





# Quality of health care around the time of childbirth during the COVID-19 pandemic: Results from the IMAGiNE EURO study in Norway and trends over time

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## Funding information

IMAGiNE EURO project was supported by the Ministry of Health, Rome - Italy, in collaboration with the Institute for Maternal and Child Health IRCCS Burlo Garofolo, Trieste - Italy. This study was supported by the UiT The Arctic University of Norway

## Abstract

**Objective:** To describe maternal perception of the quality of maternal and newborn care (QMNC) in facilities in Norway during the first year of COVID-19 pandemic.

**Methods:** Women who gave birth in a Norwegian facility from March 1, 2020, to October 28, 2021, filled out a structured online questionnaire based on 40 WHO standards-based quality measures. Quantile regression analysis was performed to assess changes in QMNC index over time.

**Results:** Among 3326 women included, 3085 experienced labor. Of those, 1799 (58.3%) reported that their partner could not be present as much as needed, 918 (29.8%) noted inadequate staff numbers, 183 (43.6%) lacked a consent request for instrumental vaginal birth (IVB), 1067 (34.6%) reported inadequate communication from staff, 78 (18.6%) reported fundal pressure during IVB, 670 (21.7%) reported that they were not treated with dignity, and 249 (8.1%) reported experiencing abuse. The QMNC index increased gradually over time (3.68 points per month, 95% CI, 2.83–4.53 for the median), with the domains of COVID-19 reorganizational changes and experience of care displaying the greatest increases, while provision of care was stable over time.

**Conclusion:** Although several measures showed high QMNC in Norway during the first year of the COVID-19 pandemic, and a gradual improvement over time, several findings suggest that gaps in QMNC exist. These gaps should be addressed and monitored.

## KEYWORDS

childbirth, COVID-19, healthcare facility, IMAGiNE EURO, maternal health, Norway, quality of care, WHO standards

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## 1 | INTRODUCTION

When COVID-19 hit Europe in early March 2020, most countries, including Norway, implemented strict measures to reduce the risk of infection. Norway went into national lockdown on March 12, 2020.<sup>1</sup> Since then, different degrees of COVID-19-related measures have been in place in the country depending on waves of local and national outbreaks. By early February 2022, it was estimated that in Norway COVID-19 had caused 27 deaths per 100 000 overall population<sup>2</sup>; however, the Norwegian health system was never strained to the same level as observed in other European countries.<sup>3,4</sup> A study from Norway on maternal and newborn outcomes published at an early stage of the pandemic found that COVID-19 had not led to maternal and newborn deaths in Norway in the study period.<sup>5</sup> Additionally, preliminary data from the Norwegian Medical Birth Registry for 2021 indicate that maternal and perinatal morbidity due to COVID-19 is very low.<sup>6</sup>

The Norwegian maternal health system is public and free of charge for antenatal, labor, and postpartum care. Cesarean rates have been low and stable for decades (16.1% in 2019<sup>7</sup>) and Norway has one of the lowest maternal and perinatal mortality rates in the world.<sup>8</sup> While responsibility for antenatal care is shared with general practitioners, midwives are the main caregivers for low-risk women in labor and consult with an obstetrician for women with risk factors. Midwives are also the main caregiver for postpartum care.<sup>9</sup> A study on parental experience of quality of maternal and newborn care (QMNC) published in 2018 found that in general parents were satisfied with the care received, but that parental information during hospital stay and postpartum care scored lower than other areas, such as labor care.<sup>10</sup>

Little evidence exists on the maternal perspective on the QMNC received in Norway during the COVID-19 pandemic. A study of 827 women using Norwegian data from the first 10 months of the pandemic found that COVID-19 had a negative impact on the birth experience of the respondents, with feelings of insecurity, loneliness, and abandonment.<sup>11</sup> Another study with data from the first year of the pandemic found that one in three women reported a high depression score after giving birth during the pandemic and a high percentage reported lack of follow-up for maternal mental health.<sup>12</sup> These findings are of concern since negative childbirth experiences can severely impact the future health and well-being of mothers and their newborns. Studies have found that a negative birth experience is associated with post-traumatic stress disorder, shorter periods of breastfeeding, and women choosing to have fewer subsequent children.<sup>13-15</sup> According to women who gave birth during the pandemic, the most intrusive change of procedure as a consequence of the pandemic was to restrict the access of a companion of choice for women during latent labor and the postpartum period.<sup>11</sup>

A better understanding of how women perceived giving birth during the COVID-19 pandemic is critical for recognition of the importance of service user views and to build knowledge on how the impact of the restrictive measures influenced one of the most vulnerable and important periods of human life.

The present study is part of the IMAGiNE EURO project, a multicountry survey conducted in the World Health Organization (WHO) European Region to collect views of women on in-hospital QMNC. The study used 40 key quality measures based on the WHO Standards for Improving the QMNC.<sup>16</sup> Specifically, the present paper reports detailed survey findings from women who gave birth in Norway during the first year of the COVID-19 pandemic.

The aim of the present study was to describe how women who gave birth during the COVID-19 pandemic perceived QMNC care at birth facilities in Norway. We hypothesized that the QMNC index would improve as the pandemic progressed due to familiarity of women and healthcare providers with the new routines and regulations and the pandemic trends in the country. To assess the hypothesis that the QMNC index score improved over time, we assessed how the maternal report of the QMNC index changed over time during the COVID-19 pandemic, when corrected for responders' characteristics.

