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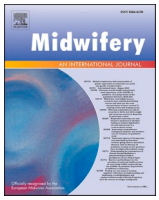

Women ‘s perception on the quality of maternal and newborn care during the COVID-19 pandemic in German-speaking countries: Findings from the IMAgiNE EURO project comparing data from Germany, Switzerland and Austria

Susanne Grylka-Baeschlin [a,*], Michael Gemperle [a], Ilaria Mariani [b], Alessia Abderhalden-Zellweger [c], Céline Miani [d,e], Christoph Zenzmaier [f], Antonia Nathalie Mueller [a], Stephanie Batram-Zantvoort [d], Martina Koenig-Bachmann [f], Claire De Labrusse [c], Maryse Arendt [g], Stefano Delle Vedove [b], Anouck Pfund [c], Imola Simon [h], Emanuelle Pessa Valente [b], Marzia Lazzerini [b,i], IMAgiNE Euro Study Group

[a] *Research Institute of Midwifery and Reproductive Health, School of Health Sciences, ZHAW Zurich University of Applied Sciences, Winterthur, Switzerland*
[b] *WHO Collaborating Center for Maternal and Child Health, Institute for Maternal and Child Health IRCCS “Burlo Garofolo”, Trieste, Italy*
[c] *School of Health Sciences (HESAV), HES-SO University of Applied Sciences and Arts Western Switzerland, Lausanne, Switzerland*
[d] *Department of Epidemiology and International Public Health, School of Public Health, Bielefeld University, Bielefeld, Germany*
[e] *Sexual and reproductive health and rights research unit, Institut national d’études démographiques (Ined), Aubervilliers, France*
[f] *Health University of Applied Sciences Tyrol, Innsbruck, Austria*
[g] *Beruffsverband vun de Laktatiounsberoderinnen zu Lëtzebuerg asbl, Luxembourg, Luxembourg*
[h] *Health Department, University of Applied Sciences Burgenland, Pinkafeld, Austria*
[i] *Maternal Adolescent Reproductive and Child Health Care Centre, Faculty of Epidemiology and Population Health, London School of Hygiene & Tropical Medicine, London, UK*

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ABSTRACT

Problem: Restrictions during the COVID-19 pandemic compromised maternal and newborn care.
Background: Countries in the German speaking area share several clinical care guidelines but differed significantly in the strictness of COVID-19 protective measures.
Aim: To investigate the quality of maternal and newborn care (QMNC) during the COVID-19 pandemic in the German-speaking area and explore associations between the reorganisational changes due to COVID-19 and QMNC, as described with WHO Standards-based Quality Measures.
Methods: As part of the IMAgiNE EURO study (ClinicalTrials.gov: NCT04847336), we conducted an online survey on the QMNC in the German-speaking area, including women who gave birth in Germany, Switzerland, and Austria. Descriptive statistics, Spearman rank correlation coefficient and multivariable quantile regression were used.
Findings: Out of a total of 70,721 women accessing the online questionnaire, 1,875 were included (Germany: n = 1,053, Switzerland: n = 494, Austria: n = 328). Significant differences across countries were found in Quality Measures. In Switzerland, women scored Quality Measures more favourable than in Germany and Austria in all four sub-indexes of QMNC. In Austria, Quality Measures gaps in the sub-index ‘Experience of care’ were higher. The sub-index ‘Reorganisational changes due to COVID-19′ correlated weakly to strongly with the other sub-indexes (between $r = 0.33$ and $r = 0.62$, $p < 0.001$ for all correlations).
Discussion: Midwives and other health professional should pay particular attention to the provision of respectful, high-quality care.

* Corresponding author at: Research Institute of Midwifery and Reproductive Health, School of Health Sciences, ZHAW Zurich University of Applied Sciences, Katharina-Sulzer-Platz 9, CH-8401 Winterthur, Switzerland.
E-mail address: susanne.grylka@zhaw.ch (S. Grylka-Baeschlin).
@SusanneGrylka (S. Grylka-Baeschlin)

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Conclusion: To effectively improve QMNC, further research is essential to monitor the quality of care and develop targeted interventions beyond the COVID-19 pandemic addressing inherent challenges in the organisation and delivery of care.

Introduction

As recommended by the World Health Organization (WHO), high-quality care is essential for maternal and newborn health (World Health Organization, 2016); however, its provision may depend on the organisation of care. Health care needs to be safe, effective, timely, equitable and person-centred to improve health outcomes (World Health Organization, 2016). Assessing quality of care is particularly important during crisis situations such as the COVID-19 pandemic, where health awareness is increasing but the conditions for providing a high quality of care are compromised (Klamroth-Marganska et al., 2021; Renfrew et al., 2020). Learning from the COVID-19 pandemic and investigating international differences in quality of care might generate knowledge that helps to prevent compromised maternity care provision in future crises.

In 2016, WHO (2016) defined the standards for improving the quality of maternal and newborn care in health facilities. The framework for Quality Maternal and Newborn Care (QMNC) by Renfrew et al. (2014) also indicated the importance that all childbearing women and their infants have access to skilled preventive and supportive care and, when needed, to the treatment of pathology. In addition, maternal and newborn care must be provided in a respectful manner, including effective communication and allowing companionship during labour and childbirth to enable a positive birth experience (World Health Organization, 2018).

The SARS-CoV-2 virus quickly spread globally at the beginning of 2020 and had major effects on daily life, working conditions, access to care and care provision (Kc et al., 2020; Townsend et al., 2021; World Health Organization EURO, 2021). During the COVID-19 pandemic, the quality of maternal and newborn care services and access to care were compromised (Chertok et al., 2022; Costa et al., 2022; de Labrusse et al., 2022; Flaherty et al., 2022; Lazzerini et al., 2022b; World Health Organization EURO, 2021). Impaired maternity care provision was found to adversely affect not only birth outcomes but also how respectful care was provided and experienced by parents (Abderhalden-Zellweger et al., 2024; Asefa et al., 2022; Chmielewska et al., 2021; S. Gill et al., 2024). Families were less involved in care, the emotional and physical support was reduced, more unjustified caesarean sections were performed, and women infected with SARS-CoV-2 virus received low-quality care due to fear of contagion (Asefa et al., 2022). Several studies revealed large differences between countries in care provision and reorganisational changes during the COVID-19 pandemic (Lazzerini et al., 2022b) and within countries (Costa et al., 2022; de Labrusse et al., 2022; Drandić et al., 2022 Lazzerini et al., 2022c). However, none focused specifically on countries of the German-speaking area.

The comparison of quality of care in the German-speaking area seems particularly interesting because of the differences in protective measures against the COVID-19 virus, such as school closures, restrictions on social life and mandatory use of physical barriers to contagion (e.g. masks) (Mathieu et al., 2020; Prantner, 2021). Mathieu et al. (2020) showed that Switzerland followed a less strict regime than the neighbouring countries which was reflected in a lower COVID-19 Containment and Health Stringency Index (17.89) compared to Austria (54.76) and Germany (61.67) on December 31, 2022. Mask obligation, fewer antenatal and postnatal checkups as well as visiting and accompanying restrictions in hospitals were observed in all three countries but were implemented more strictly and for a longer period in Germany and Austria compared to Switzerland. In all three countries, German is the major spoken language and all have highly developed and cost-intensive healthcare systems (OECD, 2021). Due to differences in population size, the number of births per year differs between countries with the highest in 2020 in Germany (773,144), followed by Switzerland (85,914) Austria (83,603) (Federal Statistical Office (Switzerland), n.d.; German Federal Statistical Office, n.d.; Statistics Austria, n.d.). Importantly, the three countries share several jointly elaborated guidelines written in German regarding maternity care-related aspects such as vaginal birth and caesarean section(German Society for Gynaecology and Obstetrics (DGGG) et al., 2020a; S. 2020b). Consequently, the problem of medicalisation in maternity care is similar with for example comparable high caesarean section rates ranging from 30.0 % in Austria up to 31.8 % in Germany and 32.6 % in Switzerland (Euro-Peristat, 2022; Federal Statistical Office, n.d.). Furthermore, intrapartum inventions such as labour induction and augmentation are high in all three countries (Daly et al., 2020; Federal Statistical Office, n.d.; Institut für Qualitätssicherung und Transparenz im Gesundheitswesen, 2022; Zenzmaier et al., 2021). Nevertheless, local differences in care provision between Germany and Switzerland, e.g. in the use of epidural anaesthesia and caesarean section, were found prior to the pandemic (Grylka-Baeschlin et al., 2014). Furthermore, impaired QMNC due to the pandemic were reported in Germany, Switzerland, and Austria (Batram-Zantvoort et al., 2023; de Labrusse et al., 2022; Lambelet et al., 2021; Wagner et al., 2022). However, there is no information available comparing those countries based on WHO Standards concerning reorganisational changes in maternity care provision due to the COVID-19 pandemic. Still, the comparison is of special interest because the similar health care systems and common guidelines might give hints about differences in quality of care in relation with major differences in regimes of COVID-19 protective measures.

