; 3.55)	<0.001	1.98 (1.65; 2.37)	<0.001	2.66 (2.23; 3.17)	< 0.001	1.07 (0.92; 1.25)	0.181
1 - min Apgar Score									
≤ 7	Ref.	0.79 (0.75; 0.83)	<0.001	1.07 (0.93; 1.23)	0.179	0.71 (0.58; 0.87)	< 0.001	0.80 (0.72; 0.88)	< 0.001

Vaginal delivery was more frequent among the immigrant mothers, compared with the Brazilian women, with an emphasis on Bolivian mothers with a 66% higher prevalence (Table 3).

Late-onset prenatal care was observed for the Bolivian mothers (8.7%) starting from the 7th month and was five times higher than that for the Brazilian mothers (1.7%). The percentage of few prenatal visits was higher among Bolivians (14.3%), in contrast to that for the Brazilian women (5.0%). The Ministry of Health establishes a minimum number of prenatal visits for each gestational age, when this number was lower, prenatal care was considered inadequate (Ministério da, 2006). Immigrant mothers had higher proportions of inadequacy, compared with that for Brazilian mothers (14.0%), particularly Bolivians (34.3%) and Peruvians (24.7%). Inadequate prenatal care was higher among immigrant mothers than among Brazilian mothers, and it was 2.4 times higher among Bolivian mothers (Table 3).

Full-term births were predominant for Brazilians and immigrants. The frequency of preterm births was high for Brazilian and Paraguayan mothers. For other immigrants, preterm births were less frequent (Tables 2 and 3). Early-term LBs were higher for Brazilian and Chinese women. All immigrant mothers exhibited a higher proportion of post-term babies than Brazilian women, while Bolivian mothers exhibited postterm births 2.8 times that for Brazilian mothers (Table 3).

A clear difference was observed in the prevalence of low birth weight among Brazilian women and immigrants. Brazilian women had the highest prevalence of low birth weight, compared with those of the immigrants (Tables 2 and 3). The opposite was observed regarding macrosomia: Bolivian mothers were 3.4 times more inclined to have children heavier than 4000 g, compared with Brazilian and Chinese mothers; a higher prevalence was observed among the Paraguayan and Peruvian mothers (Table 3).

There were no statistically significant differences for the 1-min Apgar scores between the Paraguayan ($p = 0.496$) and Brazilian LBs, both registering higher percentages of Apgar ≤ 7 (12.0 and 11.3%, respectively), compared with the other groups (Tables 2 and 3).

4. Discussion

Immigrant women may receive less optimal care during pregnancy that can lead to negative outcomes. Target health policies should face these inequities, ensuring and organizing culturally and linguistically responsive health services. Therefore, to provide appropriate programs, it is important to know the specificities of each nationality, because immigrant population differ in many ways.

The results showed considerable variations in the profiles of immigrant mothers in the MSP. Compared to the Brazilian women, there were significant differences in the maternal age and education, type of delivery, visits, beginning of prenatal care, and gestational age and birth weight (all nationalities); marital status (Paraguayan and Chinese); parity and birthplace (Bolivian and Chinese); and fetal loss (Peruvian and Chinese). Bolivian and Paraguayan mothers exhibited a similar profile in terms of age group and educational level and had a proportion of adolescent mothers, similar to that for the Brazilian mothers. Bolivian, Paraguayan, and Peruvian mothers had a higher prevalence of macrosomia, compared with Brazilian and Chinese mothers. Chinese mothers had a different profile from that of the Latin American group, which was more inclined to have high percentages of multiparous women, fetal losses, cesarean sections, early gestational age, and use of private hospitals, in this case, similar to Brazilian mothers.

Although over 98.0% of births occurred in hospitals, home births were more frequent among Bolivian mothers, compared with Brazilian mothers. On the one hand, data from the Bolivian Census showed a high prevalence of home births in the country (28.6%) (Instituto Nacional de Estadística (INE), 2012); a cultural aspect that may be related to our findings. On the other hand, it is important to consider that the higher frequency of this type of delivery, compared to that of the Brazilian mothers, may indicate a delay in going to the hospital at the time of delivery because of language barriers or lack of knowledge of the availability of free care (Secretaria Municipal da Saúde, 2015; Yajahuanca, 2015). In addition, the hesitation to use public services could be

present if these women are undocumented.

