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Large gaps in the quality of healthcare experienced by Swedish mothers during the COVID-19 pandemic: A cross-sectional study based on WHO standards

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ABSTRACT

Background and Problem: Existing healthcare systems have been put under immense pressure during the COVID-19 pandemic. Disruptions in essential maternal and newborn services have come from even high-income countries within the World Health Organization (WHO) European Region.
Aim: To describe the quality of care during pregnancy and childbirth, as reported by the women themselves, during the COVID-19 pandemic in Sweden, using the WHO 'Standards for improving quality of maternal and newborn care in health facilities'.
Methods: Using an anonymous, online questionnaire, women ≥18 years were invited to participate if they had given birth in Sweden from March 1, 2020 to June 30, 2021. The quality of maternal and newborn care was measured using 40 questions across four domains: provision of care, experience of care, availability of human/physical resources, and organisational changes due to COVID-19.
Findings: Of the 5003 women included, n = 4528 experienced labour. Of these, 46.7% perceived a poorer quality of maternal and newborn care due to the COVID-19. Fundal pressure was applied in 22.2% of instrumental vaginal births, 36.8% received inadequate breastfeeding support and 6.9% reported some form of abuse. Findings were worse in women undergoing prelabour Caesarean section (CS) (n = 475). Multivariate analysis showed significant associations of the quality of maternal and newborn care to year of birth ($P < 0.001$), parity ($P < 0.001$), no pharmacological pain relief ($P < 0.001$), prelabour CS ($P < 0.001$), emergency CS ($P < 0.001$) and overall satisfaction ($P < 0.001$).
Conclusion: Considerable gaps over many key quality measures and deviations from women-centred care were noted. Findings were worse in women with prelabour CS. Actions to promote high-quality, evidence-based and respectful care during childbirth for all mothers are urgently needed.

Abbreviations: CS, Caesarean section; COVID-19, Coronavirus disease 2019; IMAgINE-Euro, Improving Maternal Newborn Care in Europe; QMNC, Quality of maternal and newborn care; WHO, World Health Organization.

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Problem

The COVID-19 pandemic has imposed huge challenges on existing healthcare systems and has disrupted essential maternal and newborn services.

What is Already Known

Studies have reported deteriorations in maternal and neonatal health care services during the COVID-19 pandemic. Reports of decreased use of antenatal services and increased maternal stress and anxiety have come even from high-income countries within the World Health Organization (WHO) European region.

What this Paper Adds

Striking gaps over many key quality of maternal and newborn care measures were noted including the use of outdated practices and deviations from women-centred care. Women giving birth by Caesarean section expressed lower quality of maternal and newborn care scores, highlighting the importance of supporting this group in particular.

1. Introduction

Maternal experience of labour and birth is multidimensional and is influenced by a variety of factors including mode of birth, provision of care, experience of care and use of available resources [1–5]. The COVID-19 pandemic has imposed huge challenges on existing healthcare systems throughout the world and has disrupted essential maternal and newborn services [6–8]. Studies have reported substantial reductions in medical counselling and support increased medicalisation of maternal and newborn care and limitations in evidence-based practices such as breastfeeding [6–8]. These changes are not just limited to low income countries. Reports of deteriorations in key maternal-child health indicators such as increased rates of stillbirths, decreased use of antenatal services and increased maternal stress and anxiety have come from even high-income countries within the World Health Organization (WHO) European Region [6,9,10].

Scandinavia, and Sweden in particular, has one of the lowest maternal and perinatal mortality rates in the world [11,12]. With approximately 115 000 births annually, antenatal care is universally available and is free of charge [13,14]. Midwives are the main providers of antenatal care but obstetricians are involved when needed. Maternal healthcare staff follow national and local guidelines that aim to provide the highest standard of evidence-based care. However, the midwife who attends childbirth is rarely the same who cared for the women during pregnancy [13]. Home birth is rare with the overwhelming majority of births (>99.0%) occurring at the 42 maternity hospitals distributed throughout the country [14].

The WHO has emphasised the importance of quality of maternal and newborn care measures around the time of childbirth in several publications [15–20] along with accentuating the value of collecting women's views and choices [17]. In the context of a multicountry project, with partners from 20 countries within the WHO European Region (**Table S1**), a questionnaire based on a key set of 40 quality measures was developed. These measures were based on the WHO 'Standards for improving quality of maternal and newborn care in health facilities' and subsequently validated and used for an online survey. This was done in order to collect the viewpoints of women who gave birth during the COVID-19 pandemic across the WHO European Region [21].

In light of the increasing importance of women-reported outcomes, Sweden, being at the forefront with regard to universal access of high-quality maternal healthcare services, was an interesting setting to assess the WHOs standards. Consistent reports of increased risk for adverse maternal-perinatal outcomes [22,23], even from early on in the pandemic [24], had led to considerable concern and anxiety among pregnant women in Sweden [25], however there is little data exploring changes in the quality of maternal and newborn care in Sweden during the COVID pandemic.

Hence, the objective of this study was to report the findings from the 40 quality measures in women who gave birth in Sweden during the COVID-19 pandemic. We also wanted to investigate changes in the quality of maternal and newborn care depending on various background and socio-economic characteristics in the women participating in our study.

2. Participants, methods and ethics

2.1. Study design and participants

Only mothers giving birth in Sweden from a multicountry project called "Improving Maternal Newborn Care in Europe" (IMAgINE-Euro) [26] were included in the study. The Strengthening the Reporting of Observational Studies (STROBE) in Epidemiology guidelines for reporting on cross-sectional studies were used to report the findings of this study [27].