The IMAgiNE EURO Project, started in 2020 soon after the start of the COVID-19 pandemic, investigated across several countries of the WHO European Region QMNC from service users and health workers perspective, using as standardised tools two validated questionnaires based on WHO Standards (Lazzerini et al., 2022a; Valente et al., 2022). The aim of the current study was to investigate and compare the perceived QMNC across different German-speaking countries participating in the IMAgiNE EURO study, namely Germany, Switzerland, and Austria. It also aimed to explore the associations between reorganisational changes in care due to COVID-19 and comparing countries based on the WHO Standards (Lazzerini et al., 2022a).

Methods

Study design and participants

This cross-sectional study was part of the European study "Improving MAternal Newborn carE in the European Region (IMAgiNE EURO)" led by the WHO Collaborating Center for Maternal and Child Health at the Institute for Maternal and Child Health, IRCCS "Burlo Garofolo", Trieste, Italy (Lazzerini et al., 2022b). The study was conducted in >20 European countries, among others in Germany, Switzerland, and Austria, where a majority of the population speaks German. It was registered in ClinicalTrials.gov (NCT04847336) and the STROBE guidelines (Table S1) for observational studies were followed (von Elm et al., 2007).

Women ≥ 18 years old, having given birth in a hospital setting between March 1, 2020, and March 1, 2023 (date of data extraction) were eligible to participate in the IMAgiNE EURO project. The start of recruitment differed across countries (Germany: December 2020; German part of Switzerland: November 2021, and Austria: July 2022) due to the partnership consolidation in Switzerland and Austria in the

later phases of the project. Thus, the periods of having given birth was also different (Germany: March 1, 2020, to September 7, 2022; Austria: March 2, 2020, to October 18, 2022, and Switzerland: March 2, 2020, to August 11, 2022, see Figure S1). Only in Switzerland, the end of the COVID-19 pandemic (March 2022) was declared before data extraction (The Federal Council, 2022). For the purpose of this study, all questionnaires completed in German of mothers having given birth in Germany, Switzerland or Austria and providing answers to all 40 key Quality Measures and five key socio-demographic questions were included. Selecting the German answers was necessary because Switzerland has three language regions but only the German part is orientated towards the common guidelines with Austria and Germany.

Ethical aspects

Ethical approval for the IMAgiNE Euro project was obtained by the Institutional Review Board of the IRCCS Burlo Garofolo (IRB-BURLO 05/2020 15.07.2020) and for the German data used in this study by the Bielefeld University ethics committee (2020–176). In Switzerland, the Ethics committee of the Canton of Vaud assessed that the study did not fall under the Human Research Act (art. 2, CER-VD, information on July 9, 2021) and in Austria, no additional ethical approvals were necessary. Mothers received written information about the aims and the methods of the project as well as their rights to stop the completion of the study at any time. Before completing the questionnaire, they provided consent through the online tool to participate in the study. Data collection was conducted anonymously, as no personal information with which persons could be identified, was asked. Data transmission and storage were secured by encryption.

Data collection

Data collection methods have been described elsewhere (Lazzerini et al., 2022b). Briefly, an online survey hosted in REDCap® was used to collect data. The questionnaire contained the previously developed and validated 40 Quality Measures derived from key indicators of the quality standards from the World Health Organization (WHO) (Lazzerini et al., 2022a; World Health Organization, 2016). These 40 Quality Measures were subdivided into four sub-indexed: 1) provision of care, 2) experience of care, 3) availability of human and physical resources, and 4) reorganisational changes related to the COVID-19 pandemic. The questionnaire was developed in English and was available in 26 languages (IMAgiNE EURO). From these 40 Quality Measures, a QMNC index could be computed as proposed by Lazzerini et al. (2022a) and done previously in analyses from the same overall data set (Arendt et al., 2022; de Labrusse et al., 2022; Lazzerini et al., 2022b). The QMNC index ranged from 0 to 100 points for each sub-index and 0 to 400 points for the total index (Lazzerini et al., 2022a). Higher QMNC scores indicated higher adherence to WHO standards (Lazzerini et al., 2022a).

Participants accessed the online survey on a voluntary basis after informed consent via a link and could choose their preferred language regardless of the country in which they had given birth. The English version of the questionnaire was translated into German using a multi-step translation approach (Wild et al., 2005). The German translation was performed by three bilingual German and English researchers who were familiar with maternal and newborn care. A reconciliation process was conducted before the back translation as proposed by Wild et al. (2005). Eventually, final reconciliation and consensus led to the final German version of the questionnaire.

The survey was disseminated first in Germany (December 2020) followed by Switzerland (November 21) and Austria (July 2022). Multiple recruitment setting-specific strategies were used such as distribution of flyers and links by health professionals in hospitals and independent midwives, professional bodies, and networks of relevant interest groups such as midwifery associations and parent's initiatives (Table S1). Additionally, social media such as Facebook, X (former Twitter) and Instagram were used to post information and the survey link. An overview of the strategies used in the countries with sufficient German responders to be included in the analysis is shown in Table S2.

Data analysis

IMAgiNE EURO data-cleaning process was described elsewhere (Lazzerini et al., 2022a). Briefly, data cleaning included the removal of missing data of $\geq$ 20 % and suspected duplicates. Additionally, for this study, women missing data for one or more Quality Measures or key socio-demographic questions were excluded.

Data was analysed descriptively computing absolute and relative frequency for categorical variables and for the 40 Quality Measures. Quality Measures had three possible answers: (i) yes, always/almost always (Indicating high quality of care), ii) sometimes, iii) no, never/almost never. To report gaps in Quality Measures, we dichotomised the answers reporting the frequency of "sometimes" and "no, never/almost never" responses. For these two measures, we dichotomized the answers combining "yes, always/almost always" and "sometimes" responses. The QMNC index was calculated according to the predefined methodology (Lazzerini et al., 2022a).

A subgroup analysis by country was conducted, comparing and testing characteristics of women giving birth in Germany, Switzerland, and Austria with a Pearson's Chi-squared test. Quality Measures were also presented by country. To test differences by country a logistic regression model was performed for each Quality Measure adjusting for socio-demographic and obstetric variables (i.e., maternal age, education, year of birth, mode of birth, parity), type of hospital, mother giving birth in the same country where she was born.

The association among the QMNC sub-index 'Reorganisational changes due to COVID-19′ sub-index with each of the other three QMNC sub-indexes for 'Provision of care', 'Experience of care' and 'Availability of physical human resources' as well as differences of these associations between countries were firstly analysed using Spearman rank correlation coefficient. Secondly, a multivariable quantile regression with robust standard errors was performed with the QMNC subindex 'Reorganisational changes due to COVID-19′ sub-index as a dependent variable and as independent variable the QMNC indexes for other sub-indexes, country, maternal age, education, year of birth, mode of birth, parity, type of hospital, mother giving birth in the same country where she was born. The categories with the highest frequency were used as reference.

The statistical significance level was defined at a two-tailed p-value of <0.05. All analyses were performed using Stata Version 14 (StataCorp, 2015) and R version 4.1.1 (R Core Team, 2021).

Findings

Out of a total of n = 70,721 women who assessed the online questionnaire, n = 2110 were completed in German and gave birth in the countries of interest. After the exclusion of cases without consent of participation as well as cases with further exclusion criteria, missing information in key variables and Quality Measures, suspected duplicates, births in other countries and languages other than German, n = 1875 German responses were included in these analyses (Fig. 1). The analysed sample was composed of n = 1053 German responses of women giving birth in Germany, n = 494 in Switzerland and n = 328 in Austria.