## 2 | MATERIALS AND METHODS

This is a cross-sectional study and is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The STROBE Checklist is included as Table S1.

Women aged 18 years and older who gave birth from March 1, 2020, to October 28, 2021, in any Norwegian birth facility, were eligible to participate. Women aged under 18 years, who gave birth outside the set time periods and women who had an out-of-hospital birth were excluded. Women self-selected to participate by actively clicking on the link to access the questionnaire.

The online survey was made available in 24 languages. Women could participate in the study in their preferred language. The survey was actively promoted on social media by the authors through a predefined dissemination plan, especially targeting closed postnatal forums/groups of women with due dates during the pandemic. Data were downloaded on October 28, 2021.

We used a structured online questionnaire to collect data, recorded with REDCap 8.5.21 (Vanderbilt University) via a centralized platform. The process of questionnaire development, validation, and previous use has been reported elsewhere.<sup>17</sup> The questionnaire included 40 questions on one key indicator each, equally distributed in four domains: three from the WHO standards, namely provision of care, experience of care, and availability of human and physical resources, plus an additional domain on key organizational changes related to the COVID-19 pandemic.<sup>17</sup>

Some of the 40 questions related to quality measures differed depending on whether the respondents experienced labor or not; respondents were provided with the case definition of labor provided in the NICE guidelines.<sup>18</sup> Questions on individual characteristics of the participants (e.g. socioeconomic background, parity) were also included. The 40 indicators contributed to a composite QMNC index, ranging from 0 to 100 for each of the four domains (provision

of care, experience of care, resources, COVID-19), for a total range from 0 to 400 points.<sup>17</sup>

Collected data were cleaned in accordance with predefined operating procedures.<sup>17</sup> For the primary aim, we calculated absolute frequencies and percentages for sociodemographic variables and each of the 40 key quality measures. Findings for women who experienced labor and women who did not experience labor (prelabor cesarean) are reported separately.

For each domain, the QMNC index was calculated only on cases contributing to all 10 key quality measures of the domain. When calculating the index, questions answered with “not applicable” were categorized as missing data. The QMNC index is presented as median and interquartile range (IQR) because it is not normally distributed.

To assess the hypothesis that the QMNC score improved over time, we first evaluated time trends by month of birth for total QMNC index and for the QMNC index by domain. Time trends were tested with the Mann-Kendall test. Furthermore, to test time trends corrected for relevant variables, we performed a multivariable quantile regression analysis with the QMNC index as the dependent variable and with time, women's satisfaction, maternal age, parity, maternal education, country of birth, immigrant status, and mode of birth as independent variables. Interaction between time and women's satisfaction was tested both in the raw analysis and in the sociodemographic and obstetric characteristics corrected model. Quantile regression was chosen instead of linear regression since the QMNC index was not normally distributed and owing to evidence of heteroskedasticity.<sup>17</sup> Only women who completed all 40 questions were included in the index and the subsequent quantile regression analysis.

Statistical analyses were performed using Stata version 14 (Stata Corporation) and R version 4.1.1.<sup>19</sup>

The international study was approved by the Institutional Review Board of the coordinating center: the IRCCS “Burlo Garofolo” Trieste (IRB-BURLO 05/2020 15.07.2020) and by ethical committees of three other countries: Portugal (Instituto de Saúde Pública da Universidade do Porto, CE20159), Germany (Bielefeld University ethics committee, 2020-176), and Latvia (Rīgas Stradiņa universitātes, 22-2/140/2021–16/03/2021). For the national study, the study protocol was presented to the REK Regional Committees for Medical and Health Research Ethics and considered to be outside the remit of the Norwegian Act on Medical and Health Research (2020/213047). The study was conducted according to General Data Protection Regulation requirements. Participation in the online survey was voluntary and anonymous. Prior to participation, women were informed of the objectives and methods of the study, including their rights in declining participation, and each participant provided consent before responding to the questionnaire. Anonymity in data collection during the survey phase was ensured by not collecting any information that could disclose participant identity, such as place of birth or day of birth, therefore formal approval was waived by other partners' ethics committees. Data transmission and storage were secured by encryption.

### 3 | RESULTS

A total of 35 556 women gave their consent to participate in the online questionnaire. Of these, 32 516 met the inclusion criteria. We excluded women with 20% or more of missing information on key variables and suspected duplicates. After excluding women who did not give birth in Norway ( $n = 24\ 386$ ), the Norwegian sample consisted of 3326 women (Figure 1).

The proportion of women who gave birth was 81.5% ( $n = 2712$ ) and 16.4% ( $n = 544$ ) in 2020 and 2021, respectively (Table 1). Of the women, 233 (7.0%) were not born in Norway. Most of the respondents were aged 25–30 years ( $n = 1471$ , 44.2%), with 198 (6.0%) aged 18–24 years and 76 (2.3%) aged 40 years or above. Three out of four women had a higher education or a postgraduate degree ( $n = 2539$ , 76.4%), while a small percentage had junior high school education ( $n = 51$ , 1.5%). Primiparous women accounted for 57.7% ( $n = 1918$ ) of the study sample. The percentage of women who gave birth by cesarean was 15.6% ( $n = 519$ ), whereas by instrumental vaginal birth (IVB) it was 12.6% ( $n = 420$ ). Most of the women were assisted by a midwife during birth ( $n = 3236$ , 97.3%), with 57.3% ( $n = 1906$ ) reporting being assisted by a gynecologist or obstetrics medical resident and 26.3% ( $n = 875$ ) by a student. For this question more than one answer was possible, including not knowing the healthcare providers professional role.

