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Parents' experiences regarding neonatal care during the COVID-19 pandemic – country-specific findings of a multi-national survey

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ABSTRACT

Objectives

The COVID-19 pandemic has disrupted healthcare systems, challenging neonatal care provision globally. Curtailed visitation policies are known to negatively affect the medical and emotional care of sick, preterm, and low birthweight infants, compromising the achievement of the 2030 Development Agenda. Focusing on infant and family-centred developmental care (IFCDC), we explored parents' experiences of the disruptions affecting newborns in need of special or intensive care during the first year of the pandemic.

Design

Cross-sectional study using an electronic, web-based questionnaire.

Setting

Multi-country online-survey.

Methods

Data were collected between August and November 2020 using a pre-tested online, multi-lingual questionnaire. The target group consisted of parents of preterm, sick or low birthweight infants born during the first year of the COVID-19 pandemic and who received special/intensive care. The analysis followed a descriptive quantitative approach.

Results

In total, 1148 participants from 12 countries (Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, Ukraine) were eligible for analysis. We identified significant country-specific differences, showing that the application of IFCDC is less prone to disruptions in some countries than in others. For example, parental presence was affected: 27% of the total respondents indicated that no-one was allowed to be present with the infant receiving special/intensive care. In Australia, Canada, France, New Zealand and Sweden, both the mother and the father (in more than 90% of cases) was allowed access to the newborn, whereas participants indicated that no-one was allowed to be present in China (52%), Poland (39%), Turkey (49%), and Ukraine (32%).

Conclusions

The application of IFCDC during the COVID-19 pandemic differs between countries. There is an urgent need to reconsider separation policies and to strengthen the infant and family-centred developmental care approach worldwide to ensure the 2030 Development Agenda is achieved.

Strengths and limitations of this study

- This is the first multi-national survey exploring parents' experiences of the disruptions affecting newborns in need of special or intensive care during the first year of the pandemic.
- The cross-country approach, data collection in 12 countries and extensive outreach allowed us to acquire in-depth insights into parents' experiences.
- The online format of the study bears the risk of selection bias, and response rates could not be calculated.
- The respective pandemic situation, geographical, climatic and environmental aspects, as well as containment strategies vary between (and sometimes even within) countries.
- The findings comprehensively reflect the parent perspective across multiple countries giving insights into country-specific differences.

INTRODUCTION

During the last decades, major achievements have been made in the field of maternal and newborn health, particularly in light of the United Nations Sustainable Development Goals [1]. While efforts have resulted in a reduction of maternal and neonatal deaths and better health outcomes for newborns worldwide, progress in particular affecting preterm, sick, and low birthweight infants has been slow [1,2]. Pandemic-related shortages in maternal and newborn care provision have severe consequences for vulnerable infants and their families [3–5], continuing to threaten the achievement of the 2030 Development Agenda [6].

Worldwide, one in ten infants is born preterm every year, with increasing rates in almost all countries where reliable epidemiologic datasets are available, making it a truly global problem [7]. Preterm birth is the leading cause of death under five years of age, and together with birth complications, it is the leading cause of neonatal death [6,8,9]. The extremely fragile group of patients requires highly specialised care, which is labour and cost intense, and thus, stark regional discrepancies in the availability of specialised care are well described [10]. However, whilst international agreements, like the United Nations Convention on the Rights of the Child or the European Association for Children in Hospital (EACH), foster the right of children to be close to their parents [11,12], these rights have not yet been implemented in the majority of neonatal units across the globe where parents and their newborns have often been separated – already in pre-pandemic times – yet increasingly as a response to the ongoing global health crisis [13–15].

The COVID-19 pandemic and related restrictions have resulted in severe limitations in neonatal care provision [16], especially regarding acknowledged elements of infant- and family-centred developmental care (IFCDC) [15,17–23]. The frequently implemented separation of parents and their newborns has negative implications for the health outcomes of newborns [24–26], interfering with acknowledged practices such as Kangaroo Mother Care (KMC), skin-to-skin contact [27], and breastfeeding [28]. The reduction of parental presence in the neonatal intensive care units (NICU) has led to increased stress and mental health problems among parents and families, raising the risk of postnatal depression and posttraumatic stress syndrome, and limited opportunities for parent-infant bonding [14,15], while staff shortages and the lack of available guidelines have led to high levels of stress and anxiety among health professionals [17,29]. Few studies and reports have provided insights into parents' experiences regarding some of the implemented restrictions [14,15,30]. However, a comparative and holistic approach, emphasising the cornerstones of IFCDC, has been missing so far, which is the focus of this research.