Characteristics of participants

Most participants gave birth in 2020 (n = 1230, 65.6 %), followed by 2021 (n = 467, 24.9 %) and 2022 (n = 131, 7.0 %, Table 1). The majority of women gave birth in the country, in which they were born (n = 1672, 89.2 %). A large proportion of the sample was aged between 25 and 39 (n = 1687, 90.0 %) and more than half held a university or postgraduate

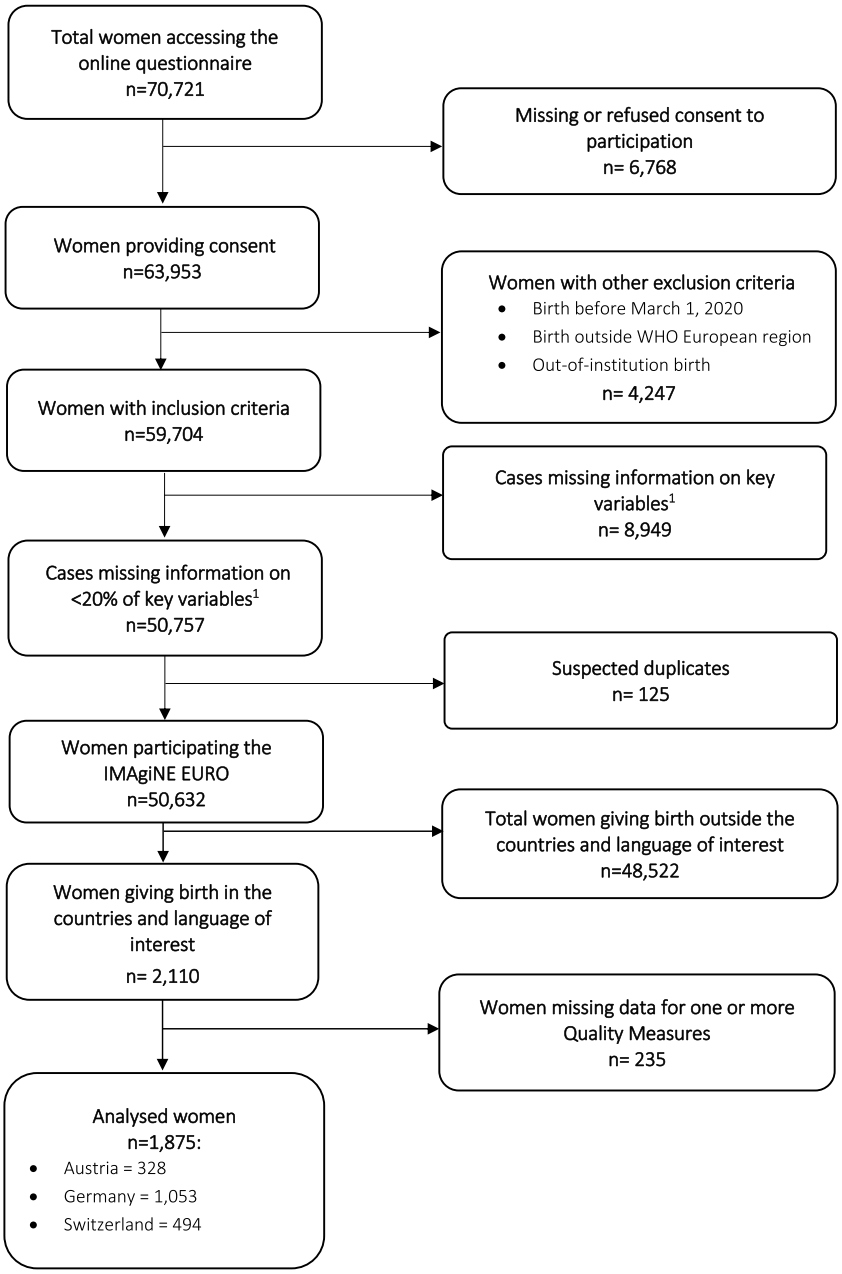

Fig. 1. Flow diagram.
Note: [1] We used 45 key variables (40 key Quality Measures and five key socio-demographic questions).

degree (n = 1108, 59.1 %). Furthermore, most women gave birth in a public hospital (n = 1690, 90.1 %). Regarding mode of birth, nearly two-thirds of participants gave birth vaginally (n = 1221, 65.1 %), n = 171 (9.2 %) had an instrumental birth and n = 482 (25.7 %) a caesarean section (CS) (emergency CS during labour: 11.3 %, emergency CS before labour: 3.6 %, elective CS before labour: 10.8 %). Nearly all women were cared for by a midwife or nurse (n = 1.811, 96.6 %) and most were assisted by an obstetrician or gynaecologist (n = 1447, 77.2 %). In several characteristics, women differed between countries (Table 1). German participants most likely (87.1 %) and those in Austria (32.0 %) least frequently gave birth in 2020 (vs Switzerland: 42.1 %, $p < 0.001$). Women giving birth in Germany most frequently had a postgraduate degree (38.2% vs Austria: 36.9 % and Switzerland: 26.3 %, $p < 0.001$). Austrian participants had most often given birth in the country, in which they were born (91.1% vs Germany: 90.4 % and Switzerland: 85.2 %, p = 0.001). Swiss participants showed the highest rate of giving birth in a private hospital (15.2% vs Germany: 4.2 % and Austria: 7.9 %).

Overall qmnc index and provision of care

The overall QMNC index (Fig. 2) and each QMNC sub-index (Fig. 3) differed significantly across countries, with participants in Switzerland showing higher indexes than those in the other two countries. While there were no significant differences in the mode of birth between Germany, Switzerland, and Austria, there were notable differences in other aspects of 'Provision of care': women who had given birth in Austria reported most often no pain relief during labour (26.2% vs Germany: 22.9 % and Switzerland: 16.8 %, $p < 0.001$, Table 2, Fig. S2). Fundal pressure in instrumental vaginal births were also significantly more frequent in Austria (77.4 %) compared to Germany (67.4 %) and Switzerland (12.2 %, $p < 0.001$). In contrast, women having given birth in Germany experienced most frequently inadequate breastfeeding

Table 1
Characteristics of respondents in the whole study sample and by country.

	Overall study sample n (%) N = 1875	Germany n (%) N = 1053	Switzerland n (%) n = 494	Austria n (%) n = 328	p-value
Year of birth					
2020	1230 (65.6 %)	917 (87.1 %)	208 (42.1 %)	105 (32.0 %)	<0.001
2021	467 (24.9 %)	95 (9.0 %)	250 (50.6 %)	122 (37.2 %)	<0.001
2022	131 (7.0 %)	11 (1.0 %)	24 (4.9 %)	96 (29.3 %)	<0.001
Missing	47 (2.5 %)	30 (2.9 %)	12 (2.4 %)	5 (1.5 %)	
Gave birth in the same country where were born?					
Yes	1672 (89.2 %)	952 (90.4 %)	421 (85.2 %)	299 (91.2 %)	0.001
No	162 (8.6 %)	77 (7.3 %)	62 (12.6 %)	23 (7.0 %)	0.001
Missing	41 (2.2 %)	24 (2.3 %)	11 (2.2 %)	6 (1.8 %)	
Age range					
18–24	43 (2.3 %)	34 (3.2 %)	2 (0.4 %)	7 (2.1 %)	0.002
25–30	438 (23.4 %)	242 (23.0 %)	92 (18.6 %)	104 (31.7 %)	<0.001
31–35	882 (47.0 %)	485 (46.1 %)	250 (50.6 %)	147 (44.8 %)	0.146
36–39	367 (19.6 %)	206 (19.6 %)	107 (21.7 %)	54 (16.5 %)	0.167
≥40	105 (5.6 %)	62 (5.9 %)	32 (6.5 %)	11 (3.4 %)	0.128
Missing	41 (2.2 %)	24 (2.3 %)	11 (2.2 %)	6 (1.8 %)	
Educational level*					
None	1 (0.1 %)	1 (0.1 %)	0 (0.0 %)	0 (0.0 %)	0.676
Elementary school	21 (1.1 %)	3 (0.3 %)	9 (1.8 %)	9 (2.7 %)	<0.001
Junior High school	273 (14.6 %)	185 (17.6 %)	45 (9.1 %)	43 (13.1 %)	<0.001
High School	432 (23.0 %)	238 (22.6 %)	113 (22.9 %)	81 (24.7 %)	0.769
University degree	455 (24.3 %)	200 (19.0 %)	186 (37.7 %)	69 (21.0 %)	<0.001
Postgraduate degree / Master /Doctorate or higher	653 (34.8 %)	402 (38.2 %)	130 (26.3 %)	121 (36.9 %)	<0.001
Missing	41 (2.2 %)	24 (2.3 %)	11 (2.2 %)	6 (1.8 %)	
Birth mode					
Spontaneous vaginal birth	1221 (65.1 %)	700 (66.5 %)	313 (63.4 %)	208 (63.4 %)	0.378
Instrumental vaginal birth	172 (9.2 %)	89 (8.5 %)	52 (10.5 %)	31 (9.5 %)	0.412
Emergency caesarean section during labour	212 (11.3 %)	124 (11.8 %)	47 (9.5 %)	41 (12.5 %)	0.320
Emergency caesarean section before labour	67 (3.6 %)	34 (3.2 %)	17 (3.4 %)	16 (4.9 %)	0.366
Elective caesarean section before labour	203 (10.8 %)	106 (10.1 %)	65 (13.2 %)	32 (9.8 %)	0.150
Missing	0 (0.0 %)	0 (0.0 %)	0 (0.0 %)	0 (0.0 %)	
Type of hospital					
Public	1690 (90.1 %)	985 (93.5 %)	408 (82.6 %)	297 (90.5 %)	<0.001
Private	145 (7.7 %)	44 (4.2 %)	75 (15.2 %)	26 (7.9 %)	<0.001
Missing	41 (2.2 %)	24 (2.3 %)	11 (2.2 %)	6 (1.8 %)	
Type of healthcare providers who directly assisted birth					
Midwife or nurse	1811 (96.6 %)	1020 (96.9 %)	473 (95.7 %)	318 (97 %)	0.488
A student (i.e. before graduation)	292 (15.6 %)	144 (13.7 %)	87 (17.6 %)	61 (18.6 %)	0.035
Obstetrics registrar / medical resident (under post-graduation training)	355 (18.9 %)	191 (18.1 %)	105 (21.3 %)	59 (18.0 %)	0.307
Obstetrics and gynecology doctor	1447 (77.2 %)	827 (78.5 %)	375 (75.9 %)	245 (74.7 %)	0.259
I don't know (healthcare providers did not introduce themselves)	101 (5.4 %)	57 (5.4 %)	15 (3.0 %)	29 (8.8 %)	0.001
Other	176 (9.4 %)	115 (10.9 %)	38 (7.7 %)	23 (7.0 %)	0.034