In Brazil, the health system is composed of a complex network of services which form a public-private mix, divided into three subsectors: public sector (Unified Health System - SUS), private sector and private health insurance sector, all of which are somehow interconnected and used according to payment and access conditions (Paim et al., 2011). The SUS have as principles: equity, universality, decentralization and social participation. Thus, through the SUS, immigrants have universal access to health services for free, a right guaranteed by the Federal Constitution and also highlighted in the Immigration Law.

It was observed that the attendance of Bolivian, Paraguayan, and Peruvian women was predominant in public hospitals (SUS), while for Chinese mothers, there was a lower frequency of the use of this health service, with greater use of private hospitals. This may be related to differences in financial conditions; several studies have shown that public services are mainly used by people of low socioeconomic status, who are less likely to have a private health plan (Ribeiro et al., 2006; Silva et al., 2010). This correlated with our results, which showed that the Chinese had a high percentage of university education, which is an indication of higher socioeconomic status than that of the other immigrants. Language barriers and lack of knowledge of their rights also influenced access to the public health system (Secretaria Municipal da Saúde, 2015).

Although most mothers were in the 20–34 age group, a higher proportion of adolescents were observed among the Bolivian, Paraguayan, and Brazilian women. This finding is relevant because teenage pregnancy is an important public health topic. In addition to psychosocial issues, it is directly related to maternal health problems and perinatal complications (Goldenberg et al., 2005). It was estimated that between 2010 and 2015, Latin America recorded the second highest fertility rate among adolescents worldwide (Pan American Health Organization, 2019). In certain cases, our results reflected the reproductive profile of these countries (United Nations, 2019). For Paraguay, the proportion of mothers < 19 years was 12.8% (2016), which was similar to our observations. However, it was different from that for Peru, where the percentage of teenage mothers (12.3%) was practically double that of the immigrants studied (6.6%). A similar result was observed among Chinese women with a low frequency of teenage mothers, which may be related to the pattern of the country of origin, where there are restrictive birth control policies (United Nations, 2019). This could be related to the women's age of migration, but our data did not identify the date of migration.

Although the comparison of immigrant mothers in Brazil with those who live in other parts of the world should be made with reservations, owing to differences in immigration, social and environmental influences in the host country, a previous study observed a higher proportion of Bolivian mothers aged < 20 years (6.1%), compared to Spanish mothers (2.1%) (Restrepo-Mesa et al., 2015). This lower frequency of Bolivian teen mothers living in Spain, compared with our results, suggested their adaptation to the Spanish social and reproductive standards.

The level of education of immigrants tended to be lower than that of native mothers (Restrepo-Mesa et al., 2015; Racape et al., 2016). Bolivian and Paraguayan women had a similar profile, with the lowest educational level, dissimilar to Peruvians and Brazilians with a higher level. Chinese mothers exhibited an intermediate profile with a lower educational level than that of Brazilian and Peruvian mothers.

Previous studies have shown greater parity and number of previous pregnancies among immigrants in relation to native mothers in the host country (Calderon-Margalit et al., 2015; Belihu et al., 2016; Gillet et al., 2013), as observed in this study, with emphasis on high percentages of highly multiparous Bolivian women. The low frequency of Chinese nulliparous mothers may be attributed to their high average age.

A higher frequency of vaginal delivery was observed among immigrants, compared to Brazilians, with an emphasis on Bolivian mothers (77.0%). This may be due to the type of antenatal and delivery services

used, since almost all of them gave birth in the public hospital. Cesarean section rates are increasing worldwide, and the reasons appear to be multiple and complex. Brazil is experiencing an epidemic of cesarean sections, where this type of delivery has become the most common form of birth, reaching 56.7% (Ministério da, 2020), being higher in private hospitals. These rates are considerably higher than those presented in studies by the World Health Organization (WHO), which suggested that cesarean section rates above 10% do not contribute to the reduction in maternal and neonatal mortality (World Health Organization, 2015).

