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RBMO

SHORT COMMUNICATION

Effects of the early phase of the COVID-19 pandemic on natural and ART-mediated birth rates in Lombardy Region, Northern Italy

BIOGRAPHY

Edgardo Somigliana graduated in Medicine in 1994, completed his Residency in Obstetrics and Gynaecology in 1999 and obtained a PhD in Prenatal Medicine in 2006. He is the Head of the Infertility Unit of the Fondazione Ca' Granda Ospedale Maggiore Policlinico, and Associate Professor in Obstetrics and Gynaecology, Università degli Studi di Milano, Milan, Italy.

Edgardo Somigliana[1,2,*], Giovanna Esposito[1], Paola Viganò[2], Matteo Franchi[3,4], Giovanni Corrao[3,4], Fabio Parazzini[1,2]

ABSTRACT

Research question: What effects did the early phase of the COVID-19 pandemic have on natural and assisted reproductive technology (ART)-mediated birth rates?

Design: Regional registries were consulted with permission from the Health Authorities of Lombardy Region, Northern Italy, an area particularly affected by the early phase of the epidemic. Deliveries occurring in the area between 1 January 2019 and 31 December 2020 from women beneficiaries of the National Health System and resident in Lombardy were identified. Comparisons mainly focused on December 2020, when women who conceived after 8 March (the start of the stringent lockdown imposed by the authorities) were expected to deliver.

Results: When comparing the periods January to November in 2019 and 2020, a 5.1% reduction of monthly general birth rate (from 5732 in 2019 to 5438 in 2020) was observed. The contribution of ART births was similar in 2019 and 2020, being 4.4% and 4.5%, respectively. In December 2020, a notable drop in natural (–17.8%), ART-mediated (–86.6%) and overall (–21.0%) births was observed compared with December 2019. After adjusting for the expected 5.1% reduction, the inferred effect of the COVID-19 crisis corresponded to a 16.7% reduction in birth rate, of which 76% was related to natural (707 births) and 24% to ART (218 births) conceptions.

Conclusions: This is the first study providing population-based evidence on the effects of COVID-19 and its related stringent restrictions on birth rates. The birth rate was dramatically reduced following the critical period, and the closure of ART centres played only a marginal role (24%) in the overall detrimental effect.

[1] Department of Clinical Sciences and Community Health, University of Milan, Milan, Italy
[2] Department of Obstetrics, Gynecology and Neonatology, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy
[3] Laboratory of Healthcare Research and Pharmacoepidemiology, Department of Statistics and Quantitative Methods, University of Milano-Bicocca, Milan, Italy
[4] National Centre for Healthcare Research and Pharmacoepidemiology, Milan, Italy

*Corresponding author. E-mail address: edgardo.somigliana@hsr.it (E. Somigliana). https://doi.org/10.1016/j.rbmo.2021.07.017 1472-6483/
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KEY WORDS

Assisted reproductive technique
Birth rate
COVID-19
Demographic crisis

INTRODUCTION

When the World Health Organization declared the potentially fatal infection known as coronavirus disease 2019 (COVID-19) a pandemic on 11 March 2020, the Italian Healthcare system was already facing significant challenges. The first case was identified on 20 February 2020 in Lombardy, the Northern Italian region that was particularly affected by the early phase of the epidemic in (*Grasselli et al., 2020*).

Starting from 8 March 2020, given the dramatic spread of the infection in the area, local authorities were forced to impose extraordinary security measures such as general lockdowns and social distancing across the whole Region in order to reduce the pressure on the healthcare system. Primary and secondary schools, academia and commercial, manufacturing, social and economic activities were all drastically limited. Restrictions were also imposed on the provision of healthcare services to citizens, suspending deferrable and non-urgent hospitalization and outpatient activities. In this context, COVID-19 had an important impact on assisted reproductive technology (ART) procedures, which were considerably decreased if not blocked, with the ultimate aim of limiting population movements and interactions, and, most importantly, diverting health personnel towards wards engaged in COVID-19 assistance. Similar decisions were taken in other areas of the world in the following weeks and months.

This sudden interruption of ART activity has rapidly engendered widespread concerns (*ESHRE COVID-19 Working Group, 2021*; *Vaiarelli et al., 2020*). A US model based on local registries estimated a decrease of 67,386 IVF cycles in the country for the 2020–2023 period, compared with an expected increase of 151,690 cycles if the COVID-19 pandemic had not taken place (*Gromsky et al., 2021*). It was claimed that reducing the number of ART procedures could significantly affect the birth rate, a situation particularly worrisome in some countries, like Italy, that are facing a dramatic demographic crisis. However, to date, population-based data supporting this concern are lacking.

This study aimed to evaluate the impact of the early phase of the COVID-19 pandemic on natural and ART-mediated birth rates. More specifically, the number of deliveries was compared per month during 2019 and 2020, focusing particularly on December 2020, when the effects of the pandemic would be discernible. Indeed, women who conceived after 8 March were generally expected to deliver from 1 December (corresponding to 40 weeks' gestation).