The results of the 40 key quality measures divided by the four domains (provision of care, experience of care, human and physical resources, and COVID-19 quality measures), are presented in Table 2, stratified by women who experienced labor ( $n = 3085$ ) and those who did not ( $n = 241$ ). The results reported below are only for women who experienced labor due to the low number of women with prelabor cesarean.

Key findings for provision of care included: 78 (18.6%) women who had an IVB reported being subjected to fundal pressure (Kristeller maneuver); 51 (18.3%) women who had a cesarean did not receive pain relief after surgery, 945 (30.6%) did not receive immediate attention from staff when needed, 711 (23.0%) were not exclusively breastfeeding at discharge. Conversely, the proportion of episiotomy performed during spontaneous vaginal births was relatively low (16.9%,  $n = 403$ ) and a minority of women did not experience skin-to-skin contact, early breastfeeding, or were not allowed to stay with their baby as they wished (3.5%,  $n = 108$ ; 8.5%,  $n = 263$ ; and 3.6%,  $n = 111$ , respectively).

For experience of care, 800 (25.9%) women reported that they were not involved in choices, 183 (43.6%) were not asked for consent prior to an IVB, and for nearly six out of 10 (58.3%,  $n = 1799$ ) women, their partner could not be present as much as they wished. One in five women complained that they were not treated with dignity (21.7%,  $n = 670$ ), while 249 (8.1%) were exposed to physical, verbal, or emotional abuse. Conversely, a relatively low proportion of women complained of no freedom of movement during labor (7.8%,  $n = 241$ ) or lack of privacy (12.1%,  $n = 373$ ), while almost none (0.9%,  $n = 29$ ) had to perform informal payments.

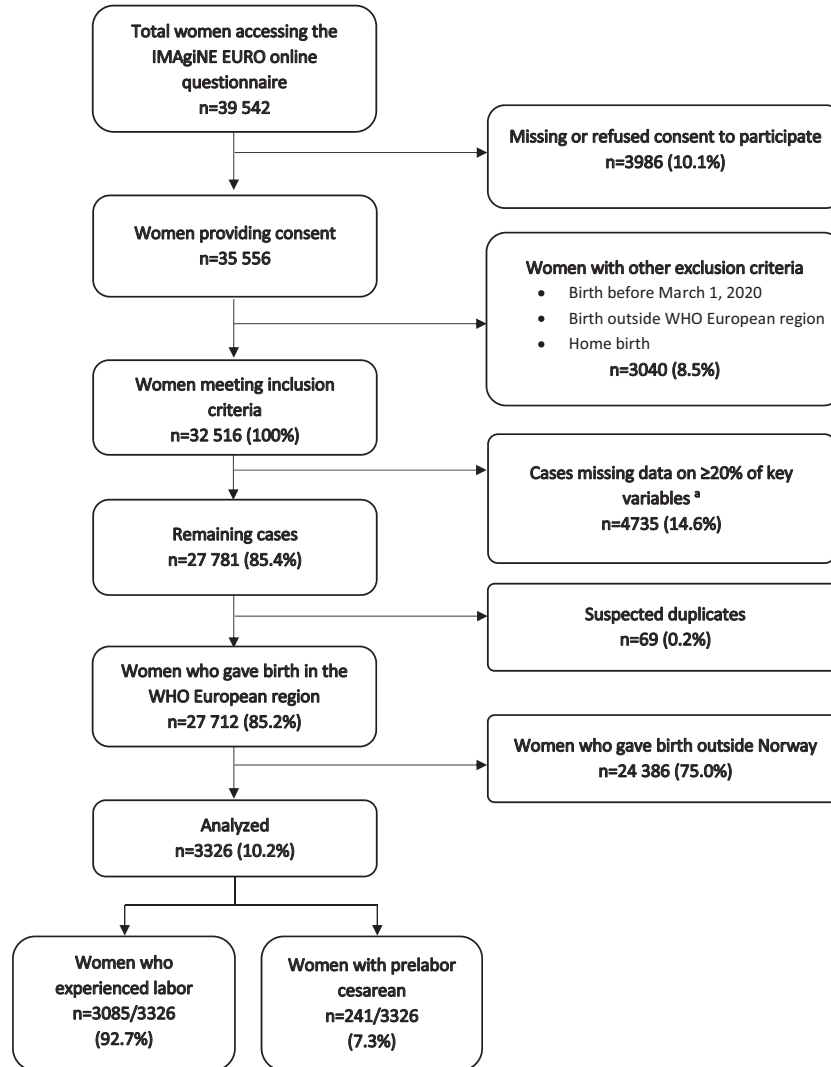


FIGURE 1 Study flow diagram. <sup>a</sup>Percentage of missing data for each woman was calculated over mandatory questions ( $n = 45$ ).