With this study, we explored parents' experiences of disruptions to neonatal care during the first year of the COVID-19 pandemic across the globe, focusing on individual country actions. We aimed to document the challenges experienced by parents, spanning wide variations across countries and regions. The analysis and corresponding findings shall provide an incentive for policy makers, public health experts, and healthcare professionals alike to learn from the different approaches and subsequent implications of the outcomes of single countries and underline the importance of parents' involvement in the care of vulnerable newborns. It is imperative that this occurs, irrespective of the ongoing pandemic or future emergency situations.

METHODS

Study design and population

We conducted a cross-sectional study using an electronic, web-based questionnaire with the aim to explore parents' experiences during the first year of the COVID-19 pandemic with regard to the core elements of IFCDC. Eligible for participation were parents of preterm, sick or low birthweight infants born during the first year of the COVID-19 pandemic (as of December 1, 2019) and who were receiving special or intensive care (inclusion criteria). The term "parent" was broadly defined, encompassing biological and/or social parents, allowing for self-definition as "mother," "father," or "other parent." We

conducted and reported the study according to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [31].

Participants were recruited by the European Foundation for the Care of Newborn Infants (EFCNI), and its initiative, the Global Alliance for Newborn Care (GLANCE), through social media activities, newsletters, website outreach, and mailings. In addition, national parent organisations and the collaborating professional healthcare associations and their members, namely the Council of International Neonatal Nurses (COINN), the European Society for Paediatric Research (ESPR), the Neonatal Individualised Developmental Care and Assessment Project (NIDCAP), and the Union of European Neonatal and Perinatal Societies (UENPS), supported the dissemination of the survey link by promoting the study across their networks. Participation was voluntary, data collection occurred anonymously.

Questionnaire development and pre-testing

Researchers of the EFCNI scientific department developed the questionnaire in collaboration with the members of the COVID-19 Zero Separation Collaborative Group – an interdisciplinary stakeholder group including medical experts and parent/patient representatives. The survey was pre-tested among n=8 parents who met the target group criteria who did not request any changes of the questionnaire.

The questionnaire consisted of 52 questions with pre-defined answers and single or multiple response answer options. It encompassed information about the respondent and infant, and COVID-19-related topics as well as categories of IFCDC [21], including the following elements: (1) background information, (2) COVID-19 testing and measures in the respective country/region (3) access to perinatal care, (4) presence with the newborn receiving special/intensive care, (5) breastfeeding/infant nutrition, (6) health communication, and (7) mental health and support. Parent representatives from EFCNI's international parent network supported the translations of the final version into 23 languages, which were all reviewed and approved by native medical professionals.

Data collection and statistical analysis

Data were collected between August and November 2020 using the SurveyMonkey® online survey tool. The analysis included answers from all respondents who met the inclusion criteria, regardless of whether they completed the survey to the end. The subsequent analysis was performed as sub-analysis based on a global survey with available data from 56 countries as previously described elsewhere [16]. For this sub-analysis, countries having a minimum of at least 30 answers per country were considered eligible for inclusion. A subsequent country selection depending on pre-defined criteria, such as geographical variation and COVID-19 situation was conducted by the main authors of this study using a consensus approach resulting in the following included countries: Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, and Ukraine.

Data analysis was conducted using an exploratory approach with descriptive statistics (relative frequency and proportion (n (%)). Multiple-answer questions were analysed as the sum of the number of responses per answer choice (n (%)) and may exceed 100%. Means, standard deviations and confidence intervals (CI) were calculated to compare data between countries. A CI for difference in means was calculated for questions related to presence with the newborn and skin-to-skin care using one answer option in order to determine statistically significant deviations between countries. A colour-coding indicated countries whose 95% CI for difference in means was higher (blue) or lower (green) than the mean CI of all countries. All analyses presented herein were carried out using SPSS software (IBM SPSS Statistics for Windows, version 27-0, IBM Corp, Armonk, New York) and Microsoft Excel (version 16).