MATERIALS AND METHODS

Regional registries of the Lombardy Region, an area with 11 million inhabitants located in Northern Italy, were consulted with permission from the Regional Health Authorities. A detailed description of the methodology is reported elsewhere (*Parazzini et al., 2015*). Briefly, in this area, a standard form is used to register all discharges from public or private hospitals (Scheda di dimissione ospedaliera [SDO]). In addition, a specific form is filled out at delivery (Certificato di assistenza al parto [CedAP]), including information on type of conception, maternal characteristics, pregnancy, delivery and obstetric and neonatal outcome at birth.

With the use of these registries, all deliveries were identified that occurred in Lombardy between 1 January 2019 and 31 December 2020 from women beneficiaries of the National Health System and resident in Lombardy. Out of these, deliveries that did not match an SDO related to childbirth were excluded, as were those with a lack of information concerning the modality of conception. This latter information was dichotomous, i.e. natural versus non-natural (referred to here as ART pregnancies). In the second situation, possible options were pregnancies obtained with ovarian stimulation, intrauterine insemination IVF or intracytoplasmic sperm injection. All data were handled anonymously. Ethical approval and informed consent to participate was not requested because, in Italy, the analysis of an administrative, anonymous database is exempted.

RESULTS

Detailed results for the number of births per month are shown in TABLE 1. Overall, considering the period January to November, the mean number of births per month decreased from 5732 in 2019 to 5438 in 2020 (–5.1%, in line with the decrease in births in the area during the last decade). The contribution of ART births was similar in the two periods, being 4.4% and 4.5%, respectively. Conversely, in December, a notable drop in natural (–17.8%), ART (–86.6%) and overall (–21.0%) births was observed. The contribution of ART to live births dropped from 4.6% in December 2019 to 0.8% in December 2020. Given an expected reduction based on the demographic trend of 5.1%, the number of expected births in December 2020 was 5536 (5282 natural and 254 ART conceptions). As only 4611 births were recorded, the inferred detrimental effects of COVID-19 crisis could be a reduction of 925 births (–16.7%), of which 76% were related to natural (707 births) and 24% to ART (218 births) conceptions.

DISCUSSION

To the authors' knowledge, this is the first study providing population-based evidence on the effects of the early phase of the COVID-19 pandemic on both natural and ART-mediated birth rates. The data support previous theoretical concerns on the detrimental effect of ART interruption, but also highlight that the situation may be more worrisome than expected. In fact, the general birth rate, and not only the rate of ART-mediated births, radically reduced. In the first period of lockdown, it was simplistically supposed that the confinement of couples would have facilitated reproduction. On the contrary, the closure of ART centres played only a marginal role (24%) in the overall detrimental effects of the early phase of the COVID-19 pandemic.

This finding should be viewed in the context of the well-known stress-related disorders that large-scale human disasters, such as global pandemic diseases, can lead to in the population affected (*Marom Haham et al., 2021*). Of note, psychological effects and emotional reactions, such as fear of infection, falling sick or dying and concerns about family members contracting COVID-19, were also reported in infertile couples (*Marom Haham et al., 2021*). However, there is no evidence to assess whether this impact could differ between fertile and infertile couples and the current study is unfortunately not informative on this aspect.

These findings should be considered as preliminary. The study has some limitations. In particular, inferences on the link between the pandemic, the

TABLE 1 NUMBER OF BIRTHS PER MONTH IN LOMBARDY, 2019 AND 2020

Period	2019		2020	
	Natural (No.)	ART (No.)	Natural (No.)	ART (No.)
January	5588	295	5562	259
February	4746	272	5030	249
March	5222	290	5149	290
April	5084	158	4774	187
May	5657	163	5246	148
June	5398	289	5021	301
July	5821	310	5472	308
August	5497	293	5205	261
September	5955	120	5609	146
October	5934	303	5409	309
November	5367	287	4646	233
December	5566	268	4575	36

In both study periods, some seasonal fluctuations in the impact of ART occurred. Nadirs in ART pregnancies were observed in April–May and September, corresponding to conceptions occurring during the summer (July–August) and winter (December–January) leaves in the country. The numbers in December 2020 are expected to reflect the impact of the COVID-19 crisis.

ART, assisted reproductive technology (including ovarian stimulation, intrauterine insemination, IVF and intracytoplasmic sperm injection).

restrictions imposed on ART centres and the reduction in live births should be drawn with caution. Of note, the lack of data on miscarriage and stillbirths did not allow any contribution from an increased rate of embryonic or fetal loss (*Bahadur et al., 2021*) to be excluded. Moreover, it must be acknowledged that it was not possible to investigate the determinants of the observed reduction in live births, hampering the possibility of drawing conclusions on the possible causes. Enlarging data from births in the whole of 2021, if not 2022, and integrating them with information on concomitant local ART activity will provide a more precise picture of the impact of the COVID-19 pandemic. These analyses will also allow the role of ART to be better clarified, and the effects of the early phase of the pandemic to be differentiated from those developing in the later phases.

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