For availability of human and physical resources, about one-third of women (29.8%,  $n = 918$ ) observed that staff were inadequate in number, while half of women noted inadequate information on maternal and newborn danger signs such as excessive maternal bleeding or neonatal jaundice in the postpartum ward (43%,  $n = 1328$  and 54.3%,  $n = 1674$ , respectively). Room comfort, cleaning, and number of women per room were rated as “inadequate” by less than 10% of women (specifically, 9.2% [ $n = 284$ ], 8.9% [ $n = 276$ ], and 9.4% [ $n = 291$ ]), while only 134 (4.3%) respondents judged staff professionalism as “inadequate”.

For reorganizational changes due to COVID-19, two-thirds of women (66.3%,  $n = 2044$ ) complained that COVID-19 had led to a reduction in QMNC, nearly half (45.9%,  $n = 1415$ ) had had difficulties in attending routine antenatal checks, and one-third (33.6%,  $n = 1038$ ) experienced barriers in accessing the facility. Regarding staff, nearly six out of 10 (59.9%,  $n = 1848$ ) women noted that healthcare personnel were not always using personal protective equipment (PPE), while for one in three (34.6%,  $n = 1067$ ) communication was inadequate to contain stress related

to COVID-19-required procedures. In contrast, only a minority of women (4.3%,  $n = 134$ ) rated the info graphics as inadequate or noted a lack of handwashing stations (5.7%,  $n = 177$ ). Overall, for all domains exploring QMNC, women with prelabor cesarean reported significantly poorer indicators than women who experienced labor (Table 2).

The time trend analysis of the total QMNC index displayed a steady increase over time, from an average of 300 points in March 2020 to 340 points at study end (trend test  $P < 0.001$ ) (Figure 2). When stratified into the four domains, each QMNC Index showed a different trend: both reorganizational changes due to COVID-19 and experience of care had a stable and significant increase over time (trend test:  $P < 0.001$ ), with the total increase being higher for the first of these two domains (reorganizational changes: from 70 to 90 points; experience: 85 to 95 points); availability of human and physical resources displayed an irregular trend with ups and downs, with an overall slight increase (60 to 65 points,  $P < 0.001$ ); provision of care had a stable trend throughout the study period (85 to 90 points, trend test  $P = 0.145$ ).

TABLE 1 Characteristics of respondents

Characteristics	No. (%) (n = 3326)
Year of birth	
2020	2712 (81.5)
2021	544 (16.4)
Missing	70 (2.1)
Mother born in Norway	
Yes	3032 (91.2)
No	233 (7.0)
Missing	61 (1.8)
Age range, year	
18–24	198 (6.0)
25–30	1471 (44.2)
31–35	1197 (36.0)
36–39	324 (9.7)
≥40	76 (2.3)
Missing	60 (1.8)
Educational level <sup>a</sup>	
None	1 (0.0)
Elementary school	1 (0.0)
Junior High school	51 (1.5)
High School	674 (20.3)
University degree	1678 (50.5)
Postgraduate degree/Masters/Doctorate or higher	861 (25.9)
Missing	60 (1.8)
Parity	
1	1918 (57.7)
>1	1348 (40.5)
Missing	60 (1.8)
Mode of birth	
Spontaneous vaginal	2387 (71.8)
Instrumental vaginal birth	420 (12.6)
Cesarean	519 (15.6)
Type of healthcare provider who directly assisted birth <sup>b</sup>	
Midwife	3236 (97.3)
Student (e.g. before graduation)	875 (26.3)
Obstetrics registrar/medical resident (under postgraduate training)	777 (23.4)
Obstetrics and gynecology doctor	1129 (33.9)
I do not know (healthcare providers did not introduce themselves)	258 (7.8)
Other	864 (26.0)
Other characteristics	
Newborn admission to NICU	309 (9.3)
Maternal admission to ICU	68 (2.0)
Multiple birth	31 (0.9)

<sup>a</sup>Wording on education levels agreed among partners during the Delphi process. Questionnaire translated and back-translated according to ISPOR Task Force for Translation and Cultural Adaptation Principles of Good Practice.

<sup>b</sup>More than one possible answer.

Multivariable quantile regression included 1615 women who had no missing values on the 40 included questions. The results showed that for each month during the study period, the median of the QMNC index increased by 3.68 points per month ( $P < 0.001$ , 95% CI, 2.83–4.53) adjusted for all other variables in the model (Table 3). Categories of variables independently associated with a reduction in QMNC index were: younger maternal age (the age group 18–25) showed a significant reduction in QMNC in the first and third quartile compared with the age group of 26–30 years, birth by IVB, and birth by cesarean. Multiparous women were associated with a higher QMNC index. The variables of maternal education and women not born in Norway were not associated with any statistically significant change in the QMNC index for any of the quartiles.