Ethical considerations

Data collection, processing and storage conformed to the General Data Protection Regulation and the Declaration of Helsinki. Informed consent was given by ticking a confirmation box. For those who

declined to participate, the web-interface was terminated. Respondents were informed that some of the questions might cause distressing reactions in view of their personal experiences, and they had the opportunity to stop participation at any time. No financial or other incentives were offered to the participants. The Ethics Committee of Maastricht UMC+, the Netherlands, has waived the need for ethical approval for this study (MECT 2020-1336).

Patient and public involvement

EFCNI, as a pan-European network of parent organisations, was the initiator of this research project and responsible for all phases of the study. In addition, representatives from national parent organisations worldwide were involved in the review of the questionnaire and in manuscript writing (as part of the COVID-19 Zero Separation Collaborative Group). Additionally, they supported the translation and dissemination of the survey in their network, and will again be involved in the dissemination of the results.

RESULTS

Baseline and COVID-19 related characteristics

In total, 1148 participants from Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey and Ukraine were eligible for analysis (Figure 1A). Baseline characteristics of participants are shown in Table 1. Nearly all answers were obtained from mothers of the infant (n=1093; 95%) and the majority of participants was between 30 and 39 years old (53%). Most infants were born very preterm (28–<32 weeks of gestation; 35%) or moderate to late preterm infants (32–<37 weeks of gestation; 37%), and were born through caesarean section (72%). Almost 50% of the infants required special/intensive care for over five weeks at the time of answering the questionnaire (Table 1). Baseline characteristics of participants per country are pre-specified in Supplementary Table S1 and partly differed on country-level.

Overall, 41% of the respondents faced lockdown measures in their country/region at the time of birth, 30% were encouraged to adhere to social distancing and 13% were located in countries/regions where precautions were advised or quarantine was implemented (11%, Table 1). In total, 2% of the respondents and 2% of the respondents' partners had tested positive for COVID-19, with the highest numbers in Mexico (12% for both options). Overall, five newborns tested positive for COVID-19 (Table 1).

Table 1. Baseline and COVID-19 characteristics of participants

	Total
Age of respondent (years)	**n = 1146**
<20	5 (0%)
20–29	468 (41%)
30–39	608 (53%)
>40	65 (6%)
Gestational age at birth (weeks)	**n = 1107**
Early preterm: <28	270 (24%)
Very preterm: 28–<32	389 (35%)
Moderate to late preterm: 32–<37	412 (37%)
Term: 37–42	36 (3%)
Multiple pregnancy	**n = 1112**
Yes	180 (16%)
No	932 (84%)
Birth mode	**n = 1111**
Vaginal birth	301 (27%)
C-section	804 (72%)
Both (e.g. in case of multiple pregnancy)	6 (1%)
Birth weight of the baby (grams)	**n = 1110**
<1000	290 (26%)
1000–1500	373 (34%)
>1500–2500	374 (34%)
>2500	71 (6%)
Don't know the birth weight	2 (0%)
Duration of special/intensive care (weeks) (at time of data collection)	**n = 1112**
<1	81 (7%)

1–3	251 (23%)
>3–5	277 (25%)
>5	503 (45%)
COVID-19 situation in country/region at time of baby's birth	**n = 1071**
No major concern	49 (5%)
Precautions	137 (13%)
Social distancing	325 (30%)
Lockdown	438 (41%)
Quarantine	122 (11%)
Have you tested positive for Coronavirus/COVID-19?	**n = 1084**
Yes	27 (2%)
No	1057 (98%)
Has your partner tested positive for Coronavirus/COVID-19?	**n = 1086**
Yes	25 (2%)
No	1039 (96%)
Don't know	22 (2%)
Has your baby tested positive for Coronavirus/COVID-19?	**n = 1087**
Yes	5 (0%)
No	1035 (95%)
Don't know	47 (4%)

Prenatal care and birth

Significant variations regarding the presence of support persons during pregnancy-related appointments and birth could be observed (Figure 1B and Figure 1C). In total, 41% of all participants were not allowed to have a companion present during pregnancy-related appointments. This number was highest in Sweden and Poland (>60%) and lowest in Australia (20%). During birth, 57% of the respondents were not permitted to have another person present (Figure 1C). In Mexico, 87% of the women gave birth without a supporting companion. In Poland, this applied to 90% of the respondents. In Australia, New Zealand and Sweden >90% of the women were permitted to have another person present, and in Australia 90% of the accompanying persons could stay for the entire labour (Supplementary Table S2). Likewise, in Brazil, China and New Zealand >85% of the accompanying persons could stay during the entire labour (Supplementary Table S2).