The IMAgiNE EURO questionnaire was translated into 23 languages and actively disseminated by project partners across Europe including Sweden. Using social media platforms, women who gave birth in Sweden were invited to join the study in their preferred language. Most of the women were recruited through Instagram swipe-up links administered by accounts run by the maternity wards of the two university hospitals with a large national following or by parenting influencer accounts (voluntary, without reimbursement) as well as through Facebook links shared in parental groups. The study reports on data collected from November 26, 2020 up to June 30, 2021.

Women at least 18 years of age who gave birth in Sweden from March 1, 2020 up to the end of the data collection period (June 30, 2021) were asked to give voluntary consent to participate in an online, anonymous survey. Women who did not match the above criteria, or declined participation, or did not give birth in the hospital setting were excluded from the study.

2.2. Data collection tool

Data were collected online using REDCap 8.5.21 - © 2021 Vanderbilt University. The IMAgiNE EURO questionnaire included 40 questions based on WHO standards [28], on four domains: three domains from WHO Standards [28] (namely: provision of care, experience of care and availability of human and physical resources) and the additional domain on key organisational changes related to the COVID-19 pandemic. The questionnaire included two different paths, i.e., women who underwent labour and those who underwent prelabour Caesarean section (CS) (i.e. before the onset of labour), each with 40 key quality measures. Women who gave birth vaginally were considered as having experienced labour; mothers with prelabour CS were considered as not having experienced labour; women with emergency CS were categorised based on their report of having undergone labour or not. A definition of labour based on the National Institute for Health and Care Excellence (NICE) guidelines was provided to the women [29].

The questionnaire development, validation and its previous use has been reported elsewhere [30]. Briefly, the questionnaire was developed by an international team of experts and validated systematically through six consecutive phases which included: an extensive literature review (screening of 32 754 papers); a Delphi process with international experts and mothers; a formal assessment of the psychometric properties of the tool and two rounds of field testing (including 3940 mothers and 113 decision makers) to evaluate the acceptability and utility of the questionnaire in the real-world setting [30,31]. Further details on the validation and adaptation for the online survey are reported in **Figure S1.** The questionnaire, initially developed in English (**Table S2**), was translated in other languages and back-translated into English following

guidance of the Professional Society for Health Economics and Outcomes Research (ISPOR) Task Force for Translation and Cultural Adaptation Principles of Good Practice [32].

The 40 key measures contributed to a composite quality of maternal and newborn care index (QMNC Index), which ranged from 0 to 400. The index was developed drawing on previous examples [33], as a complementary synthetic measure of the quality of care. Briefly, a predefined score (e.g. 0-5-10 points) was attributed to each possible answer on the 40 questions exploring quality measures; the total QMNC Index was calculated as the sum of all points for all women providing an answer on all the 40 key quality measures. Higher scores therefore reflected better care. Additional details on the QMNC Index are provided in **Table S3.**

2.3. Statistical analyses

Data were cleaned according to standardised operating procedures. We screened for internal consistency among data and duplicates were identified using date and place of birth, other socio-demographic and

Table 1
Characteristics of women included in the study and differences according to mode of birth.