Note: *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.

support (30.4 % versus Austria: 27.1 % and Switzerland: 10.7 %, $p < 0.001$). No rooming-in however was most often experienced in Switzerland (16.4% vs Austria: 12.2 % and Germany: 11.0 %, $p < 0.001$). In Austria, compared to the other two countries, women most frequently did not get immediate attention when needed (29.3% vs Germany: 26.4 % and Switzerland: 11.7 %).

Experience of care

In the sub-index 'Experience of care', participants, who gave birth in Austria consistently had the highest rates of gaps in Quality Measures (Table 2, Fig. S2). This included no freedom of movement during labour (25.7% vs Germany: 18.4 % and Switzerland: 8.7 %) and the highest frequency of no consent requested for vaginal examination in pre-labour caesarean section (32.0% vs Germany: 29.2 % and Switzerland: 19.0 %, $p < 0.001$). Instrumental vaginal birth without consent requested was most often experienced from women in Austria (64.5% vs Germany 61.8 % and Switzerland: 38.4 %, $p = 0.010$). No clear or not effective communication from health care provider was least often expressed by women in Switzerland (8.7% vs Germany: 22.3 % and Austria: 24.4 %, $p < 0.001$). The same also applied for no involvement in choices (Switzerland: 15.2% vs Germany: 30.9 % and Austria: 36.9 %, $p < 0.001$), restrictions in companionship (Switzerland: 37.4% vs Germany: 58.1 % and Austria: 61.0 %, $p = 0.001$), not being treated with dignity (Switzerland: 11.5% vs Germany: 25.3 % and Austria: 61.0 %, $p < 0.001$), no emotional support (Switzerland: 17.4 % vs: Germany: 30.6 %

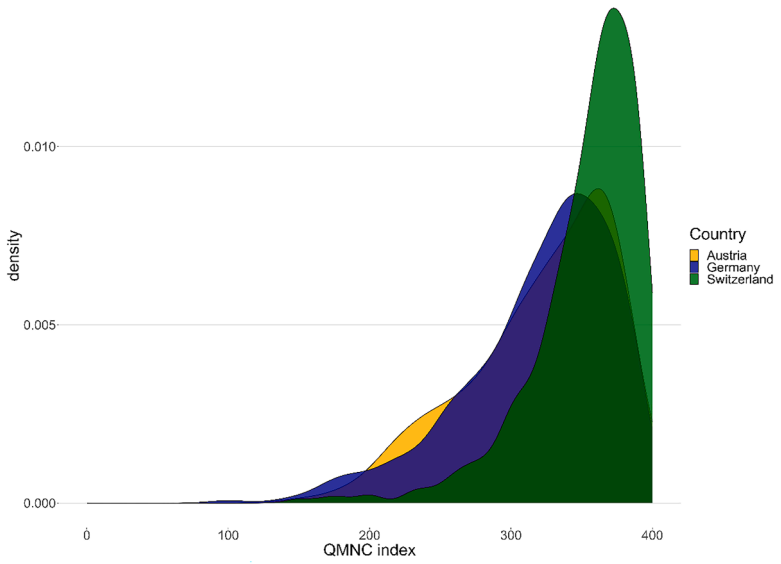

Fig. 2. QMNC overall index by country ($N = 1875$).
Note: The analysed sample with $n = 1875$ participants was composed of $n = 1053$ German responses of women giving birth in Germany, $n = 494$ in Switzerland and $n = 328$ in Austria. Abbreviation: QMNC = quality of maternal and newborn care.

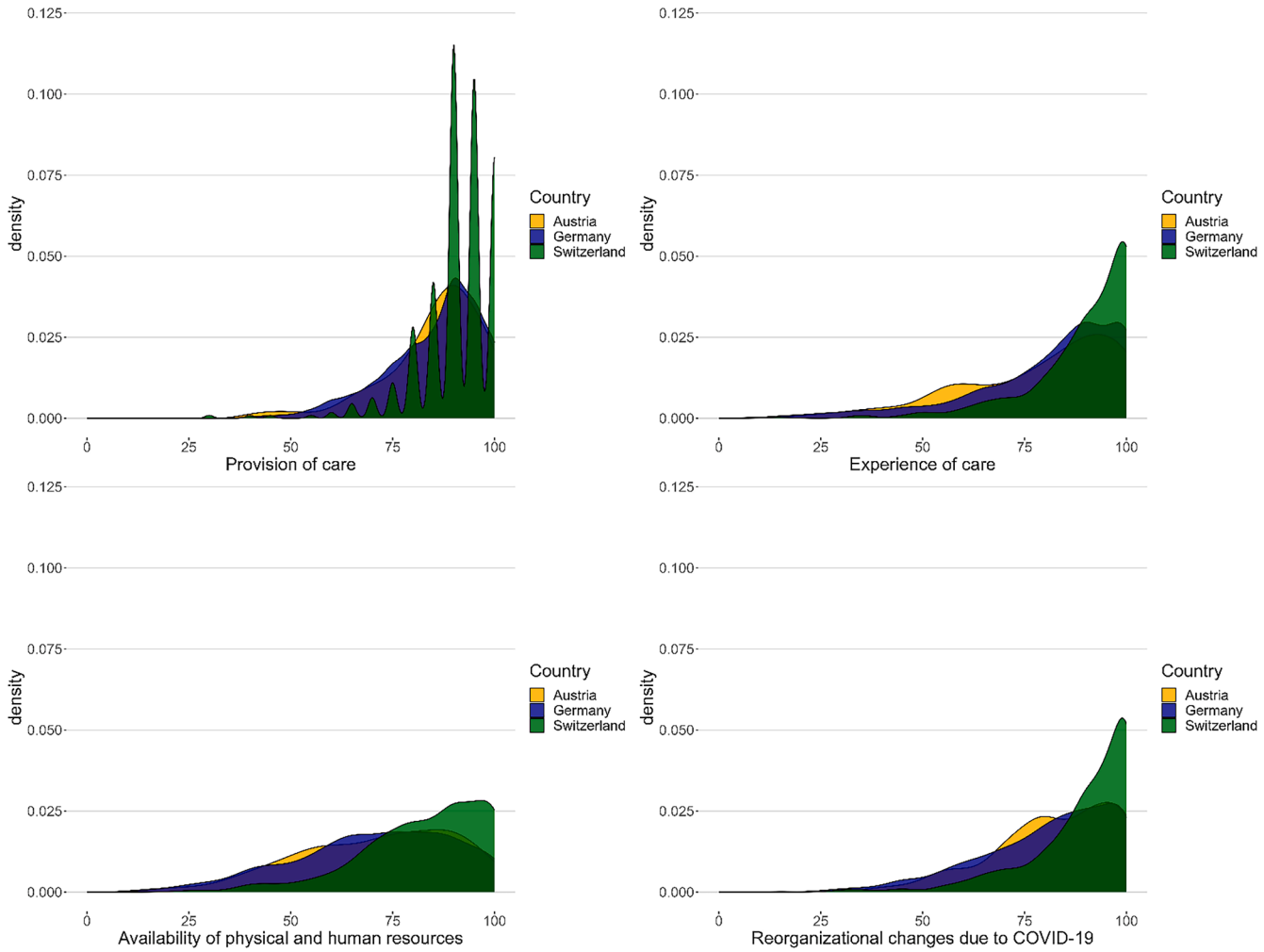

Fig. 3. QMNC index domains by country ($N = 1875$).
Note: The analysed sample with $n = 1875$ participants was composed of $n = 1053$ German responses of women giving birth in Germany, $n = 494$ in Switzerland and $n = 328$ in Austria. Abbreviation: QMNC = quality of maternal and newborn care.