[Figure 1 here]

Presence with the newborn and skin-to-skin care

In total, 82% of the participants answered that the COVID-19 pandemic affected the facility policy around their ability to be present with the newborn receiving special/intensive care (Table 3). Parental presence was one of the areas affected most, with 27% percent of the total respondents indicating that no-one was allowed to be present with the newborn, with highest numbers in China (52%) and Turkey (49%).

Analysis showed country-specific differences regarding access of family members to the hospitalised infant: around 80–>90% of participants from Australia, Canada, France, New Zealand and Sweden answered that both parents were allowed access. Lower proportions were observed for the remaining countries, with the lowest numbers in China where 35% of the mothers and 29% of the fathers were permitted to be present with the newborn (Table 3). More than half of the participants in Australia, China, France, New Zealand, and Sweden indicated that more than one person was allowed to be present with the newborn at the same time (Table 3).

Overall, 32% of the respondents could see their newborn all the time (24/7), and 13% multiple times per day (Figure 1A). More than 20% were not allowed to see their newborn at any time, which was particularly observed in China (85%) and also reported by respondents from Mexico (14%), Poland (28%), Turkey (36%) and Ukraine (15%, Figure 1A). While more than half of the respondents from Poland were provided with either photos, livestream options or recorded videos as alternative tools to being present, parents from Mexico (78%), Turkey (55%) and Ukraine (81%) were mostly not offered any alternatives (Supplementary Table S3).

While in Australia, Canada, France, New Zealand and Sweden more than 80% of the respondents had unlimited access to their newborn, other countries implemented duration restrictions (Table 3). Significantly high proportions of being "not at all" allowed to be present with the infant were noted in China (87%) and Turkey (34%). In Mexico, Turkey and Ukraine more than half of the respondents indicated that they were allowed to see their baby for up to one hour. More than 70% of the respondents from Canada, China, Mexico, Poland, Turkey and Ukraine felt that the measures implemented due to COVID-19 made it more difficult for them to be present, and more than 70% from China, Mexico, Poland and Turkey to be interactive with their newborn, e.g. regarding skin-to-skin contact (Table 3).

The possibilities to have skin-to-skin contact with the infant differed between countries, with significantly high proportions of respondents in Mexico (47%) and Turkey (49%) indicating that skin-to-skin care was not initiated during the time in the hospital. In China, most respondents (85%) answered that skin-to-skin care had not yet been initiated (if still in the hospital). In the remaining countries, skin-to-skin care was mainly initiated after the first day but during the first week with few exceptions having high answer rates with regards to an early initiation (immediately after birth or on the first day) such as France. In Sweden and France >80% of the mothers were permitted to have skin-to-skin contact with their newborn as often as they wanted. While >95% of the respondents from Australia, Brazil, Canada, France, New Zealand and Sweden could touch their newborn in the incubator or bed as often as they wanted or at least once per day, 92% of the participants in China, and 60% in Turkey were not permitted to do so (Table 3).

The involvement in the care was perceived differently by parents across countries. While participants from Australia, France, New Zealand and Sweden felt they were highly involved in the care by medical and nursing staff (>80%), more than 70% of participants in China, Poland, Turkey and Ukraine felt that staff did neither include them nor their partner in the care. In addition, while the majority of participants from Sweden (85%) responded that also their partner was highly involved by medical and nursing staff, this was not the case for participants in Turkey.

