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Sociodemographic characteristics of pregnant women tested positive for COVID-19 admitted to a referral center in Northern Italy during lockdown period

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Abstract

Introduction: We investigated association between sociodemographic characteristics and COVID-19 disease among pregnant women admitted to our unit, the largest high-risk maternity unit in the Milan metropolitan area.

Methods: Between March 1, 2020 and April 30, 2020, 896 pregnant women were admitted to our Institution and tested for COVID-19. We collected information regarding their sociodemographic characteristics. Additional information on geographical area of residence, number of family members, number of family members tested positive for COVID-19, and clinical data was collected for women tested positive for COVID-19. Odds ratios (ORs) and 95% confidence intervals (CIs) for the risk of developing COVID-19 according to sociodemographic characteristics were estimated by unconditional logistic regression models.

Results: Among the 896 women enrolled, 50 resulted positive for COVID-19. Pregnant women aged ≥35 years had a significantly lower risk of developing the infection (crude OR = 0.29; 95% CI:0.16–0.55). Conversely, foreign women (crude OR = 3.32; 95% CI:1.89–5.81), unemployed women (crude OR = 3.09; 95% CI: 1.77–5.40), and women with an unemployed partner (crude OR = 3.16; 95% CI: 1.48–6.79) showed a significantly higher risk of infection. Ethnicity was positively associated with the risk of developing COVID-19 (mutually adjusted OR = 2.15; 95% CI:1.12–4.11) in the multivariate analysis. Foreign women with COVID-19 were more likely to have a lower education level ($p < 0.01$), to be unemployed ($p < 0.01$), and to live in larger families ($p < 0.01$) compared to Italian pregnant women.

Conclusions: The socioeconomic conditions described are characteristic of immigration patterns in our metropolitan area. These factors may increase the risk of viral transmission, reducing the effectiveness of lockdown and social distancing.

Key words: COVID-19, lockdown, pregnancies, risk factors, sociodemographic characteristics.

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Introduction

The COVID-19 disease, caused by SARS-CoV-2, was declared a pandemic by the World Health Organization (WHO) on March 11, 2020.[1–3] Northern Italy was the first European area to be hit by the pandemic and the national government established strict measures in order to control the spreading of the outbreak. These measures were aimed at changing people's transmission-related behaviors and included hand hygiene, disinfection of objects and surfaces, use of face masks, physical distancing, and isolation.[4, 5] However, people's adherence to the abovementioned measures may have been dependent on cultural and psychological factors, as well as sociodemographic characteristics.

Several studies on COVID-19 disease in pregnancy are focused on risk factors such as maternal age,[6, 9] overweight or obesity,[6–10] pre-existing or gestational diabetes and/or hypertension.[6, 8, 11] Other studies have investigated the prevalence of COVID-19 among pregnant women, concluding that ethnic minorities and vulnerable subgroups presented a higher incidence of infection.[9, 10] To the best of our knowledge, there are limited data concerning sociodemographic characteristics of pregnant women with COVID-19.[2, 4, 6, 9–14]

The aim of the study was to investigate the association between sociodemographic characteristics and COVID-19 disease among pregnant women who were admitted to hospital for pregnancy health care in the metropolitan area of Milan.

Methods

Study design and data collection

We conducted a cross-sectional study on 896 pregnant women admitted for pregnancy-related health care between March 1, 2020 and April 30, 2020 in our Institution (Fondazione IRCCS Ca' Granda, Ospedale Maggiore Policlinico, Milan, Italy), one of the six COVID-19 maternity hubs designed by the Regional Health Authority. Our institute is the largest high-risk maternity unit in the metropolitan area of Milan, Lombardy.[15]

Table 1 Distribution of 50 COVID-19-positive women and 846 COVID-19-negative women visited between March and April 2020 according to sociodemographic characteristics

Variables	COVID-19				Chi-squared test p-value
	Yes		No		
	n	(%)	n	(%)	
Age					
<35	37	(74.0)	401	(47.4)	
≥35	13	(26.0)	445	(52.6)	$\chi^2 = 13.37$; $p < 0.01$
Education[a]					
Low	11	(22.0)	121	(14.3)	
High	39	(78.0)	725	(85.7)	$\chi^2 = 2.23$; $p = 0.14$
Ethnicity					
Italy	22	(44.0)	607	(71.8)	
Other	28	(56.0)	239	(28.3)	$\chi^2 = 17.38$; $p < 0.01$
Europe	1	(2.0)	64	(7.6)	
North America	0	(–)	2	(0.2)	
Central South America	12	(24.0)	69	(8.2)	
Africa	10	(20.0)	46	(5.4)	
Asia	5	(10.0)	58	(6.9)	
Occupation[b]					
Employed	26	(52.0)	666	(78.7)	
Unemployed	24	(48.0)	180	(21.3)	$\chi^2 = 19.17$; $p < 0.01$
Partner occupation[b]					
Employed	42	(84.0)	800	(94.6)	
Unemployed	8	(16.0)	46	(5.4)	$\chi^2 = 9.30$; $p < 0.01$
Smoking					
Never	44	(88.0)	745	(88.1)	
Ever	6	(12.0)	101	(11.9)	$\chi^2 < 0.01$; $p = 0.99$

[a]Low education level included women with no education, primary schools, and middle schools; high education level included women with high schools or graduated. and [b]Unemployed included housewives and students.