Table 2
Gaps in key Quality Measures of QMNC by country.

Gaps in key Quality Measures of QMNC (40 items)		Overall study sample n (%)	Germany n (%)	Switzerland n (%)	Austria n (%)	Adj p-value[d]
		N = 1875	*N* = 1053	*N* = 494	*N* = 328	
Provision of care[a]						
1	No pain relief during labor (for SVB, IVB, emergency CS after labor)	410 (21.9 %)	241 (22.9 %)	83 (16.8 %)	86 (26.2 %)	<0.001
2a	Mode of birth: instrumental vaginal birth	172 (9.2 %)	89 (8.5 %)	52 (10.5 %)	31 (9.5 %)	>0.99
2b	Mode of birth: emergency CS after labor	212 (11.3 %)	124 (11.8 %)	47 (9.5 %)	41 (12.5 %)	>0.99
2c	Mode of birth: pre-labor emergency CS	67 (3.6 %)	34 (3.2 %)	17 (3.4 %)	16 (4.9 %)	>0.99
2d	Mode of birth: elective CS	203 (10.8 %)	106 (10.1 %)	65 (13.2 %)	32 (9.8 %)	>0.99
3a[b]	Episiotomy (in SVB)	153 (12.5 %)	98 (14.0 %)	25 (8.0 %)	30 (14.4 %)	0.077
3b[b]	Fundal pressure (in IVB)	95 (55.2 %)	60 (67.4 %)	11 (21.2 %)	24 (77.4 %)	<0.001
3c[b]	No pain relief after CS	60 (12.4 %)	39 (14.8 %)	13 (10.1 %)	8 (9.0 %)	0.662
4	No skin to skin	55 (2.9 %)	30 (2.8 %)	7 (1.4 %)	18 (5.5 %)	0.008
5	No early breastfeeding	125 (6.7 %)	73 (6.9 %)	26 (5.3 %)	26 (7.9 %)	0.622
6	Inadequate breastfeeding support	462 (24.6 %)	320 (30.4 %)	53 (10.7 %)	89 (27.1 %)	<0.001
7	No rooming-in	237 (12.6 %)	116 (11.0 %)	81 (16.4 %)	40 (12.2 %)	<0.001
8	Not allowed to stay with the baby as wished	41 (2.2 %)	24 (2.3 %)	10 (2.0 %)	7 (2.1 %)	0.203
9	No exclusive breastfeeding at discharge	464 (24.7 %)	286 (27.2 %)	105 (21.3 %)	73 (22.3 %)	0.231
10	No immediate attention when needed	432 (23.0 %)	278 (26.4 %)	58 (11.7 %)	96 (29.3 %)	<0.001
Experience of care						
1a[b]	No freedom of movements during labor	276 (17.2 %)	168 (18.4 %)	36 (8.7 %)	72 (25.7 %)	<0.001
1b[b]	No consent requested for vaginal examination in pre-labor CS	506 (27.0 %)	307 (29.2 %)	94 (19.0 %)	105 (32.0 %)	<0.001
2a[b]	No choice of birth position (in SVB)	452 (37.0 %)	259 (37.0 %)	108 (34.5 %)	85 (40.9 %)	0.572
2b[b]	No consent requested (for IVB)	95 (55.2 %)	55 (61.8 %)	20 (38.5 %)	20 (64.5 %)	0.010
2c[b]	No information on newborn (in CS)	102 (21.2 %)	53 (20.1 %)	23 (17.8 %)	26 (29.2 %)	0.373
3	No clear/effective communication from HCP	358 (19.1 %)	235 (22.3 %)	43 (8.7 %)	80 (24.4 %)	<0.001
4	No involvement in choices	521 (27.8 %)	325 (30.9 %)	75 (15.2 %)	121 (36.9 %)	<0.001
5	Companionship not allowed	997 (53.2 %)	612 (58.1 %)	185 (37.4 %)	200 (61.0 %)	<0.001
6	Not treated with dignity	419 (22.3 %)	266 (25.3 %)	57 (11.5 %)	96 (29.3 %)	<0.001
7	No emotional support	518 (27.6 %)	322 (30.6 %)	86 (17.4 %)	110 (33.5 %)	<0.001
8	No privacy	352 (18.8 %)	222 (21.1 %)	50 (10.1 %)	80 (24.4 %)	<0.001
9	Abuse (physical/verbal/emotional)	249 (13.3 %)	161 (15.3 %)	34 (6.9 %)	54 (16.5 %)	<0.001
10	Informal payment	66 (3.5 %)	39 (3.7 %)	14 (2.8 %)	13 (4.0 %)	0.292
Availability of physical and human resources[a]						
1	No timely care by HCP at facility arrival	269 (14.3 %)	185 (17.6 %)	36 (7.3 %)	48 (14.6 %)	<0.001
2	No information on maternal danger signs	686 (36.6 %)	409 (38.8 %)	135 (27.3 %)	142 (43.3 %)	<0.001
3	No information on newborn danger signs	833 (44.4 %)	494 (46.9 %)	163 (33.0 %)	176 (53.7 %)	<0.001
4	Inadequate room comfort and equipment	49 (2.6 %)	36 (3.4 %)	6 (1.2 %)	7 (2.1 %)	0.017
5	Inadequate number of women per rooms	100 (5.3 %)	51 (4.8 %)	20 (4.0 %)	29 (8.8 %)	0.032
6	Inadequate room cleaning	59 (3.1 %)	53 (5.0 %)	2 (0.4 %)	4 (1.2 %)	<0.001
7	Inadequate bathroom	84 (4.5 %)	68 (6.5 %)	5 (1.0 %)	11 (3.4 %)	<0.001
8	Inadequate partner visiting hours	802 (42.8 %)	534 (50.7 %)	109 (22.1 %)	159 (48.5 %)	<0.001
9	Inadequate HCP number	249 (13.3 %)	155 (14.7 %)	32 (6.5 %)	62 (18.9 %)	<0.001
10	Inadequate HCP professionalism	69 (3.7 %)	49 (4.7 %)	7 (1.4 %)	13 (4.0 %)	0.087
Reorganisational changes due to COVID-19						
1	Difficulties in attending routine antenatal visits	489 (26.1 %)	274 (26.0 %)	112 (22.7 %)	103 (31.4 %)	0.003
2	Any barriers in accessing the facility	528 (28.2 %)	331 (31.4 %)	103 (20.9 %)	94 (28.7 %)	0.004
3	Inadequate infographics	405 (21.6 %)	300 (28.5 %)	57 (11.5 %)	48 (14.6 %)	<0.001
4	Inadequate wards reorganization	678 (36.2 %)	437 (41.5 %)	127 (25.7 %)	114 (34.8 %)	<0.001
5	Inadequate room reorganization	515 (27.5 %)	328 (31.1 %)	101 (20.4 %)	86 (26.2 %)	0.003
6[c]	Lacking one functioning accessible hand-washing station	100 (5.3 %)	79 (7.5 %)	11 (2.2 %)	10 (3.0 %)	<0.001
7	HCP not always using PPEs	337 (18.0 %)	246 (23.4 %)	44 (8.9 %)	47 (14.3 %)	<0.001
8	Insufficient HCP number	453 (24.2 %)	289 (27.4 %)	66 (13.4 %)	98 (29.9 %)	<0.001
9	Communication inadequate to contain COVID-19 related stress	572 (30.5 %)	350 (33.2 %)	93 (18.8 %)	129 (39.3 %)	<0.001
10	Limitations on care due to COVID-19	837 (44.6 %)	497 (47.2 %)	142 (28.7 %)	198 (60.4 %)	<0.001

[a] All the indicators in the domains are directly based on WHO standards.
[b] Indicator tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 3a was calculated on spontaneous vaginal births; 3b was calculated on instrumental vaginal births).
[c] 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.
[d] p-values were obtained from the logistic regression model testing Quality Measures difference by country adjusted for socio-demographic and obstetric variables (i.e., maternal age, education, year of birth, mode of birth, parity), type of hospital, mother giving birth in the same country where she was born.