## 4 | DISCUSSION

This is the first study exploring the perceived QMNC care at birth facilities in Norway. Many of the quality measures explored—such as those related to the high rate of early breastfeeding and skin-to-skin contact in line with WHO recommendations,<sup>17,18</sup> freedom of movement during labor, privacy, and room comfort—suggest high QMNC in Norway. However, gaps in QMNC were also reported in each domain explored: provision of care (e.g. no pain relief after cesarean and rate of exclusive breastfeeding at discharge); experience of care (lack of companionship, consent request, and reported abuse); availability of resources (lack of staff and lack of information on maternal and newborn danger signs); and reorganizational changes (staff not always using PPE and inadequate communication). Mothers reported improving trends over time, in particular in the domains of reorganizational changes due to COVID-19 and experience of care. These data call for action to address the observed gaps, while further monitoring in the near future may help assess further progress over time.

Some of the findings of this study are of particular concern. In the domain of provision of care, that women with an IVB are still subjected to fundal pressure is surprising, since this practice is not recommended by the WHO and other national guidelines due to the increased risk of morbidity<sup>20,21</sup> and it is no longer taught as a technique to Norwegian midwives and obstetricians. That a proportion of women with an emergency cesarean did not receive any pain relief is a breach of hospital procedures and should be followed up. With 39 out of 45 birth facilities certified as baby-friendly hospitals,<sup>22</sup> it is discouraging that one in five reported inadequate breastfeeding support and that almost one in four did not exclusively breastfeed at discharge; the equivalent findings were much higher for women who had a prelabor cesarean.

Several of the observed quality measures in the domain of experience of care are concerning and, in particular, that 6 out of 10 reported the lack of companion of choice. The importance of a companion of choice was well known before the pandemic and has, since 2014, been a WHO recommendation to improve both maternal satisfaction and birth outcomes.<sup>23,24</sup> The recommendation was

TABLE 2 Results of the 40 key quality measures (n = 3326)<sup>a,b,c</sup>

Provision of care	No. (%)	Experience of care	No. (%)	Availability of human and physical resources	No. (%)	Reorganizational changes due to COVID-19	No. (%)
Women who experienced labor (n = 3085)							
1. No pain relief during labor	390 (12.6)	1. No freedom of movements during labor	241 (7.8)	1. No timely care by HCPs at facility arrival	432 (14.0)	1. Difficulties in attending routine antenatal visits	1415 (45.9)
2. Mode of birth		2a. No choice of birth position (in SVB)	783/2387 (32.8)	2. No information on maternal danger signs	1328 (43.0)	2. Any barriers in accessing the facility	1038 (33.6)
2a. IVB	420 (13.6)	2b. No consent requested (for IVB)	183/420 (43.6)				
2b. Emergency cesarean during labor	278 (9.0)	2c. No information on newborn (in emergency cesarean)	97/278 (34.9)				
3a. Episiotomy (in SVB)	403/2387 (16.9)	3. No clear/effective communication from HCP	930 (30.1)	3. No information on newborn danger signs	1674 (54.3)	3. Inadequate info graphics	134 (4.3)
3b. Fundal pressure (in IVB)	78/420 (18.6)						
3c. No pain relief after cesarean	51/278 (18.3)						
4. No skin-to-skin contact	108 (3.5)	4. No involvement in choices	800 (25.9)	4. Inadequate room comfort and equipment	284 (9.2)	4. Inadequate wards reorganization	986 (32.0)
5. No early breastfeeding	263 (8.5)	5. Inadequate companionship	1799 (58.3)	5. Inadequate number of women per rooms	291 (9.4)	5. Inadequate room reorganization	861 (27.9)
6. Inadequate breastfeeding support	632 (20.5)	6. Not treated with dignity	670 (21.7)	6. Inadequate room cleaning	276 (8.9)	6. Lacking one functioning accessible hand-washing station	177 (5.7)
7. No rooming-in	663 (21.5)	7. No emotional support	703 (22.8)	7. Inadequate bathroom	364 (11.8)	7. HCP not always using PPE	1848 (59.9)
8. Not allowed to stay with the baby as wished	111 (3.6)	8. No privacy	373 (12.1)	8. Inadequate partner visiting hours	1860 (60.3)	8. Insufficient HCP number	1067 (34.6)
9. No exclusive breastfeeding at discharge	711 (23.0)	9. Abuse (physical/verbal/emotional)	249 (8.1)	9. Inadequate HCP number	918 (29.8)	9. Communication inadequate to contain COVID-19-related stress	1067 (34.6)
10. No immediate attention when needed	945 (30.6)	10. Informal payment	29 (0.9)	10. Inadequate HCP professionalism	134 (4.3)	10. Reduction in QMNC due to COVID-19	2044 (66.3)

TABLE 2 (Continued)