295 Table 3. Presence with the newborn and skin-to-skin care

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you know if the Coronavirus/COVID-19 situation affected the facility policy around your ability to be present with the baby receiving special/intensive care?													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
There were no changes	80 (8%)	7 (13%)	2 (6%)	2 (4%)	5 (10%)	12 (11%)	4 (12%)	2 (5%)	4 (13%)	4 (3%)	23 (32%)	10 (3%)	5 (5%)
Restrictions were implemented	816 (82%)	44 (80%)	30 (88%)	44 (90%)	36 (69%)	94 (85%)	27 (79%)	34 (92%)	25 (81%)	118 (89%)	44 (60%)	241 (84%)	79 (82%)
I don't know if there were changes	95 (10%)	4 (7%)	2 (6%)	3 (6%)	11 (21%)	4 (4%)	3 (9%)	1 (3%)	2 (6%)	10 (8%)	6 (8%)	37 (13%)	12 (13%)
Who was allowed to be present with your baby receiving special/intensive care? (multiple answers possible)													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
Sum of multiple answers	**1497 (151%)**	**112 (204%)**	**57 (168%)**	**89 (182%)**	**73 (140%)**	**215 (195%)**	**59 (174%)**	**57 (154%)**	**56 (181%)**	**155 (117%)**	**145 (199%)**	**368 (128%)**	**111 (116%)**
Mother	680 (69%)	52 (95%)	30 (88%)	44 (90%)	18 (35%)	101 (92%)	30 (88%)	25 (68%)	28 (90%)	84 (64%)	60 (82%)	142 (49%)	66 (69%)
Father/partner	501 (51%)	54 (98%)	24 (71%)	42 (86%)	15 (29%)	106 (96%)	27 (79%)	23 (62%)	26 (84%)	19 (14%)	68 (93%)	84 (29%)	13 (14%)
Sibling/s	27 (3%)	3 (5%)	0 (0%)	1 (2%)	3 (6%)	6 (5%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	12 (16%)	0 (0%)	1 (1%)
Other family members	14 (1%)	3 (5%)	2 (6%)	1 (2%)	3 (6%)	0 (0%)	0 (0%)	1 (3%)	1 (3%)	0 (0%)	3 (4%)	0 (0%)	0 (0%)
Friends	2 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
No one	265 (27%)	0 (0%)	1 (3%)	0 (0%)	27 (52%)	2 (2%)	2 (6%)	8 (22%)	0 (0%)	52 (39%)	1 (1%)	141 (49%)	31 (32%)
I don't know	8 (1%)	0 (0%)	0 (0%)	0 (0%)	7 (13%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)
Could more than one person be present with the baby at the same time?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 130**	**n = 74**	**n = 288**	**n = 96**
Yes	326 (33%)	31 (56%)	9 (26%)	20 (41%)	27 (52%)	70 (64%)	2 (6%)	2 (5%)	16 (52%)	5 (4%)	62 (84%)	66 (23%)	16 (17%)
No	664 (67%)	24 (44%)	25 (74%)	29 (59%)	25 (48%)	40 (36%)	32 (94%)	35 (95%)	15 (48%)	125 (96%)	12 (16%)	222 (77%)	80 (83%)
How long were you allowed to see your baby per visit?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 109**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 73**	**n = 288**	**n = 96**
Up to an hour	338 (34%)	1 (2%)	11 (32%)	0 (0%)	2 (4%)	0 (0%)	11 (32%)	31 (84%)	0 (0%)	44 (34%)	0 (0%)	186 (65%)	52 (54%)
More than one hour, up to three hours	41 (4%)	2 (4%)	1 (3%)	0 (0%)	4 (8%)	5 (5%)	3 (9%)	1 (3%)	0 (0%)	22 (17%)	0 (0%)	2 (1%)	1 (1%)
More than three hours, but not unlimited	51 (5%)	5 (9%)	5 (15%)	2 (4%)	1 (2%)	15 (14%)	3 (9%)	0 (0%)	4 (13%)	4 (3%)	2 (3%)	1 (0%)	9 (9%)
Unlimited	360 (36%)	47 (85%)	16 (47%)	47 (96%)	0 (0%)	88 (81%)	15 (44%)	1 (3%)	27 (87%)	27 (21%)	70 (96%)	2 (1%)	20 (21%)
Not at all	199 (20%)	0 (0%)	1 (3%)	0 (0%)	45 (87%)	1 (1%)	2 (6%)	4 (11%)	0 (0%)	34 (26%)	1 (1%)	97 (34%)	14 (15%)
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be present with your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 288**	**n = 96**
Yes	726 (73%)	33 (60%)	18 (53%)	37 (77%)	39 (76%)	61 (55%)	19 (56%)	35 (95%)	20 (65%)	112 (85%)	14 (19%)	263 (91%)	75 (78%)
No, not more difficult	192 (19%)	17 (31%)	15 (44%)	10 (21%)	3 (6%)	42 (38%)	14 (41%)	1 (3%)	7 (23%)	17 (13%)	46 (62%)	11 (4%)	9 (9%)
No, there were no restrictive measures in place	39 (4%)	4 (7%)	1 (3%)	1 (2%)	0 (0%)	4 (4%)	1 (3%)	1 (3%)	3 (10%)	2 (2%)	11 (15%)	3 (1%)	8 (8%)
Don't know	33 (3%)	1 (2%)	0 (0%)	0 (0%)	9 (18%)	3 (3%)	0 (0%)	0 (0%)	1 (3%)	1 (1%)	3 (4%)	11 (4%)	4 (4%)
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be interactive with your baby (e.g. skin-to-skin contact or being involved in the care of your baby)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 286**	**n = 96**
Yes	634 (64%)	13 (24%)	15 (44%)	27 (55%)	38 (75%)	41 (37%)	21 (62%)	36 (97%)	9 (29%)	106 (80%)	9 (12%)	266 (93%)	53 (55%)