Abbreviations: CS = caesarean section; HCP = health care provider; IVB = instrumental vaginal birth; PPE = personal protective equipment; QMNC = quality maternal and newborn care; SVB = spontaneous vaginal birth.

and Austria: 33.5, $p < 0.001$), no privacy (Switzerland: 10.1% vs Germany 21.1 % and Austria: 24.4 %, $p < 0.001$) and physical, verbal or emotional abuse (Switzerland: 6.9% vs Germany: 15.3 % and Austria: 16.5 %, $p < 0.001$).

Availability of physical and human resources'

In the sub-index 'Availability of physical and human resources', participants from Switzerland least often reported Quality Measures gaps compared to German and Austrian women (Table 2, Fig. S2). Whilst no timely care by health care providers at the arrival in the facility was most often experienced in Germany (17.6 % versus Austria: 14.6 % and Switzerland: 7.3 %, $p < 0.001$), no information on maternal danger signs (Austria: 43.3 % versus German: 38.3 % and Switzerland: 27.3 %, $p < 0.001$) and newborn danger signs (Austria: 53.7% vs Germany: 46.9 % and Switzerland: 33.0 %, $p < 0.001$) were reported most frequently from

participants in Austria. Inadequate room comfort and equipment were rare but most frequently observed in Germany (3.4 % versus Austria: 2.1 % and Switzerland: 1.2 %, $p = 0.017$). Whereas an inadequate number of women per room was most frequently reported by participants in Austria (8.8% vs Germany: 4.8 % and Switzerland: 4.0 %, $p = 0.032$), inadequate room cleaning was significantly more often noted in Germany (5.0 % versus Austria: 1.2 % and Switzerland: 0.4 %, $p < 0.001$). Women giving birth in Germany evaluated the bathroom as being inadequate more frequently than those in the other two countries (6.5 % versus Austria: 3.4 % and Switzerland: 1.0 %, $p < 0.001$). A good half of women in Germany (50.7 %) and nearly half of them in Austria (48.5 %) evaluated the partner's visiting hours as being inadequate compared to Switzerland (22.1 %, $p < 0.001$). Additionally, participants in Austria most frequently reported that the health professionals were not adequate (18.9% vs Germany: 14.7 % and Switzerland 6.5 %, $p < 0.001$).

Reorganisational changes due to COVID-19

The 'Reorganisational changes due to COVID-19′ differed significantly in all aspects between countries with Switzerland showing the lowest Quality measures gaps (Table 2, Fig. S2). Attending routine antenatal visits was most often difficult for participants in Austria (31.4 % versus Germany: 26.0 % and Switzerland: 22.7 %, $p = 0.003$). In contrast, barriers to accessing the facility (Germany: 31.4 % versus Austria: 28.7 % and Switzerland: 28.7 %, $p = 0.004$) as well as inadequate infographics (Germany: 28.5 % versus Austria: 14.6 % and Switzerland: 11.5 %, $p < 0.001$) were most frequently expressed by women in Germany. Furthermore, inadequate ward reorganisation (Germany: 41.5 % versus Austria: 34.8 % and Switzerland: 25.7 %, $p < 0.001$), inadequate room organisation (Germany: 31.1 % versus Austria: 26.2 % and Switzerland: 20.4 %, $p = 0.003$), lacking one functioning accessible hand-washing station (Germany: 7.5 % versus Austria: 3.0 % and Switzerland: 2.2 %, $p < 0.001$) as well as the health care providers not always using personal protective equipment were also most often stated by women in Germany(Germany: 23.4 % versus Austria: 14.3 % and Switzerland: 8.9 %, $p < 0.001$). In contrast, insufficient healthcare providers in (Austria: 29.9 % versus Germany: 27.4 % and Switzerland: 13.4 %, $p < 0.001$), communication, which was inadequate to contain COVID-19 related stress (Austria: 39.3 % versus Germany: 33.2 % and Switzerland: 18.8 %, $p < 0.001$) and limitations on care due to COVID-19 (Austria: 60.4 % versus Germany: 47.2 % and Switzerland: 28.7 %, $p < 0.001$) were reported most frequently from participants in Austria.

Correlations between reorganisational changes due to COVID-19′ and other qmnc sub-indexes

In all countries, the QMNC sub-index 'Reorganisational changes due to COVID-19′ correlated significantly, low to strongly, with the QMNC sub-indexes 'Provision of care', 'Experience of care' and 'Availability of physical and human resources' ($p < 0.001$ for all correlations, Table 3). The highest, strong correlation was found between 'Reorganisational changes due to COVID-19′ and the sub-index 'Availability of physical and human resources' (whole study group: $r = 0.62$, $p < 0.001$) followed by the moderate correlation with 'Experiences of care' (whole study group: $r = 0.52$, $p < 0.001$) and the low correlation with 'Provision of care' (whole study group: $r = 0.33$, $p < 0.001$). The correlations between 'Reorganisational changes due to COVID-19′ and 'Provision of care' (Germany: $r = 0.35$ versus Austria: $r = 0.28$ and Switzerland: $r = 0.20$) and 'Experiences of care' (Germany=0.51 versus Switzerland and Austria both: 0.46) were stronger in Germany. In Switzerland, the correlation between 'Reorganisational changes due to COVID-19′ and 'Availability of physical as well as human resources' was lower than in the other two countries ($r = 0.52$ versus Germany and Austria both: 0.61). The multivariable quantile regression with the QMNC sub-index "Reorganisational changes due to COVID-19′ as a dependent variable showed significant association with the sub-index 'Provision of care' and 'Availability of physical and human resources' ($p < 0.001$ for all quantiles, Table S3).

Table 3
Correlation between the QMNC sub score 'Organizational changes due to COVID-19′ and other QMNC sub scores.

	Whole study population Correlation coefficient* (p-value) $N = 1875$	Germany Correlation coefficient* (p-value) $N = 1053$	Switzerland Correlation coefficient* (p-value) $N = 494$	Austria Correlation coefficient* (p-value) $N = 328$
Correlation between 'Reorganisational changes due to COVID-19′ and 'Provision of care'	0.33 (<0.001)	0.35 (<0.001)	0.20 (<0.001)	0.28 (<0.001)
Correlation between 'Reorganisational changes due to COVID-19′ and 'Experience of care'	0.52 (<0.001)	0.51 (<0.001)	0.46 (<0.001)	0.46 (<0.001)
Correlation between 'Reorganisational changes due to COVID-19′ and 'Availability of physical and human resources'	0.62 (<0.001)	0.61 (<0.001)	0.52 (<0.001)	0.61 (<0.001)

* Correlations are obtained using a Spearman's rank correlation coefficient (Spearman's ρ).

Discussion

To our knowledge, this was the first study comparing the quality of maternal and neonatal care during the COVID-19 pandemic in the German-speaking area including Germany, Switzerland, and Austria. In Switzerland, participants reported higher QMCN scores compared to Germany and Austria in all four sub-indexes whereas women in Austria indicated higher gaps in all QMNC Measures in the sub-index 'Experience of care' compared to the other two countries. Responses to the sub-index 'Reorganisational changes due to COVID-19′ significantly correlated with the QMNC sub-indexes 'Provision of care', 'Experience of care' and 'Availability of physical and human resources' in all countries, but the correlation was stronger in participants in Germany compared to those Austria and Switzerland.

Participants assessed the QMNC Quality Measures of the sub-index 'Provision of care' less distinctly different than the Quality Measure in the other sub-index between countries. This might be due to the shared maternity care-related guidelines in Germany, Switzerland, and Austria (German Society for Gynaecology and Obstetrics (DGGG) et al., 2020a; S. 2020b). Thus, the shared guidelines about vaginal births at term and caesarean sections might be associated with similar CS and instrumental birth rates in the investigated countries (Euro-Peristat, 2022; Federal Statistical Office, n.d.). Breastfeeding initiation and exclusive breastfeeding rates did also not differ significantly between countries, even though, no common guideline exists and participants in the three countries studied evaluated breastfeeding support from healthcare professionals significantly differently. A potential explanation for this result might be the Ten Steps of the International Baby Friendly Hospital Initiative from the World Health Organization and the United Nations (World Health Organization, n.d.) which are partly being followed by many hospitals in all three countries (Labbok, 2012).