Provision of care	No. (%)	Experience of care	No. (%)	Availability of human and physical resources	No. (%)	Reorganizational changes due to COVID-19	No. (%)
Women with prelabor cesarean (n = 241)							
1. Mode of birth			55 (22.8)		96 (39.8)		111 (46.1)
1a. Elective cesarean	93 (38.6)	1. Consent requested for vaginal examination		1. No information on maternal danger signs		1. Difficulties in attending routine antenatal visits	
1b. Emergency cesarean before labor	148 (61.4)	2. No information on newborn	88 (36.5)	2. No information on newborn danger signs	120 (49.8)	2. Any barriers in accessing the facility	94 (39.0)
2. No pain relief after cesarean	35 (14.5)	3. No clear/effective communication from HCP	85 (35.3)	3. Inadequate room comfort and equipment	21 (8.7)	3. Inadequate info graphics	15 (6.2)
3. No skin-to-skin contact	48 (19.9)	4. No involvement in choices	152 (63.1)	4. Inadequate number of women per rooms	29 (12.0)	4. Inadequate wards reorganization	89 (36.9)
4. No early breastfeeding	77 (32.0)	5. Companionship not allowed	77 (32.0)	5. Inadequate room cleaning	25 (10.4)	5. Inadequate room reorganization	76 (31.5)
5. Inadequate breastfeeding support	62 (25.7)	6. Not treated with dignity	55 (22.8)	6. Inadequate bathroom	35 (14.5)	6. Lacking one functioning accessible hand-washing station	15 (6.2)
6. No rooming-in	96 (39.8)	7. No emotional support	38 (15.8)	7. Inadequate partner visiting hours	150 (62.2)	7. HCP not always using PPE	152 (63.1)
7. Not allowed to stay with the baby as wished	28 (11.6)	8. No privacy	21 (8.7)	8. Inadequate HCP number	72 (29.9)	8. Insufficient HCP number	95 (39.4)
8. No exclusive breastfeeding at discharge	101 (41.9)	9. Abuse (physical/verbal/emotional)	2 (0.8)	9. Inadequate HCP professionalism	15 (6.2)	9. Communication inadequate to contain COVID-19-related stress	102 (42.3)
9. No immediate attention when needed	95 (39.4)	10. Informal payment	18 (7.5)	10. Inadequate wards reorganization	89 (36.9)	10. Reduction in QMNC due to COVID-19	167 (69.3)
10. No timely care by HCP at facility arrival	35 (14.5)						

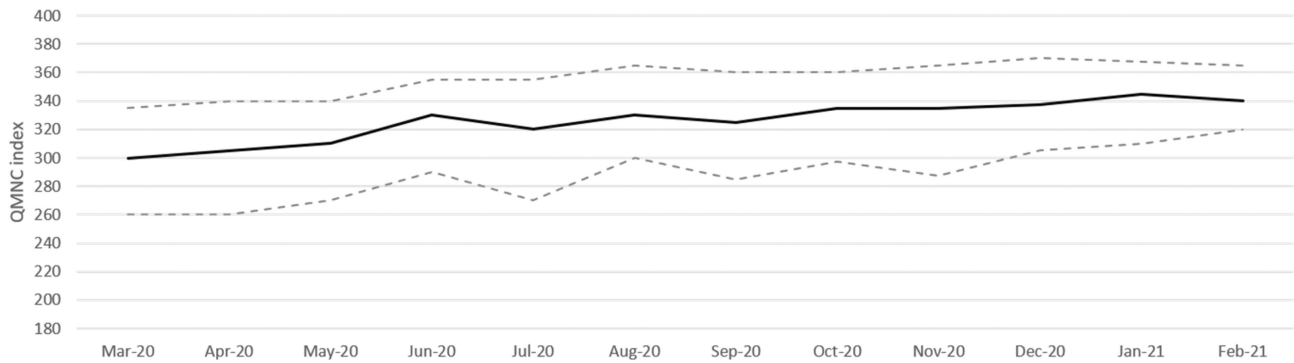
Abbreviations: HCP, healthcare provider; IVB, instrumental vaginal birth; PPE, personal protective equipment; QMNC, quality maternal and newborn care; SVB, spontaneous vaginal birth.

<sup>a</sup>All the indicators in the domains of provision of care, experience of care, and resources are directly based on WHO standards.

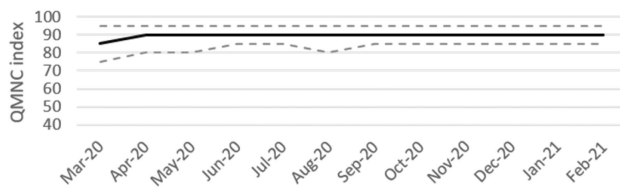
<sup>b</sup>Indicators identified with letters (e.g. 3a, 3b) were tailored to take into account different mode of birth (i.e. spontaneous vaginal, IVB, and cesarean). These were calculated on subsamples (e.g. 3a was calculated on spontaneous vaginal births; 3b was calculated on IVB).

<sup>c</sup>Indicator 6 in the domains of reorganizational changes due to COVID-19 was defined as: at least one functioning and accessible hand-washing station (near or inside the room where the mother was hospitalized) supplied with water and soap or with disinfectant alcohol solution.