At time of admission, all women were tested for COVID-19 with a nasopharyngeal swab in accordance to the Italian National Guidelines.[16] Among the 896 women enrolled in our study, 50 resulted positive for COVID-19 (Table 1). Data on sociodemographic characteristics were collected from electronic clinical records and included age, ethnicity, education, occupation, partner's occupation, and use of tobacco. Among women tested positive for COVID-19, we also collected information regarding geographical area of residence, number of family members, number of family members tested positive for COVID-19, and number of family members with symptoms suspect for COVID-19.

The study was approved by the Institutional Review Board of Fondazione IRCCS Ca' Granda, Ospedale Maggiore Policlinico, Milan, Italy (No. 1512; date: April 2020).

Statistical analysis

Chi-squared test was used for evaluating differences in proportions. Odds ratios (ORs) and the corresponding 95% confidence intervals (CIs) for the risk of COVID-19 according to sociodemographic characteristics were estimated by the means of unconditional logistic regression models.[17] In particular, we computed crude models in order to evaluate the relationship of each sociodemographic characteristic and the risk COVID-19 separately. We also computed a mutually adjusted model in order to evaluate the relationship of each sociodemographic characteristic taking into account the effect of other characteristics. The mutually adjusted model included terms for age (<35; ≥35 years), education (low; high), ethnicity (Italian; others, including Europe, North America, Central and South America, Africa, and Asia), occupation (employed; unemployed), partner's occupation (employed; unemployed), and use of tobacco (no; yes). All analyses were performed using the SAS statistical software, version 9.4 (SAS Institute Inc., Cary, NC).

Results

Compared to pregnant women tested negative for COVID-19, pregnant women with COVID-19 were more likely to be aged <35 years ($p < 0.01$), foreign ($p < 0.01$), unemployed ($p < 0.01$), and with an unemployed partner ($p < 0.01$) (Table 1). No significant differences concerning education or tobacco use were observed between the two groups.

Pregnant women aged ≥35 years had a significantly reduced risk of COVID-19 (crude OR = 0.29; 95% CI: 0.16–0.55; Table 2). Conversely, foreign pregnant women (crude OR = 3.32; 95% CI: 1.89–5.81), unemployed women (crude OR = 3.09; 95% CI: 1.77–5.40), and women with an unemployed partner (crude OR = 3.16; 95% CI: 1.48–6.79) showed a significantly higher risk of infection. Ethnicity was still significantly associated with an increased risk of COVID-19 (mutually adjusted OR = 2.15; 95% CI: 1.12–4.11) when taking into account the effect of other sociodemographic characteristics (Table 2).

Foreign pregnant women were more likely to have a lower education level ($p < 0.01$), to be unemployed ($p < 0.01$), and to live in larger families ($p < 0.01$) compared to Italian pregnant women (Table 3). No other differences in sociodemographic characteristics (Table 3) were observed among foreign and Italian pregnant women.

Table 2 Odds ratios (ORs) and 95% confidence intervals (CIs) for COVID-19 according to sociodemographic characteristics

Variables	Crude model OR (95% CI)	Mutually adjusted model OR (95% CI)
Age		
<35	Ref.	Ref.
≥35	0.29 (0.16–0.55)	0.40 (0.21–0.78)
Education[a]		
Low	Ref.	Ref.
High	0.55 (0.28–1.07)	1.03 (0.50–2.09)
Ethnicity		
Italy	Ref.	Ref.
Other	3.32 (1.89–5.81)	2.15 (1.12–4.11)
Occupation[b]		
Employed	Ref.	Ref.
Unemployed	3.09 (1.77–5.40)	1.56 (0.81–3.00)
Partner occupation[b]		
Employed	Ref.	Ref.
Unemployed	3.16 (1.48–6.78)	1.95 (0.88–4.33)
Smoking		
Never	Ref.	Ref.
Ever	1.12 (0.48–2.63)	1.20 (0.50–2.89)

[a]Low education level included women with no education, primary schools, and middle schools; high education level included women with high schools or graduated. and [b]Unemployed included housewives and students.