		Total women, N = 5003 n (%, 95%CI)	Women who underwent labour, N = 4528 n (%, 95% CI)	Women with prelabour Caesarean section, N = 475 n (%, 95%CI)	*P* value
Year of giving birth	2020	4290 (85.7, 84.2–86.1)	3894 (86.0, 85–87)	396 (83.4, 80.0–86.7)	0.462
	2021	446 (8.9, 8.1–9.7)	408 (9.0, 8.2–9.8)	38 (8.0, 5.6–10.4)	0.119
	Missing	267 (5.3, 4.7–6.0)	226 (5.0, 4.4–5.6)	41 (8.6, 6.1–11.2)	0.001
Mother born in Sweden	Yes	4416 (88.3, 87.3–89.1)	4015 (88.7, 87.7–89.6)	401 (84.4, 81.2–87.7)	0.006
	No	337 (6.7, 6.0–7.4)	302 (6.7, 5.9–7.4)	35 (7.4, 5.0–9.7)	0.563
	Missing	250 (5.0, 4.4–5.6)	211 (4.7, 4.0–5.3)	39 (8.2, 5.7–10.7)	0.001
Age (years)	18–24	243 (4.9, 4.3–5.4)	231 (5.1, 4.5–5.7)	12 (2.5, 1.1–3.9)	0.013
	25–30	2082 (41.6, 40.2–42.9)	1941 (42.9, 41.4–44.3)	141 (29.7, 25.6–33.8)	<0.001
	31–35	1838 (36.7, 35.4–38.0)	1644 (36.3, 34.9–37.7)	194 (40.8, 36.4–45.3)	0.051
	36–39	482 (9.6, 8.8–10.4)	418 (9.2, 8.4–10.1)	64 (13.5, 10.4–16.5)	0.003
	≥40	111 (2.2, 1.8–2.6)	86 (1.9, 1.5–2.3)	25 (5.3, 3.3–7.3)	<0.001
	Missing	247 (4.9, 4.3–5.5)	208 (4.6, 4.0–5.2)	39 (8.2, 5.7–10.7)	0.001
Educational level[a]	None	3 (0.1, 0.0–0.1)	3 (0.1, 0.0–0.1)	0 (0.0, 0.0–0.0)	>0.999
	Elementary school	2 (0.0, 0.0–0.1)	1 (0.0, 0.0–0.1)	1 (0.2, 0.0–0.6)	0.181
	Junior High school	64 (1.3, 1.0–1.6)	54 (1.2, 0.9–1.5)	10 (2.1, 0.8–3.4)	0.092
	High School	1258 (25.1, 23.9–26.3)	1144 (25.3, 24.0–26.5)	114 (24.0, 20.2–27.8)	0.545
	University degree	2712 (54.2, 52.8–55.5)	2470 (54.5, 53.1–56.0)	242 (50.9, 46.5–55.4)	0.134
	Postgraduate degree / Master /Doctorate or higher	716 (14.3, 13.3–15.3)	647 (14.3, 13.3–15.3)	69 (14.5, 11.4–17.7)	0.888
	Missing	248 (5.0, 4.4–5.6)	209 (4.6, 4.0–5.2)	39 (8.2, 5.7–10.7)	0.001
Parity	1	2820 (56.4, 54.9–57.7)	2603 (57.5, 56.0–58.9)	217 (45.7, 41.2–50.2)	<0.001
	>1	1935 (38.7, 37.3–40.0)	1716 (37.9, 36.5–39.3)	219 (46.1, 41.6–50.6)	<0.001
	Missing	248 (5.0, 4.4–5.6)	209 (4.6, 4.0–5.2)	39 (8.2, 5.7–10.7)	0.001
Type of health care providers who directly assisted childbirth[b]	Midwife	4684 (93.6, 92.8–94.2)	4270 (94.3, 93.6–95.0)	414 (87.2, 84.1–90.2)	<0.001
	Nurse	2236 (44.7, 43.3–46)	1901 (42.0, 40.5–43.4)	335 (70.5, 66.4–74.6)	<0.001
	A student (i.e. before graduation)	1480 (29.6, 28.3–30.8)	1370 (30.3, 28.9–31.6)	110 (23.2, 19.4–27.0)	0.002
	Obstetrics registrar / medical resident (under post-graduation training)	844 (16.9, 15.8–17.9)	656 (14.5, 13.5–15.5)	188 (39.6, 21.0–28.7)	<0.001
	Obstetrics and Gynaecology doctor	1451 (29.0, 27.7–30.2)	1139 (25.2, 23.9–26.4)	312 (65.7, 61.4–70.0)	<0.001
	I don't know (health care providers did not introduce themselves)	354 (7.1, 6.4–7.8)	312 (6.9, 6.2–7.6)	42 (8.8, 6.3–11.4)	0.138
	Other	1299 (26.0, 24.7–27.2)	1169 (25.8, 24.5–27.1)	130 (27.4, 23.4–31.4)	0.497
Which type of student assisted childbirth?	Midwife student	1041 (20.8, 19.7–21.9)	1012 (22.3, 21.1–23.6)	29 (6.1, 4.0–8.3)	<0.001
	Nurse student	102 (2.0, 1.6–2.4)	88 (1.9, 1.5–2.3)	14 (2.9, 1.4–4.5)	0.193
	Medical student	337 (6.7, 6.0–7.4)	270 (6.0, 5.3–6.7)	67 (14.1, 11.0–17.2)	<0.001
Birth mode	Vaginal spontaneous	3736 (74.7, 73.4–75.8)	–	–	–
	Instrumental vaginal birth	369 (7.4, 6.6–8.1)	–	–	–
	Emergency Caesarean section during labour	423 (8.5, 7.7–9.2)	–	–	–
	Emergency Caesarean section before going into labour	173 (3.5, 2.9–4.0)	–	–	–
	Elective Caesarean section	302 (6.0, 5.4–6.7)	–	–	–

[a] Wording on education levels agreed among partners during the Delphi; questionnaire translated and back translated according to ISPOR Task Force for Translation and Cultural Adaptation Principles of Good Practice [32].
[b] Categories are not mutually exclusive, therefore their sum is more than the total.

obstetric data **(Figure S2)**. Summary statistics and the key quality measures were presented as absolute frequencies and percentages. Frequencies of the key quality measures were grouped in women who underwent labour and women with prelabour CS. Odds ratios (OR) were calculated to assess differences in the 40 key quality measures between the two groups. As the QMNC Index was not normally distributed, it was graphically presented as median and interquartile range (IQR). Multivariate analysis was performed to study associations among QMNC Index and key background and socio-demographic characteristics such as maternal age, born in Sweden status, year of giving birth, parity, maternal educational level, mode of birth, pain relief (pharmacological or non-pharmacological) in labour or after CS, overall maternal satisfaction and the presence of an Obstetrics and Gynaecology doctor assisting childbirth. Since the QMNC index has evidence of heteroskedasticity (Breusch-Pagan/Cook-Weisberg test $P < 0.05$ for parity, CS, pain relief, women satisfaction, COVID-19 status) and was not normally distributed, a multiple quantile regression with robust standard errors was performed modelling the median, the 25th and 75th percentile. The categories with the highest frequency were used as reference.

A two tailed *P*-value less than 0.05 was considered statistically significant. Statistical analyses were performed using Stata/SE version 14.0 (Stata Corporation, College Station, TX, USA) and R software version 3.6.1.

3. Results

Of the 34 391 women that accessed the survey, 28 296 met the inclusion criteria. After removing all women that gave birth outside of Sweden (n = 22 732, 80.3%), cases with missing data ≥90% of key variables (n = 400, 7.2%) and suspected duplicates (n = 161, 3.1%), a total of 5003 mothers were included in the final cohort (**Figure S3**). Characteristics of the mothers are reported in Table 1. The majority of women had given birth during 2020 (n = 4290, 85.7%), women with a Post-graduate or University degree accounted for 68.5% of the cohort, and about half (56.4%) were primiparous. Overall, about three-fourths (74.7%) had spontaneous vaginal birth, 7.4% instrumental vaginal birth and 6.0% had prelabour CS. Among the total population, 88.3% of women were born in Sweden. The vast majority (93.6%) were attended by midwives during childbirth with an Obstetrics/Gynaecology doctor being involved in 29.0% of cases. In comparisons between women who underwent labour vs women who underwent prelabour CS, significant differences were found for mothers that were born in Sweden, maternal age ranges, parity, type of healthcare provider who assisted childbirth and type of student who assisted childbirth (Table 1).