The host country functioned as a variable of great importance when comparing cesarean rates, particularly for groups such as North Africans and Latin Americans (Merry et al., 2013). The variations in these rates reflected the public policies, healthcare, and cultural factors of the host countries. Studies have shown that the risk factors for cesarean deliveries among immigrants are language barriers, unfavorable socioeconomic indices, and poor access to prenatal care (Mumtaz et al., 2014; Merry et al., 2013). Chinese mothers had the highest cesarean section rates, but they did not have the worst access to prenatal care. Their high cesarean section rates may be related to their frequent use of private hospitals. In addition, they had a high proportion of early-term LBs, similar to Brazilian women, which may be related to elective cesarean sections, which are more frequently performed in private hospitals (Oliveira et al., 2016).

High proportions of no or few visits and late-onset prenatal care were observed among Bolivian mothers, similar to a previous study (Yajahuanca, 2015). Many Bolivian women failed to attend appointments because of inadequate time, high workload, waiting times at health facilities, fear of prejudice from health professionals, and linguistic difficulties (Yajahuanca, 2015). Similar results were observed in a retrospective cohort in Spain, where pregnant African women received poor prenatal care, compared with that for Spanish natives (Paz-Zulueta et al., 2015). In Brazil, a case-control study with Brazilian and Bolivian parturients showed a great number of Bolivians who did not receive prenatal care. For those who did, less than five consultations each were made (Sass et al., 2010). In addition to cultural and linguistic barriers, the difficulty in accessing prenatal care can be related to their low educational levels, as it is required for better access to healthcare (McAuliffe and Ruhs, 2017). In interviews carried out in a maternity hospital in the city of São Paulo, Bolivian women reported having suffered discrimination during prenatal care because they were poor and because of language difficulties (Yajahuanca, 2015).

Certain characteristics of newborns are related to early neonatal mortality, such as low birth weight, prematurity, and complications during pregnancy and childbirth (Schoeps et al., 2007). In 2010, it was estimated that 11.1% of births worldwide were preterm (Blencowe et al., 2012). Here, a high frequency of preterm births and low birth weights were observed among the children of Paraguayan and Brazilian mothers. The Bolivian mothers had a high proportion of postterm LBs and birth weights > 4000 g. In a case-control study at a hospital in the MSP, a higher proportion of large-for-gestational-age LBs, lower proportion of preterm births, and small-for-gestational-age LBs were observed for Bolivian mothers, compared with those for Brazilian women (Sass et al., 2010). These findings correlated with our results. Differences in birth weight were observed for children of native women, compared to immigrant children in a retrospective study in Spain. The results showed a higher proportion of low birth weights among Spanish children, compared to the children of immigrants from Ecuador, Colombia, and Bolivia, and higher percentages of macrosomia were observed among the immigrants, with the highest proportion among the children of Bolivian mothers (Restrepo-Mesa et al., 2015). Fetal macrosomia among immigrant mothers may be related to low access to prenatal care, which may lead to neglect in cases of diabetes that could be discovered and treated during pregnancy (Sass et al., 2010).

4.1. Strengths and limitations

This study is one of the first to investigate this topic in Brazil. Its strength is to report results for specific birthplaces instead of viewing immigrants in an aggregate manner, which masks the differences in individual nationalities. However, comparability between groups was limited precisely because of great cultural and sociodemographic differences.

For the limitations, the data from SINASC does not contain information on the length of time of residence in Brazil, if they have a permanent residence in the municipality, or if they are temporarily in Brazil for work or study. Other migration-related factors such as refugee/nonrefugee status were not available. The accuracy of certain variables may have been compromised, such as educational level, which is a variable that is difficult to measure, as the organization of the educational system differs among countries (Gillet et al., 2013).

5. Conclusion

This study enabled the identification of the differences in the sociodemographic profiles of pregnancy, childbirth, and LBs of immigrant mothers because of their increase and diversity in the MSP. There was a greater vulnerability among immigrant mothers, compared with Brazilian mothers, regarding access to prenatal care, with higher percentages of few consultations, late-onset prenatal care, and low educational levels among migrants from Bolivia and Paraguay.

It is expected that these findings will motivate future research and stimulate the monitoring of the birth results of immigrant mothers so that a municipality with great cultural diversity and migratory flow is prepared to meet the health needs of this population.

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CRedit authorship contribution statement

Érica Karoline Ferreira: Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing. **Marcia Furquim de Almeida:** Visualization, Writing – review & editing. **Gizelton Pereira Alencar:** Visualization, Writing – review & editing. **Zilda Pereira da Silva:** Conceptualization, Formal analysis, Writing – original draft, Visualization, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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