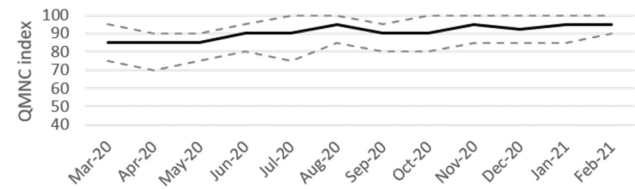
## (a) QMNC index



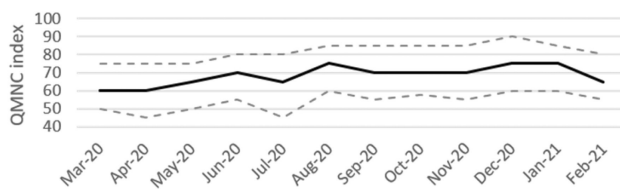
## (b) Provision of care



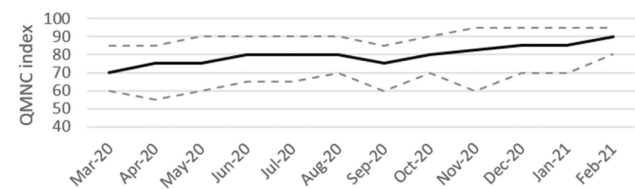
## (c) Experience of care



## (d) Availability of human and physical resources



## (e) Reorganizational changes due to COVID-19



**FIGURE 2** Quality of maternal and newborn care (QMNC) index by month. (a) QMNC index by month for all women contributing to the index ( $n = 1615$ ). (b) QMNC index by Provision of care. (c) QMNC index by Experience of care. (d) QMNC index by Availability of human and physical resources. (e) QMNC index by Reorganizational changes due to COVID-19. Black solid lines represent the QMNC index median, while gray dashed lines represent the interquartile range.

based on studies finding increased likelihood of spontaneous vaginal birth and reduced risk of cesarean and negative feelings about the birth experience for women with continuous support versus regular care, especially if support was provided by non-facility staff.<sup>25</sup> In Norway, the presence of a companion of choice has been both recommended and a norm of decades. Forbidding or restricting the presence of partners can therefore have had far-reaching consequences for women and their families that should not be underestimated. Findings on measures related to respectful maternal care—such as lack of involvement in choices, lack of consent, lack of dignity, and reported abuse—do not appear to be justifiable by the pandemic alone and may be related more deeply to the culture of care. Mistreatment of women during childbirth is a breach of women's fundamental human rights,<sup>26</sup> and our findings illustrate and support that information on women's experience of giving birth should be considered just as important as registering clinical outcomes of pregnancy and childbirth. This is particularly relevant since studies from other high-income countries have found that minority groups of women were subjected to more mistreatment than women in the majority groups.<sup>27</sup> User involvement and informed choice have been part of the quality requirements for Norwegian birth facilities since

2010<sup>9</sup> and should be elevated. There are no pre-existing studies considering disrespect and abuse during childbirth in Norway; these findings should therefore be explored further and will be of great interest to decision makers, clinicians, researchers, and end-users in maternal health.

It is concerning that one in three women reported inadequate numbers of healthcare personnel and inadequate communication from staff. WHO recommend that human resources should be skilled,<sup>14</sup> and adequate communication is a key skill during childbirth and the postpartum period. However, prepandemic studies in Norway have shown that poor communication with health personnel was already a challenge according to women who gave birth in 2017.<sup>10</sup>

Our study cannot estimate to what extent the gaps in QMNC were caused by COVID-19 restrictions. After the first lockdown, Norway had less severe societal restrictions compared with other European countries<sup>3</sup> and at no point were mothers with suspected or confirmed COVID-19 advised to be separated from their newborns.<sup>28</sup> Our finding that the QMNC index increased steadily over time may be explained by several factors, including a better organization of care over time, and downscaling of restrictions.<sup>29</sup>



**TABLE 3** Quality of maternal and newborn care index over time adjusted for maternal characteristics. Results of the multivariable quantile regression estimates ( $n = 1615$ )

	1st quartile		2nd quartile (median)		3rd quartile	
	Coefficient (95% CI)	P value	Coefficient (95% CI)	P value	Coefficient (95% CI)	P value
Month	4.72 (3.69–5.75)	<0.001	3.68 (2.83–4.53)	<0.001	2.86 (2.28–3.43)	<0.001
Age range, year						
18–25	-22.50 (-42.14 to -2.86)	0.025	-16.76 (-36.56 to 3.03)	0.097	-12.86 (-24.97 to -0.74)	0.038
26–30	Ref		Ref		Ref	
31–35	2.50 (-5.82 to 10.82)	0.555	-4.85 (-11.65 to 1.95)	0.162	-3.57 (-8.19 to 1.05)	0.129
36–40	4.44 (-7.69 to 18.58)	0.473	-2.94 (-13.17 to 7.28)	0.573	-5.00 (-13.48 to 3.48)	0.247
>40	17.22 (-26.96 to 61.40)	0.445	14.71 (-9.48 to 38.89)	0.233	8.57 (2.96–14.18)	0.003
Parity						
1	Ref		Ref		Ref	
>1	15.00 (7.19–22.81)	<0.001	11.18 (4.73–17.62)	0.001	7.14 (2.99–11.30)	0.001
Educational level						
High school or lower	5.56 (-6.08 to 17.19)	0.349	3.24 (-5.90 to 12.37)	0.487	0.00 (-4.97 to 4.97)	>0.99
University degree	Ref		Ref		Ref	
Postgraduate degree/Masters/Doctorate or higher	13.06 (5.26–20.85)	0.001	6.47 (-0.36 to 13.30)	0.063	3.57 (-1.10 to 8.24)	0.134
Mother born in Norway						
Yes	Ref		Ref		Ref	
No	-5.56 (-20.05 to 8.94)	0.452	-0.59 (-11.74 to 10.56)	0.918	3.57 (-8.09 to 15.23)	0.548
Mode of birth						
Spontaneous vaginal <sup>a</sup>	Ref		Ref		Ref	
Instrumental vaginal	-18.33 (-28.65 to -8.02)	0.001	-18.53 (-27.83 to -9.23)	<0.001	-14.29 (-24.49 to -4.08)	0.006
Cesarean	-32.22 (-45.80 to -18.64)	<0.001	-27.65 (-38.76 to -16.53)	<0.001	-23.57 (-28.45 to -18.69)	<0.001
Intercept	241.11 (228.44–253.78)	<0.001	295.74 (285.96–305.52)	<0.001	332.86 (326.33–339.39)	<0.001

<sup>a</sup>Spontaneous vaginal births include all noninstrumental vaginal births independently of spontaneous or induced onset of labor.