The composite QMNC Index scores reported by the women participating in the study are shown in Fig. 1. The mean QMNC Index score was 313.8 ± 52.9. Table 2 shows findings from the 40 key quality measures, divided by domain, in women who underwent labour (Table 2a) and women who underwent prelabour CS (Table 2b). Out of the total number of women who underwent labour (n = 4528), in the domain of provision of care, 327 (7.2%) reported receiving no pain relief during labour, 131 (2.9%) experienced no initial skin to skin contact with their newborn, 338 (7.5%) no early breastfeeding i.e. did not breastfeed during the first two hours after birth, and 764 (16.9%) did not receive constant rooming-in with their newborns. More than one-third (n = 1666, 36.8%) reported inadequate breastfeeding support and 1144 women (25.3%) did not exclusively breastfeed at discharge from the hospital. In the domain of experience of care, 35.4% reported no choice of birth position and 36.0% narrated that they were not asked to consent when instrumental vaginal birth was performed. Half of the women (n = 2297, 50.7%), were not allowed their companion of choice during birth with one-fourth (n = 1199, 26.5%) narrating no clear or effective communication during their childbirth experience. Abuse (physical/verbal/emotional) was reported by 311 women (6.9%) with six women reporting some form of informal payment to health care staff (0.1%). In the domain availability of human and physical resources, the majority of women reported that they had not received information on maternal danger signs (i.e. excessive vaginal bleeding, difficulty urinating, difficulty breathing) (52.5%) nor information about possible danger signs to look out for in their newborn after birth (64.8%) and 24.8% thought that the number of health care providers were inadequate. With regard to the COVID-19 pandemic domain, 38.7% observed poor ward reorganisation and almost half of the women reported an overall reduction in the quality of care provided due to the pandemic (46.7%). Interestingly, the majority of women (62.5%) noted that health care providers did not always use personal protective equipment (PPE). Sub-analysis of this group (**Table S4**), showed significant improvement in observed use PPE by health care providers by women that gave birth in 2021 as compared to women who gave birth in 2020 ($P < 0.001$).

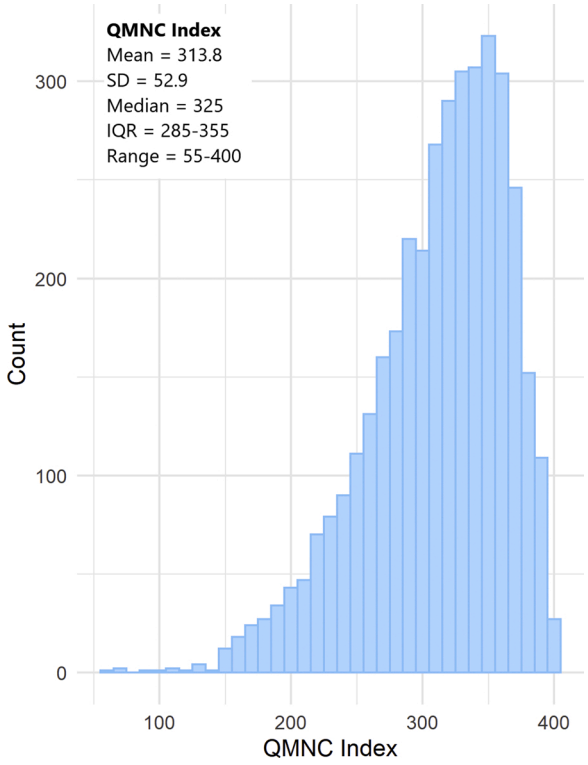

Fig. 1. Histogram of the QMNC Index reported by the women included in the study (N = 3799).
Abbreviations: IQR = interquartile range; QMNC = quality of maternal and newborn care, SD = standard deviation.

In the group of women who underwent prelabour CS (n = 475), shortcomings in the quality of maternal and newborn care were generally more frequent as compared to women who underwent labour (Table 3). Significant differences included: no skin-to-skin (16.6% in those who did not experience labour vs 2.9% in those who did, OR 6.8 95% CI 5.0–9.1); no early breastfeeding (21.1% vs 7.5%, OR 3.3 95% CI 2.6–4.3); inadequate breastfeeding support (46.1% vs 36.8%, OR 1.5 95% CI 1.2–1.8); no exclusive breastfeeding at discharge (44.8% vs 25.3%, OR 2.4 95%CI 2.0–3.0), no immediate attention when needed (42.9% vs 30.3%, OR 1.8 95% CI 1.4–2.1); no clear/effective communication 37.9% vs 26.5%, OR 1.7 95% CI 1.4–2.1); no involvement in choices (41.3% vs 30.6%, OR 1.6 95% CI 1.3–2.0); not treated with dignity (28.0% vs 18.4%, OR 1.7 95% CI 1.4–2.2); no emotional support (27.8% vs 20.1%, OR 1.5 95% CI 1.2–1.9); bad room comfort and equipment (13.1% vs 7.0%, OR 2.1 95% CI 1.5–2.8) and inadequate number of women per room (4.8% vs 9.6%, OR 0.5 95% CI 0.3−0.8). In the COVID-19 domain, mothers reported large access barriers to health care services (26.5% vs 33.9%, OR 1.5 95% CI 1.2–1.8) and inadequacies in their communication with health care providers (39.0% vs 47.8%, OR 1.5 95% CI 1.3–1.9) (Table 3).

Multivariate analysis (Table 4) showed significant associations of the QMNC Index to age (31−35 years) for the 25th percentile ($P = 0.02$), age (36−39 years) for the 25th and 75th percentiles ($P = 0.001$ and $P =$

Table 2a
Results from the Quality of maternal and newborn care questionnaire in women who underwent labour (N = 4528).