In most QMNC Quality Measures of the sub-index "experience of

care", women giving birth in Switzerland were more satisfied than those from Germany and Austria. Even though in Austria fewer participants gave birth during lockdowns, women giving birth in this country experienced more gaps in all the Quality Measures of this sub-index. Missing request consents during labour, no companionship allowed, no emotional support, not being treated with dignity and physical, verbal and emotional abuse were reported by women significantly more often in Austria than in the other two countries. This result cannot be explained by either the common guidelines set by the Association of the Scientific Medical Societies (2020a, 2020b) nor the strictness of the protective measures according to the Stringency Index (Mathieu et al., 2020). However, the allegations are serious and violate basic human rights. It is also known that respectful maternity care and companionship allowed during labour and birth are essential for a positive birth experience (Abderhalden-Zellweger et al., 2024; World Health Organization, 2018). Therefore, respectful maternity care at the highest quality should be addressed in midwives' and doctors' education as well as further post-graduate education. Additionally, it is essential that these issues will be addressed by decision makers and health care policymakers.

In the sub-index 'Availability of physical and human resources', participants reported nearly all Quality Measures significantly different across countries and again, mothers, who gave birth in Switzerland reported less gaps than those having given birth in Germany and Austria. According to the Organisation for Economic Co-operation and Development (OECD), Switzerland exhibited a higher total health expenditure per capita than Germany and Austria (OECD, 2021), which might be the cause of a greater availability of physical and human resources. Nonetheless, this report also shows that all three of the selected countries are situated amongst the six nations with the highest absolute expenditures. However, in Switzerland a larger number of doctors and nurses are working compared to the other two countries (OECD, 2021). This indicates that it is not only the overall health expenditure that is significant, but especially the expenditure for the healthcare workforce. It is also known that workforce shortage plays a role in the availability of human resources (Albrecht et al., 2019; Mannava et al., 2015).

In all three countries, women reported important quality gaps regarding reorganisational changes due to COVID-19. However, the differences between countries were highly significant with fewer gaps reported by participants in Switzerland compared to the other two countries. This is congruent with the extent of protective measures applied, which were highest in Germany (Mathieu et al., 2020). However, this conclusion needs to be reflected critically and could also be due to the highest proportion of women having given birth during the phase of the pandemic compared to Austria and Switzerland. Germany was the earliest to join the study and more women in this country gave birth during the acute phase of the pandemic in its sample. But also Austria, the latest country participating in the project, had a high proportion of participants, which were dissatisfied with the reorganisational changes due to COVID-19. In all three countries, the sub-index 'Reorganisational changes due to COVID-19′ correlated with all the other sub-indexes. Especially the 'Experience of care' and the 'Availability of physical and human resources' were affected by the reorganisation. However, the current study could not distinguish, if besides the impact of the protective measures on the QMNC, other factors such as pre-existing differences in care provision despite common guidelines or different expectations of care potentially being associated with the satisfaction of the quality of care (Galle et al., 2015) contributed to the differences between countries. Further research is needed to identify potential contributing aspects to the variations in care provision.

Participants in all countries complained about not being treated with dignity, missing emotional support, abuse and denial of companionship during labour. The qualitative analysis of comments in the same survey showed that women were confronted with disrespectful attitudes from health professionals, abuse but also from being separated from family members (Abderhalden-Zellweger et al., 2024). This is congruent with results of other studies during the COVID-19 pandemic, in which participants complained about missing information from health professional but also about insupportable pain because of anxiety and lack of companionship (Asefa et al., 2022; Lalor et al., 2023; Liepinaitienė et al., 2024; Miyauchi et al., 2022). The World Health Organization demands respectful care for a positive birth experience and long term positive health outcomes (World Health Organization, 2018) what many parturients were denied during the COVID-19 pandemic. Disrespectful and low-quality maternity care led to more intrapartum intervention such as induction and caesarean section (Lalor et al., 2023). Renfrew et al. (2020) claimed that the provision of evidence-based, safe and respectful care must also be ensured during a pandemic. This is especially important to avoid negative labour and birth outcomes Midwives and other health care providers should pay particular attention to high quality and respectful maternity care, especially in case of reorganisational changes due to future health crises.

Strengths and weaknesses

This study has strengths, including the use of a validated questionnaire to assess QMNC based on WHO Standards and a large overall sample size. However, the staggered start of recruitment resulted in variations in the distribution of women across the pandemic years. In particular, Germany had the highest number of women who gave birth during the period of strictest protection measures. To minimise this limitation, multivariable analyses were adjusted for year of birth. Nevertheless, caution should be exercised to the interpretation of results of country comparison and generalisability of results is not possible. Furthermore, only German responses could be included in the analysis to ensure that women were cared for under the common guidelines in the German speaking area excluding a relevant part of migrant women. Additionally, women self-assessed their experienced QMNC and we therefore cannot rule out recall bias.

Conclusion

Women giving birth in Germany, Switzerland and Austria perceived QMNC significantly different during the COVID-19 pandemic with women having given birth in Switzerland evaluating QMNC higher than those in Germany and Austria. However, the provision of respectful maternity care was compromised in all countries. This highlights a significant gap between women's needs and expectations and the provision and presentation of health services even in the case of common maternity care guidelines (German Society for Gynaecology and Obstetrics (DGGG) et al., 2020b; 2020a). Participants' perceived 'Reorganisational changes due to COVID-19′ correlated with 'Provision of care', 'Experience of care' and 'Availability of physical and human resources' in all countries. These findings underscore the importance of learning valuable lessons for future pandemics to ensure that protective measures do not compromise the quality of care to such an extent. It is important to recognise that negative responses cannot be attributed solely to the pandemic situation but may reveal underlying problems in the organisation and delivery of care. In order to effectively improve the quality of care, further research is essential to distinguish the effects of the COVID-19 pandemic from inherent challenges in the organisation and delivery of care. Future studies should monitor QMNC after the end of the emergency phase of the COVID-19 pandemic. The IMAgiNE EURO project, currently ongoing in 26 countries in the European region, aims at further documenting QMNC, in future publications.

IMAgiNE euro study group

Austria: Martina König-Bachmann[1], Christoph Zenzmaier[1], Simon Imola[2], Elisabeth D`Costa[3] – 1 Health University of Applied Sciences, Innsbruck, Austria, 2 University of Applied Sciences Burgenland, Pinkafeld, Austria, 3 Medical University of Innsbruck, Innsbruck, Austria

Belgium: Anne Galle[1], Silke D'Hauwers[1] – 1 UCVV, University Center Nursery and Midwifery at Ghent University

Bosnia-Herzegovina: Amira Ćerimagić[1] – 1 NGO Baby Steps, Sarajevo, Bosnia-Herzegovina

Cyprus: Ourania Kolokotroni[1], Eleni Hadjigeorgiou[1], Maria Karanikola[1], Nicos Middleton[1], Ioli Orphanide Eteocleous[2] - 1 Cyprus University of Technology School of Health Sciences, 2 Birth Forward NGO

Croatia: Daniela Drandić[1], Magdalena Kurbanović[2] - 1 Roda – Parents in Action, Zagreb, Croatia, 2 Faculty of Health Studies, University of Rijeka, Rijeka, Croatia

Czech Republic: Lenka Laubrova Zirovnicka[1], Miloslava Kramná [2]- 1 Association For Freestanding Birth Centres and Alongside Midwifery Units (APODAC), 2 Healthy Parenting Association (APERIO)

France: Rozée Virginie[1], Elise de La Rochebrochard[1], Kristina Löfgren[2] - 1 Sexual and Reproductive Health and Rights Research Unit, Institut National d'Études Démographiques (INED), Aubervilliers, France, 2 Baby-friendly Hospital Initiative (IHAB), France

Germany: Céline Miani[1], Stephanie Batram-Zantvoort[1] - 1 Department of Epidemiology and International Public Health, School of Public Health, Bielefeld University, Bielefeld, Germany

Greece: Antigoni Sarantaki[1], Dimitra Metallinou[1], Aikaterini Lykeridou[1] - 1 Department of Midwifery, School of Health and Care Sciences, University of West Attica, Athens, Greece

Israel: Ilana Chertok[1,2], Rada Artzi-Medvedik[1] - 1 Ohio University, School of Nursing, Athens, Ohio, USA, 2 Ruppin Academic Center, Department of Nursing, Emek Hefer, Israel