Additionally, it is plausible that women who had more time to mentally prepare for a birth with restrictions in place perceived better QMNC than women who were due to deliver in the early stages of the pandemic, although most of our indicators (such as breastfeeding, rooming-in, and fundal pressure) were exposed to little subjectivity. To objectively document a trend in the explored indicators over time, and to assess whether observed gaps in QMNC will be solved after the end of the COVID-19 pandemic, more rounds of surveys should be performed in the future. This should not refrain stakeholders from acting now, based on the observed data, to improve QMNC in Norway. Notably, a recent study from Norway found that one in three women who gave birth during the pandemic scored high on depressive symptoms compared with 10% in the prepandemic reference population.<sup>12</sup>

The main strengths of the study are the use of a validated questionnaire<sup>17</sup> and the large study sample. A strength of recruiting participants through social media is that we reached a large group of potential respondents in a short time at national level. A weakness of this strategy is the risk of selection bias through

the anonymous and voluntary participation in the study. In addition, we missed women not using social media, or those who did not have an acquired level of Norwegian to understand the invitation to participate. Compared with the total number of women who gave birth in 2020, women older than 35 years are underrepresented, while nulliparous and women aged 25–30 years are overrepresented.<sup>30</sup> Women with a university degree are strongly overrepresented in the study (76.4%), compared with the overall proportion in the population of Norwegian women of fertile age in 2020 (47.5%).<sup>31</sup> Almost one in three women who gave birth in Norway in 2020 were born outside the country (27.4%), compared with only 7% in the study sample.<sup>32</sup> This lack of representation from more disadvantaged and vulnerable groups limits the generalizability of the study. However, it is unknown in which direction this may have affected results, i.e. if toward better or worse perceived QMNC. Another weakness is that we did not have information about the specific birthplace of the participants. Such information could have provided a better understanding of how different interpretations and practice variations of the COVID-19

restrictions could have influenced women's perceived QMNC. Women who gave birth outside a birth facility were excluded since they fell outside the scope of the study; however, on average, less than 1% of births take place outside birth facilities in Norway and it has probably not influenced our results. The finding that almost half of the respondents reported that they had difficulties in attending routine antenatal care visits warrants further investigation.

In conclusion, although many of the indicators included in this study suggest high QMNC in Norway, our findings highlight that gaps exist. These gaps, such as inadequate staff number and frequent use of fundal pressure, should be addressed and policymakers in maternal and newborn health need to take these findings into consideration. We also found that women's experience of QMNC improved during the study period, but further research is needed to gain knowledge on QMNC during the next phases of the pandemic and beyond.

### AUTHOR CONTRIBUTIONS

Marzia Lazzerini conceived the IMAGiNE EURO study, with major inputs from Ingvild Hersoug Nedberg, Eline Skirnisdottir Vik, Sigrun Kongslie, Ilaria Mariani, Emanuelle Pessa Valente, and Benedetta Covi who contributed to revising the protocol. Eline Skirnisdottir Vik promoted the survey. Ingvild Hersoug Nedberg wrote the first draft, with major inputs from Eline Skirnisdottir Vik, Sigrun Kongslie, and Marzia Lazzerini and additional inputs from all other authors. Ilaria Mariani analyzed the data. Ingvild Hersoug Nedberg wrote the final draft, with major inputs from all authors. All authors approved the final version of the manuscript for submission.

### ACKNOWLEDGMENTS

The IMAGiNE EURO project was supported by the Ministry of Health, Rome - Italy, in collaboration with the Institute for Maternal and Child Health IRCCS Burlo Garofolo, Trieste - Italy. This study was supported by the UiT The Arctic University of Norway. We would like to thank the volunteers who helped in the development of the questionnaire and all women who took the time to respond to the survey despite the burden of the COVID-19 pandemic. We would also like to thank Marit Kongslie for back-translation of the Norwegian questionnaire. Special thanks to the IMAGiNE EURO study group for their contribution to the development of this project and support for this manuscript.

### CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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## DATA AVAILABILITY STATEMENT

Data can be made available on reasonable request to the corresponding author or the last author.

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**How to cite this article:** Nedberg IH, Vik ES, Kongslien S, et al. Quality of health care around the time of childbirth during the COVID-19 pandemic: Results from the IMAGINE EURO study in Norway and trends over time. *Int J Gynecol Obstet.* 2022;159(Suppl. 1):85-96. doi: [10.1002/ijgo.14460](https://doi.org/10.1002/ijgo.14460)

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