Provision of care[b]	n (%)	Experience of care[b]	n (%)	Availability of human and physical resources[b]	n (%)	COVID-19 pandemic	n (%)
N	4528	N	4528	N	4528	N	4528
No pain relief in labour	327 (7.2)	No liberty of movements in labour	961 (21.2)	No timely care by health care providers at hospital arrival[a]	483 (10.7)	Difficulties in antenatal care	1352 (29.9)
2a. Simple vaginal birth	3736 (82.5)	No choice of birth position (vaginal birth)	1321/3736 (35.4)	No maternal danger signs information	2375 (52.5)	Access barriers	1201 (26.5)
2b. Instrumental vaginal birth	369 (8.1)	No consent requested (instrumental vaginal birth)	133/369 (36.0)	No newborn danger signs information	2934 (64.8)	Inadequate info graphics	230 (5.1)
2c. Caesarean section (CS)	423 (9.3)	No information on newborn (emergency CS)	183/423 (43.3)	Bad room comfort and equipment	315 (7.0)	Inadequate wards reorganisation	1754 (38.7)
3a. Episiotomy (vaginal birth)	242/3736 (6.5)	No clear/effective communication	1199 (26.5)	Inadequate number of women per rooms	435 (9.6)	Inadequate room reorganisation	1424 (31.4)
3b. Fundal pressure (instrumental vaginal birth)	82/369 (22.2)	No involvement in choices	1387 (30.6)	Bad room cleaning	278 (6.1)	Inadequate hand-washing station	202 (4.5)
3c. No pain relief after CS	96/423 (22.7)	Limited companionship hours	2297 (50.7)	Bathroom inadequacy	500 (11.0)	Health care providers not always use personal protective equipment	2828 (62.5)
No skin to skin	131 (2.9)	Not treated with dignity	833 (18.4)	Inadequate partner visiting hours	2452 (54.2)	Number of health care providers inadequate	1651 (36.5)
No early breastfeeding	338 (7.5)	No emotional support	910 (20.1)	Number of health care providers inadequate	1123 (24.8)	Inadequate communication	1765 (39.0)
Inadequate breastfeeding support	1666 (36.8)	No privacy	717 (15.8)	Lack of professionality by health care providers	230 (5.1)	Reduction in quality of maternal and newborn care due to COVID-19	2113 (46.7)
No rooming-in	764 (16.9)	Abuse (physical/verbal/emotional)	311 (6.9)				
Not allowed to stay with the baby as wished	437 (9.7)	Informal payment	6 (0.1)				
No exclusive breastfeeding at discharge	1144 (25.3)						
No immediate attention when needed	1373 (30.3)						

0.006 respectively), year of giving birth ($P < 0.001$) across all percentiles, parity >1 ($P < 0.001$) for the 50th percentile, no pain relief ($P < 0.001$) across all percentiles and overall women satisfaction ($P < 0.001$) across all percentiles were observed. Women with an emergency CS reported significantly lower coefficients for all percentiles ($P < 0.001$) as compared to women with spontaneous vaginal birth, with increasing coefficients at lower quantiles. Similarly, women with a prelabour CS had lower coefficients for the 25th ($P = 0.007$), and 50th quantiles ($P < 0.001$) as compared to women with spontaneous vaginal birth.

4. Discussion

To the best of our knowledge, this is the first large scale study investigating women's views on the quality of maternal healthcare services provided in Sweden during the COVID-19 pandemic. Women reported an overall reduction in the quality of maternal health care services as compared to before the pandemic. Of note, the majority of the women included in the study had given birth in 2020 (85.7%), where knowledge on how COVID-19 could affect pregnant women was scarce and healthcare services were struggling to formulate evidence based clinical guidelines and coping with enormous changes in their infrastructure [24,34–36].

Sweden did not enforce national lock-downs to decrease the spread of COVID-19. Instead, strict recommendations were issued by authorities such as social-distancing, staying at home if one had symptoms of COVID-19 and to work from home as much as possible [37]. In the beginning of the pandemic, wearing face masks was not recommended outside of healthcare settings and there was rapid spread of the virus prior to the introduction of vaccines [37]. Pregnant women were recognised as a risk group only from February 2021, more than a year after the start of the pandemic. This may affect the findings in this study and a Swedish qualitative study [38] found that pregnant women felt vulnerable in the sense that maternal health-care services did not provide much guidance regarding COVID-19 during pregnancy. Despite this, trust in maternal health-care services was strong [38].

In our study, many women observed barriers and difficulties in accessing basic antenatal services and were not satisfied by the reorganisation of healthcare services in the pandemic. Up to 62.5% of women noted that health care providers did not always use PPE. These findings may be explained by shortages in the availability of PPE during the beginning of the pandemic along with inter-regional changes in recommendations (to save PPE for only suspected/confirmed cases of COVID-19) [39,40] but they also highlight the fact that Swedish maternal healthcare services were not prepared for the pandemic. Marked improvement in PPE use from 29.8% in 2020 to 85.9% in 2021 confirms our reasoning for the reported figures.

A number of findings were contrary to current clinical recommendations. For example, 36.0% reported no consent requested prior to instrumental vaginal birth and 22.2% of women undergoing instrumental vaginal birth reported the use of fundal pressure which is not recommended in current guidelines [41] and 26.5% of women felt that there was a lack of clear/effective communication. Whether the use of techniques such as the Kristeller manoeuvre, occurred in a higher frequency during the pandemic (as compared to earlier) was not examined in the current study. However, we do know that there have been workforce shortages in Sweden during the pandemic which may have aggravated the ability to deliver high-quality, evidence-based care including appropriate women-centred care. A recent study including 1747 midwives in Sweden, reported that the midwives worked in a highly strained environment that was characterised by high demands and low control [42]. However, there is also evidence that measures taken during the COVID-19 pandemic disrupted the quality of care

Table 2b
Results from the Quality of maternal and newborn care questionnaire in women who underwent prelabour Caesarean section (N = 475).