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
No, not more difficult	258 (26%)	31 (56%)	16 (47%)	16 (33%)	4 (8%)	53 (48%)	11 (32%)	0 (0%)	13 (42%)	22 (17%)	46 (62%)	11 (4%)	35 (36%)
No, there were no restrictive measures in place	72 (7%)	10 (18%)	2 (6%)	5 (10%)	0 (0%)	15 (14%)	1 (3%)	1 (3%)	9 (29%)	3 (2%)	18 (24%)	4 (1%)	4 (4%)
Don't know	25 (3%)	1 (2%)	1 (3%)	1 (2%)	9 (18%)	1 (1%)	1 (3%)	0 (0%)	0 (0%)	1 (1%)	1 (1%)	5 (2%)	4 (4%)
When was skin-to-skin contact with your baby and one of the parents initiated (e.g. holding the baby on the chest, kangaroo mother care)?													
	n = 1044	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 117**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
Immediately after birth	65 (6%)	7 (13%)	1 (3%)	8 (16%)	2 (4%)	13 (11%)	1 (3%)	0 (0%)	5 (16%)	7 (5%)	11 (15%)	4 (1%)	6 (6%)
On the first day	99 (9%)	14 (25%)	0 (0%)	7 (14%)	0 (0%)	43 (37%)	1 (3%)	0 (0%)	5 (16%)	4 (3%)	19 (25%)	4 (1%)	2 (2%)
After the first day but during the first week	236 (23%)	23 (41%)	8 (24%)	21 (43%)	0 (0%)	45 (38%)	8 (23%)	3 (8%)	14 (45%)	36 (25%)	35 (47%)	17 (6%)	26 (25%)
After the first week	244 (23%)	11 (20%)	21 (64%)	13 (27%)	4 (8%)	14 (12%)	18 (51%)	13 (34%)	7 (23%)	32 (22%)	10 (13%)	60 (19%)	41 (39%)
Not so far (If still in hospital)	156 (15%)	1 (2%)	2 (6%)	0 (0%)	44 (85%)	1 (1%)	0 (0%)	4 (11%)	0 (0%)	19 (13%)	0 (0%)	72 (23%)	13 (13%)
Not during the time in the hospital if discharged	244 (23%)	0 (0%)	1 (3%)	0 (0%)	2 (4%)	1 (1%)	7 (20%)	18 (47%)	0 (0%)	48 (33%)	0 (0%)	151 (49%)	16 (15%)
How often were you permitted to have skin-to-skin contact (kangaroo mother care) with your baby?													
	n = 1043	**n = 56**	**n = 32**	**n = 49**	**n = 52**	**n = 118**	**n = 34**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
As often as I wanted	302 (29%)	18 (32%)	14 (44%)	25 (51%)	0 (0%)	99 (84%)	8 (24%)	0 (0%)	16 (52%)	12 (8%)	63 (84%)	11 (4%)	36 (35%)
At least once per day	227 (22%)	31 (55%)	11 (34%)	21 (43%)	2 (4%)	15 (13%)	13 (38%)	12 (32%)	12 (39%)	31 (21%)	9 (12%)	43 (14%)	27 (26%)
At least once per week	64 (6%)	6 (11%)	3 (9%)	2 (4%)	0 (0%)	2 (2%)	3 (9%)	4 (11%)	3 (10%)	17 (12%)	3 (4%)	18 (6%)	3 (3%)
Less than once per week	77 (7%)	0 (0%)	1 (3%)	1 (2%)	2 (4%)	1 (1%)	4 (12%)	7 (18%)	0 (0%)	24 (16%)	0 (0%)	29 (9%)	8 (8%)
Not so far	373 (36%)	1 (2%)	3 (9%)	0 (0%)	48 (92%)	1 (1%)	6 (18%)	15 (39%)	0 (0%)	62 (42%)	0 (0%)	207 (67%)	30 (29%)
Did medical/nursing staff involve you in the care of your baby (e.g. nappy changing, feeding, temperature taking)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 287**	**n = 96**
Yes, to a high degree	438 (44%)	44 (80%)	15 (44%)	34 (69%)	4 (8%)	102 (93%)	22 (65%)	6 (16%)	27 (87%)	48 (37%)	67 (91%)	22 (8%)	47 (49%)
Yes, to some degree	180 (18%)	10 (18%)	10 (29%)	15 (31%)	3 (6%)	7 (6%)	10 (29%)	11 (30%)	4 (13%)	29 (22%)	7 (9%)	53 (18%)	21 (22%)
No, not at all	364 (37%)	1 (2%)	9 (26%)	0 (0%)	40 (78%)	1 (1%)	2 (6%)	20 (54%)	0 (0%)	53 (40%)	0 (0%)	211 (74%)	27 (28%)
Don't know	7 (1%)	0 (0%)	0 (0%)	0 (0%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1 (0%)	1 (1%)
Did medical/nursing staff involve your partner in the care of your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 288**	**n = 96**
Yes, to a high degree	274 (28%)	35 (64%)	4 (12%)	29 (59%)	3 (6%)	87 (79%)	19 (56%)	5 (14%)	18 (58%)	2 (2%)	63 (85%)	4 (1%)	5 (5%)
Yes, to some degree	121 (12%)	18 (33%)	9 (26%)	14 (29%)	4 (8%)	15 (14%)	8 (24%)	6 (16%)	6 (19%)	10 (8%)	7 (9%)	18 (6%)	6 (6%)
No, not at all	567 (57%)	1 (2%)	19 (56%)	6 (12%)	39 (76%)	6 (5%)	6 (18%)	24 (65%)	5 (16%)	114 (87%)	3 (4%)	263 (91%)	81 (84%)
Don't know	17 (2%)	0 (0%)	2 (6%)	0 (0%)	5 (10%)	0 (0%)	1 (3%)	1 (3%)	0 (0%)	4 (3%)	0 (0%)	1 (0%)	3 (3%)
I don't have a partner	11 (1%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)	1 (3%)	2 (6%)	1 (1%)	1 (1%)	2 (1%)	1 (1%)