Table 3 Distribution of 50 COVID-19-positive women visited between March and April 2020, according to sociodemographic and clinical characteristics by ethnicity

Variables	Ethnicity				Chi-squared test *p*-value
	Italy		Other		
	n	(%)	n	(%)	
Sociodemographic					
Age (years)					
<35	14	(63.6)	23	(82.1)	
≥35	8	(36.4)	5	(17.9)	$\chi^2 = 2.19$; $p = 0.14$
Education[a]					
Low	1	(4.6)	10	(35.7)	
High	21	(95.5)	18	(64.3)	$\chi^2 = 6.97$; $p < 0.01$
Occupation[b]					
Employed	17	(77.3)	9	(32.1)	
Unemployed	5	(22.7)	19	(67.9)	$\chi^2 = 10.05$; $p < 0.01$
Partner occupation[b]					
Employed	20	(90.9)	22	(78.6)	
Unemployed	2	(9.1)	6	(21.4)	$\chi^2 = 1.40$; $p = 0.24$
Smoking					
Never	18	(81.8)	26	(92.9)	
Ever	4	(18.2)	2	(7.1)	$\chi^2 = 1.42$; $p = 0.23$
Area of living					
Milan	11	(50.0)	12	(42.9)	
Milan hinterland	6	(27.3)	10	(35.7)	
Other towns	5	(22.7)	6	(21.4)	$\chi^2 = 0.42$; $p = 0.81$
Number of family members					
1	-	(–)	1	(3.6)	
2	9	(40.9)	4	(14.3)	
3	8	(36.4)	3	(10.7)	
4	3	(13.6)	9	(32.1)	
5+	2	(9.1)	11	(39.3)	$\chi^2 = 13.91$; $p < 0.01$
Family members with COVID-19					
No	18	(81.8)	22	(78.6)	
Yes	4	(18.2)	6	(21.4)	$\chi^2 = 0.08$; $p = 0.78$
Family members with suspected COVID-19					
No	15	(68.2)	22	(78.6)	
Yes	7	(31.8)	6	(21.4)	$\chi^2 = 0.69$; $p = 0.41$
Clinical					
COVID-19 symptoms					
No	10	(45.5)	8	(28.6)	
Yes	12	(54.6)	20	(71.4)	$\chi^2 = 1.52$; $p = 0.22$
Fever	8	(36.4)	14	(50.0)	
Cough	3	(13.6)	3	(10.7)	
Cold	–	(–)	2	(7.1)	
Sorethroat	1	(4.6)	–	(–)	
Dyspnea	–	(–)	1	(3.6)	

[a]Low education included mothers with no education, primary schools, and middle schools, whereas high education included mothers with high schools or graduated; and [b]Unemployed included housewives and students.

Discussion

Our results show that foreign women living in metropolitan areas of Milan and Lombardy were more likely to result positive for COVID-19 compared to Italian women.

We hypothesized that social factors may play an important role, more than ethnicity, in the different infection rate.

The association between COVID-19 and ethnicity has been observed among the black community and other ethnic minorities in the larger study reporting

the UKOSS registry on COVID-19.[9] Ethnic disparities in the SARS-CoV-2 infection rate have also been described among nonpregnant populations.[18, 19] This association may be due to social and health behaviors, comorbidities, and a genetic predisposition.[9, 18, 19]

Our previous study[11] described the clinical course of six pregnant women tested positive for COVID-19 who concurrently developed gestational diabetes. Among these women, 4 were foreign.

Contrast to our results, other studies indicated an age greater than 35 years as a possible risk factor for COVID-19.[6–9] Our findings may be explained by the fact that foreign women, who according to our results are at a greater risk of developing COVID-19 disease, are usually pregnant at an earlier age, compared to Italian women.

An interesting study[20] conducted in Singapore investigated the attitude and precaution measures toward COVID-19 carried out by noninfected pregnant women. The authors concluded that social demographical factors including age > 36 years old, Malay ethnicity, employment in front line jobs, and attendance at high-risk clinics are likely to influence the attitude and precaution practices among pregnant women toward COVID-19.

To the best of our knowledge, this is the first work to investigate women's educational level and working status as possible risk factors. The low level of education among foreign women may reflect poor integration in the community. Surprisingly, we observed a higher risk for COVID-19 among unemployed women. A possible explanation for this finding may be represented by the fact that foreign people living in Italy are often only employed for occasional jobs. Conversely, some occupations (i.e., healthcare professions) expose people to a greater risk of infection. However, none of the patients enrolled in our study nor their family members worked in a hospital setting. Our work shows that living in crowded households, which is common among ethnic minorities in our country, represents a risk factor for developing a COVID-19 infection.

A possible limitation of the present analysis may be represented by a higher proportion of foreign women admitted in our Institution during the study period. However, the proportion of foreign pregnant women (27.7%) admitted in our hospital in 2019 was not significantly different ($p = 0.20$) to the proportion considered in our study (29.8%). A similar distribution was observed for the other analyzed variables. The main strength of this study is that it was conducted in one of the six reference centers for the treatment of women with COVID-19 infection in Lombardy, the first region affected in Europe and one of those with the highest diffusion rate of infection.[13, 14]

In conclusion, the socioeconomic conditions we described are characteristic of contemporary immigration patterns. These factors altogether increase the risk of viral transmission by droplets and contact within households, ultimately reducing the effectiveness of lockdown and social distancing.

Conflict of 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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