Provision of care[b]	n (%)	Experience of care[b]	n (%)	Availability of human and physical resources[b]	n (%)	COVID-19 pandemic	n (%)
N	475	N	475	N	475	N	475
Type of Caesarean section (CS)		No vaginal examination consent request	57 (12.0)	No maternal danger signs information	262 (55.2)	Difficulties in antenatal care	161 (33.9)
1a. Emergency CS before labour	173 (36.4)	No information on newborn (CS)	164 (34.5)	No newborn danger signs information	310 (65.3)	Access barriers	161 (33.9)
1b. Prelabour CS	302 (63.6)	No clear/effective communication	180 (37.9)	Bad room comfort and equipment	62 (13.1)	Inadequate info graphics	27 (5.7)
No pain relief after CS	95 (20.0)	No involvement in choices	196 (41.3)	Inadequate number of women per rooms	23 (4.8)	Inadequate wards reorganisation	214 (45.1)
No skin to skin	79 (16.6)	Limitations in companionship	246 (51.8)	Bad room cleaning	39 (8.2)	Inadequate room reorganisation	141 (29.7)
No early breastfeeding (within 2 h of birth)	100 (21.1)	Not treated with dignity	133 (28.0)	Bathroom inadequacy	52 (10.9)	Inadequate hand-washing station	24 (5.1)
Inadequate breastfeeding support	219 (46.1)	No emotional support	132 (27.8)	Inadequate partner visiting hours	265 (55.8)	Health care professionals not always use personal protective equipment	311 (65.5)
No rooming-in	90 (18.9)	No privacy	87 (18.3)	Number of health care professions inadequate	124 (26.1)	8. Number of health care professions inadequate	193 (40.6)
Not allowed to stay with the baby as wished	50 (10.5)	Abuse (physical/verbal/ emotional)	44 (9.3)	Lack of professionality by health care professionals	27 (5.7)	Inadequate communication	227 (47.8)
No exclusive breastfeeding at discharge	213 (44.8)	Informal payment	0 (0)	Inadequate wards reorganisation	214 (45.1)	Reduction in quality of maternal and newborn care due to COVID-19	239 (50.3)
No immediate attention when needed	204 (42.9)						
No timely care by health care professionals at hospital arrival [a]	50 (10.5)						

Note for *provision of care*: indicators 3a, 3b, 3c are based on mode of birth: 3a. on vaginal birth; 3b on instrumental vaginal birth, 3c. on emergency Caesarean section during labour.
Note for *experience of care*: indicators 2a, 2b, 2c among women who underwent labour are based on mode of delivery (2a. on vaginal birth; 2b on instrumental vaginal birth, 2c emergency caesarean section during labour), indicator 2 for women who did not undergo labour is based on caesarean section birth mode.
Abbreviations: CS = Caesarean section.
[a] According to the WHO standards this indicator pertains both to the provision domain and the resource's domain.
[b] All the indicators in the three domains of provision of care, experience and resources are directly based on WHO standards.

provided to women during labour and respectful maternity care across many global settings. Health workers from 71 countries reported that respectful care provided to women and newborns with suspected or confirmed COVID-19 infection was severely affected due to health workers' fear of getting infected and enhanced infection prevention measures [43]. Staff reported being overwhelmed by rapidly changing medical guidelines. Also, the use of PPE reduced face-to-face contact with women and led to depersonalization of care. This affected the ability of healthcare providers to give physical and emotional support to the women [43]. This is further confirmed by a qualitative study from Australia [44], in which women described perceiving care during the pandemic as impersonal and incomplete, resulting in a very different experience than expected including missing care.

Another important aspect is the concept of 'consent' in maternity care. Midwives and obstetricians have a duty to ensure that women understand the risks of medical interventions during childbirth and can make an informed choice [45]. By the very nature of instrumental vaginal birth, consent needs to be obtained even in an emergency setting. Women should therefore be informed about possible birth interventions already during their antenatal education. This may enable them to give informed consent in the emergency setting.

In our study, 18.4% of women felt that they were not treated with dignity and 6.9% narrated that they suffered from some form of abuse (physical/verbal/emotional) during their childbirth experience. Indeed, respectful maternal care is increasingly being recognised as a critical element of strategies to improve the quality of maternity care. Healthcare providers should always aim to ensure the dignity of all women during childbirth while providing evidence-based maternity care that fosters wholeness and safety [46].

The results from the quality of maternal and newborn care measures were significantly worse in the group of women delivered by prelabour CS, with women lacking early skin-to-skin contact, breastfeeding support, clear communication and involvement in choices among a range of other factors. An important aspect to bear in mind is that women undergoing prelabour CS often have underlying health conditions that make this group more susceptible to a negative birth experience. Nystedt et al. [47] highlighted that increased medicalisation of birth can lead to a negative experience for both the mother and her partner. Therefore, while most of the women reported a relatively high QMNC Index, the study clearly shows that there is room for improvement across all provisional domains of maternal healthcare services. In addition to the need for continuous monitoring of these domains, these findings can be adapted to shape future maternal health policies for implementation not only in Sweden, but in other countries as well.

The use of a standardised validated questionnaire, divided into four comprehensive domains and covering key quality measures based on the WHO Standards, was a major strength of the current study. Questions exploring women's views on structural changes in maternal health services due to the COVID-19 pandemic were also added to the survey and it should be noted that the survey was an evidence-based framework centred around what women and newborn infants need from maternal and newborn services [17]. In addition, the cohort accounted for a considerable proportion of the total births expected in the country [14] during the study period (13.1%) and can therefore shed light on the views and opinions of the larger population as well. Since the survey was disseminated using social media and was, in its entirety, web-based, a large portion (89.2%) of women who accessed the survey provided informed consent, which suggested a good response rate and willingness to participate. Good internet resources in Sweden further facilitated the dissemination of the survey.