Italy: Marzia Lazzerini[1], Emanuelle Pessa Valente[1], Ilaria Mariani[1], Arianna Bomben[1], Stefano Delle Vedove[1], Sandra Morano[3], Antonella Nespoli[3], Simona Fumagalli[3] - 1 Institute for Maternal and Child Health IRCCS Burlo Garofolo, Trieste, Italy; 2 Medical School and Midwifery School, Genoa University, Genoa, Italy, 3 University of Milano Bicocca, Italy

Latvia: Elizabete Pumpure [1,2], Dace Rezeberga [1,2,3], Dārta Jakovicka [4,5], Gita Jansone-Šantare [1,2], Anna Šibalova[1], Elīna Voitehoviča [1,3], Dārta Krēsliņa[1] - 1 Department of Obstetrics and Gynaecology, Rīga Stradiņš University, Rīga, Latvia, 2 Riga East Clinical University Hospital, Rīga, Latvia, 3 Riga Maternity Hospital, Rīga, Latvia, 4 Rīga Stradiņš University, Rīga, Latvia, 5 Children's Clinical University Hospital, Rīga, Latvia

Lithuania: Alina Liepinaitienė [1,2,3], Andželika Kondrakova[2], Marija Mizgaitienė[4], Simona Juciūtė[5] - 1 Faculty of Natural Sciences, Department of Environmental Sciences, Vytautas Magnus University, Kaunas, Lithuania, 2 Kauno kolegija Higher Education Institution, Kaunas, Lithuania, 3 Republican Siauliai County Hospital, Siauliai, Lithuania, 4 Kaunas Hospital of the Lithuanian University of Health Sciences, Kaunas, Lithuania, 5 Hospital of Lithuanian University of Health Sciences Kauno klinikos, Kaunas, Lithuania

Luxembourg: Maryse Arendt[1], Barbara Tasch [1,2] – 1 Beruffsverband vun de Laktatiounsberoderinnen zu Lëtzebuerg asbl (Professional association of the Lactation Consultants in Luxembourg), Luxembourg, Luxembourg, 2 Neonatal intensive care unit, KannerKlinik, Centre Hospitalier de Luxembourg, Luxembourg, Luxembourg

Netherlands: Enrico Lopriore[1], Thomas Van den Akker [1,2] - 1 Leiden University Medical Center, Leiden, the Netherlands, 2 Athena Institute, Vrije Universiteit, Amsterdam, Netherlands

Norway: Ingvild Hersoug Nedberg[1], Sigrun Kongslien[1], Eline Skirnisdottir Vik[2] – 1 Department of health and care sciences, UiT The Arctic University of Norway, Norway, 2 Department of health and caring sciences, Western Norway University of Applied Sciences, Norway

Poland: Barbara Baranowska[1], Urszula Tataj-Puzyna[1], Beata Szlendak[1], Paulina Pawlicka[2] - 1 Department of Midwifery, Centre of Postgraduate Medical Education, Warsaw, Poland, 2 Division of Intercultural Psychology and Gender Psychology, University of Gdańsk, Gdańsk, Poland

Portugal: Raquel Costa [1,2,3], Catarina Barata[4], Teresa Santos [5,6], Heloísa Dias[7], Tiago Miguel Pinto[3], Sofia Marques [8,9], Ana Meireles [8–9], Joana Oliveira [8–9], Mariana Pereira [9], Maria Arminda Nunes [10,11] - 1 EPIUnit - Instituto de Saúde Pública, Universidade do Porto, Porto, Portugal, 2 Laboratório para a Investigação Integrativa e Translacional em Saúde Populacional (ITR), Universidade do Porto, Porto, Portugal, 3 Lusófona University, HEI-Lab: Digital Human-Environment Interaction Labs, Portugal, 4 Instituto de Ciências Sociais, Universidade de Lisboa, Lisboa, Portugal and Associação Portuguesa pelos Direitos da Mulher na Gravidez e Parto, Portugal, 5 Universidade Europeia, Lisboa, Portugal, 6 Plataforma CatólicaMed/Centro de Investigação Interdisciplinar em Saúde (CIIS) da Universidade Católica Portuguesa, Lisbon, Portugal, 7 Regional Health Administration of the Algarve, (ARS - Algarve, IP), Portugal, 8 Institute of Psychology and Educational Sciences, Lusíada University, Porto, Portugal, 9 CIPD—Psychology for Development Research Centre, Lusíada University, Porto, Portugal, 10 Associação Portuguesa dos Enfermeiros Obstetras, Portugal, 11 Nursing School of Porto, Porto, Portugal

Romania: Marina Ruxandra Otelea [1,2] - 1 University of Medicine and Pharmacy Carol Davila, Bucharest, Romania, 2 SAMAS Association, Bucharest, Romania

Serbia:Jelena Radetić[1], Jovana Ružičić[1] - 1 Centar za mame, Belgrade, Serbia

Slovenia: Zalka Drglin[1], Anja Bohinec[1] - 1 National Institute of Public Health, Ljubljana, Slovenia

Spain: Serena Brigidi[1], Alejandra Oliden[2], Lara Martín Castañeda [1,2] - 1 Institute of Research (VHIR), Vall d'Hebron University Foundation. Maternal and Fetal Medicine Research Group Medical Anthropology Research Center - MARC - Rovira i Virgili University, Tarragona, Spain. Department of Anthropology, Philosophy, and Social Work - Rovira i Virgili University, Tarragona, Spain. President of Observatory of Obstetric Violence in Spain - OVO., 2 Nurse, La casa de Isis Birth Centre - Orba, Alicante, Spain Member of Observatory of Obstetric Violence in Spain - OVO

Sweden: Helen Elden [1,2], Karolina Linden[1], Mehreen Zaigham[3] - 1 Institute of Health and Care Sciences, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden, 2 Department of Obstetrics and Gynecology, Region Västra Götaland, Sahlgrenska University Hospital, Gothenburg, Sweden, 3 Obstetrics and Gynaecology, Department of Obstetrics and Gynecology, Institution of Clinical Sciences Lund, Lund University, Lund and Skåne University Hospital, Malmö, Sweden.

Switzerland: Claire de Labrusse[1], Alessia Abderhalden-Zellweger[1], Anouck Pfund[1], Harriet Thorn[1], Susanne Grylka-Baeschlin[2], Michael Gemperle[2], Antonia Mueller[2] - 1 School of Health Sciences (HESAV), HES-SO University of Applied Sciences and Arts Western Switzerland, Lausanne, Switzerland, 2 Institute of Midwifery and Reproductive Health, School of Health Sciences, ZHAW Zurich University of Applied Sciences.

Contribution

ML conceived the IMAgiNE EURO study, with major inputs from EPV, IM and additional input from all other authors. All authors promoted the surveys and supported the process of data collection. SG-B, MG, ANM, CdL and AAB conceived the present article, with major inputs from ML. IM and SDV analysed data, with major inputs from SG-B, MG, ANM, CdL and AAB. All authors have approved the final version of the manuscript for submission.

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Competing interest

The authors did declare no competing interests.

Disclaimer

The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated.

CRediT authorship contribution statement

Susanne Grylka-Baeschlin: Writing – review & editing, Writing – original draft, Data curation, Conceptualization. **Michael Gemperle:** Writing – review & editing, Writing – original draft, Data curation. **Ilaria Mariani:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Alessia Abderhalden-Zellweger:** Writing – review & editing, Writing – original draft, Data curation. **Céline Miani:** Writing – review & editing, Data curation. **Christoph Zenzmaier:** Writing – review & editing, Data curation. **Antonia Nathalie Mueller:** Writing – review & editing, Writing – original draft, Data curation. **Stephanie Batram-Zantvoort:** Writing – review & editing, Data curation. **Martina Koenig-Bachmann:** Writing – review & editing, Data curation. **Claire De Labrusse:** Writing – review & editing, Writing – original draft, Data curation. **Maryse Arendt:** Writing – review & editing, Data curation. **Stefano Delle Vedove:** Writing – review & editing, Formal analysis, Data curation. **Anouck Pfund:** Writing – review & editing, Data curation. **Imola Simon:** Writing – review & editing, Data curation. **Emanuelle Pessa Valente:** Writing – review & editing, Methodology, Data curation, Conceptualization. **Marzia Lazzerini:** Writing – review & editing, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

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

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.midw.2024.104209.

Data availability

Data are available upon reasonable request to the corresponding author.

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