One important limitation was a relative over-representation of highly educated women as compared to expected levels in the general population. Higher education in women [48] has been reported to be associated with a better quality of maternal and newborn care, which

Table 3
Comparison of the 40 key Quality of maternal and newborn care measures between women who underwent labour (N = 4528) and women who underwent prelabour Caesarean section (N = 475).

Provision of care	Adj OR (95% CI)	*P*-value	Experience of care	Adj OR (95% CI)	*P*-value	Availability of human and physical resources	Adj OR (95% CI)	*P*-value	COVID-19 pandemic	Adj OR (95% CI)	*P*-value
3c. No pain relief after CS	0.9 (0.6; 1.2)	0.381	2c. No information on newborn (ECS)	0.7 (0.5; 0.9)	0.028	No timely care by health care providers at hospital arrival[a]	0.9 (0.7; 1.3)	0.683	1. Difficulties in antenatal care	1.3 (0.9; 1.5)	0.054
No skin to skin	7.3 (5.2; 10.1)	<0.001	No clear/effective communication	1.7 (1.4; 2.2)	<0.001	No maternal danger signs information	1.1 (0.9; 1.4)	0.106	2. Access barriers	1.4 (1.1; 178)	0.006
No early breastfeeding	3.5 (2.7; 4.6)	<0.001	No involvement in choices	1.6 (1.3; 2.0)	<0.001	No newborn danger signs information	1.1 (0.9; 1.3)	0.528	3. Inadequate info graphics	1.0 (0.8; 1.3)	0.955
Inadequate breastfeeding support	1.7 (1.3; 2.0)	<0.001	Limited companionship hours	1.1 (0.9; 1.3)	0.361	Bad room comfort and equipment	2.1 (1.5; 2.8)	<0.001	Inadequate wards reorganisation	1.4 (1.1; 1.7)	0.002
No rooming-in	1.2 (0.9; 1.5)	0.152	Not treated with dignity	1.8 (1.4; 2.2)	<0.001	Inadequate number of women per rooms	0.5 (0.3; 0.8)	0.001	Inadequate room reorganisation	0.9 (0.7; 1.1)	0.327
Not allowed to stay with the baby as wished	0.98 (0.7; 1.4)	0.927	No emotional support	1.5 (1.2; 1.9)	<0.001	Bad room cleaning	1.4 (0.9; 2.0)	0.109	Inadequate hand-washing station	1.2 (0.8; 1.9)	0.462
No exclusive breastfeeding at discharge	2.5 (2.0; 3.1)	<0.001	No privacy	1.2 (0.9; 1.6)	0.136	Bathroom inadequacy	1.0 (0.7; 1.4)	0.887	Health care providers not always use personal protective equipment	1.3 (1.0; 1.6)	0.024
No immediate attention when needed	1.8 (1.5; 2.3)	<0.001	Abuses (physical /verbal /emotional)	1.5 (1.1; 2.1)	0.021	Inadequate partner visiting hours	1.2 (0.9; 1.5)	0.084	Number of health care providers inadequate	1.3 (1.0; 1.6)	0.016
			Informal payment	NA[b]	NA	Number of health care professionals inadequate	1.2 (0.9; 1.5)	0.186	Inadequate communication	1.5 (1.3; 1.9)	<0.001
						Lack of professionality by health care providers	1.2 (0.8; 1.7)	0.480	Reduction in quality of maternal and newborn care due to COVID-19	1.2 (1.0; 1.5)	0.027

Note: Odds ratios are calculated using women who went in to labour as reference and adjusting for age, educational level, year of birth, parity, mother born in Sweden and type of health care providers who directly assisted childbirth. Only key measures evaluated on both women who underwent labour and women who did not are shown.
Note for *provision of care*: indicator 3c is based on mode of birth; the emergency caesarean section during labour (N = 423) is the reference group.
Note for *experience of care*: indicators 2c is based on mode of birth; the emergency caesarean section during labour (N = 423) is the reference group.
[a] According to the WHO standards this indicator pertains both to the resource's domain and the provision domain.
[b] No women made any kind of informal payment among women who did not undergo labour.

would implicate that there is a possible overestimation in our study. On the other hand, it is well known that mothers with higher education are more empowered to express their views freely and have better access to internet resources [48]. This, in turn, may lead them to be overly critical causing an under-estimation of the actual quality of care. The cohort may have had selection bias with regard to other characteristics which have not been accounted for. As mentioned earlier, women undergoing prelabour CS often have underlying health conditions like preeclampsia, which can be an added source of bias. Further, due to limited socio-demographic data, it is not possible to identify intersecting forms of discrimination (e.g. gender, sexual orientation, race, relationship status etc.) that could impact the quality of care. Since the sample was self-selected, with women participating that were genuinely interested in the subject matter, it is difficult to speculate how the results were affected since women with both a positive or a negative childbirth experience may have interest in reporting their experiences. On the other hand, most of the 40 questions included in the survey were binary measures and were therefore easy to answer (e.g. fundal pressure with instrumental vaginal birth yes/no), which increased the reliability of the data. Certain questions were open to the respondents own subjective judgment (e.g. questions on respect and dignity) and indicators of the quality of maternal and newborn care lack conventional validation. The findings of the study must therefore be interpreted in light of these limitations [48,49].

5. Conclusions

The study assessed the quality of care provided in maternal health services in Sweden based on the women's own views. Striking gaps over many key quality of maternal and newborn care measures were noted, including the use of outdated practices and deviations from woman-centred care. Women with prelabour CS, including emergency CS, expressed lower QMNC scores across all domains highlighting the importance of supporting this group in particular. This study adds to previous evidence [8,9,17,31,47] advocating for health care providers to use evidence-based practices to improve maternal and newborn healthcare services even in high-income countries such as Sweden.

The findings of this study should be translated into appropriate health policies to improve maternal and newborn health services in Sweden and beyond. Regardless of the pandemic, policymakers at all levels in the health sector are required to work together in order to ensure that all women receive the highest quality of evidence-based care.

Ethical statement

The study was conducted according to General Data Protection Regulation (GDPR) regulations. Participation in the online survey was voluntary and anonymous. Participating women were informed prior to answering the survey about the objectives and methods of the study, including their rights in declining participation. As such, informed

Table 4
Multivariate percentile regression estimates (N = 3716) in association to the QMNC Index.

	25th percentile		50th percentile (median)		75th percentile	
	Coefficient (95%CI)	*P*- value	Coefficient (95%CI)	*P*- value	Coefficient (95%CI)	*P*- value
Age						
18−24	−5 (−12.5; 2.5)	0.194	−5 (−11.7; 1.7)	0.141	1.1 (−5; 7.2)	0.720
25−30	Ref		Ref		Ref	
31−35	5 (0.6; 9.4)	0.026	0 (−2.6; 2.6)	>0.999	1.7 (−1.1; 4.4)	0.235
36−39	7.5 (3.3; 11.7)	0.001	5 (−0.4; 10.4)	0.067	5 (1.4; 8.6)	0.006
≥40	7.5 (−1.8; 16.8)	0.114	0 (−8.3; 8.3)	>0.999	1.7 (−4.1; 7.4)	0.572
Mother born in Sweden						
Yes	Ref		Ref		Ref	
No	−2.5 (−10; 5)	0.514	−5 (−11.2; 1.2)	0.114	0 (−4.8; 4.8)	>0.999
Year of giving birth						
2020	Ref		Ref		Ref	
2021	15 (9.3; 20.7)	<0.001	10 (6.7; 13.3)	<0.001	8.9 (6; 11.8)	<0.001
Parity						
1	Ref		Ref		Ref	
>1	2.5 (−1.3; 6.3)	0.194	5 (2.5; 7.5)	<0.001	1.7 (−0.7; 4.1)	0.173
Educational level						
Junior high school or lower	−2.5 (−11.4; 6.4)	0.583	−5 (−18.4; 8.4)	0.465	−5 (−11.2; 1.2)	0.114
High school	Ref		Ref		Ref	
University or higher	0 (−3.9; 3.9)	>0.999	0 (−2.7; 2.7)	>0.999	−1.1 (−2.3; 4.5)	0.526
Birth mode						
Spontaneous vaginal birth	Ref		Ref		Ref	
Instrumental vaginal birth	0 (−8.6; 8.6)	>0.999	0 (−5.7;5.7)	>0.999	1.7 (−4.7; 8)	0.606
Emergency Caesarean section	−15 (−21.1; −8.9)	<0.001	−15 (−19.6; 10.4)	<0.001	−12.2 (−17.0; −7.5)	<0.001
Prelabour Caesarean section	−30 (−44.6; −15.4)	<0.001	−25 (−30.1; 19.9)	<0.001	−7.8 (−27.5; 12.0)	0.440
Pain relief[a]						
Yes	Ref		Ref		Ref	
No	−27.5 (−35.4; −19.6)	<0.001	−20 (−25.1; −14.9)	<0.001	−20 (−25.5; −14.5)	<0.001
Satisfaction						
Very positive	Ref		Ref		Ref	
Positive	−60 (−63.7; −56.3)	<0.001	−50 (−52.7; 47.3)	<0.001	−43.9 (−46.3; −41.5)	<0.001
Negative	−130 (−136.1; −123.9)	<0.001	−115 (−120.2; −109.8)	<0.001	−103.9 (−110; −97.8)	<0.001
Obstetrics and Gynaecology doctor in the team who directly assisted childbirth						
No	Ref		Ref		Ref	
Yes	2.5 (−2.3; 7.3)	0.307	0 (−3.1; 3.1)	>0.999	0.6 (−2.8; 3.9)	0.743
Intercept	−330 (325.9; 334.1)	<0.001	350 (347; 353)	<0.001	376.2 (363.5; 371)	<0.001

Note: 95% CI and *P*-value are calculated using robust estimation of standard errors.
Abbreviations: QMNC = quality of maternal and newborn care, CI = confidence interval.
[a] During labour or after Caesarean section.

consent was obtained prior to answering the questionnaire. Since no personal information was obtained and there was no way to trace answers back to the respondents, the study was exempted from ethical permission in Sweden SFS 2003:460 (www.etikprovning.se). All data storage and analyses were performed in Italy. Data transmission and storage were secured by encryption. In Italy, the study was approved by the Institutional Review Board of the coordinating centre: the IRCCS Burlo Garofolo Trieste (IRB-BURLO 05/2020 15.07.2020). The study protocol was also reviewed and approved by the ethical committees of three other countries to comply with local regulations: Norway (Norwegian Regional Committee for Medical Research Ethics, 2020/213047), Portugal (Instituto de Saúde Pública da Universidade do Porto, CE20159); and Germany (Bielefeld University ethics committee, 2020-176).

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Conflict of interest

None declared.

Authorship contributions

Marzia Lazzerini is the PI of the IMAgiNE EURO project and conceptualized the research idea, provided the structure for the draft.

Mehreen Zaigham conceptualization; data curation; investigation; methodology; visualization; writing the original draft, review and editing.

Karolina Linden, **Verena Sengpiel**, **Emanuelle Pessa Valente**, **Benedetta Covi**, **Helen Elden** conceptualization; data curation; investigation; methodology; visualization; review and editing of the draft.

Ilaria Mariani conceptualization; data curation; formal analysis; methodology; software; review and editing of the draft.

All authors promoted the surveys and supported the process of data collection. All authors have approved the final version of the manuscript for submission.

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Appendix A. Supplementary data

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