Blue: 95% confidence interval for difference in means: significantly higher than total
Green: 95% confidence interval for difference in means: significantly lower than total

Nutrition and breastfeeding

In total, 89% of the respondents answered that their newborns were fed with breastmilk (breastfeeding or pumped milk), 22% received donor human milk and 34% were fed with infant formula (multiple response question; Supplementary Table S4). Initiation of breastfeeding was highly (50%) or somewhat (26%) encouraged by medical/nursing staff in most countries (Supplementary Table S4). Overall, 18% indicated that breastfeeding was not encouraged at all. This lack of encouragement was especially noted in Italy (32%), Poland and Turkey (>25%). However, newborns in Italy and Turkey were in over 90% of cases still exclusively or partly breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth (Supplementary Table S4).

Also, the initiation of breastfeeding differed across countries. In Canada, first breastfeeding or provision of mother's own pumped/expressed breastmilk took place on the first day (57%) or after the first day but during the first week (37%). Likewise, in Australia, France and New Zealand, >50% of the respondents indicated that breastfeeding was initiated on the first day. In Mexico, 50% of the babies received first breastmilk after the first week. In Brazil, France, Italy and Ukraine more than 20% of the babies were first breastfed after the first week (Supplementary Table S4).

In most countries, the respondents were allowed to bring expressed milk from home to the unit (76%). In Brazil, the milk had to be expressed at the hospital (71%). In New Zealand, Poland, Sweden and Ukraine more than 10% of the respondents indicated that they were not allowed to bring expressed milk from home to the unit.

Health information and communication

Almost 90% of the respondents felt that they had received adequate general health information about their newborn during the hospital stay either to a high or some degree (Supplementary Table S5). Parents from Australia, Brazil, Canada, France, Italy, New Zealand and Sweden indicated to a high degree of having received general health information (>50%). While 84% of the respondents from China indicated that they received general health information to a high or to some degree, 10% answered that they did not receive any information.

Almost 80% of the respondents received information about their newborn multiple times per day or once per day (Supplementary Table S5). General health information was mostly communicated to the parents in face-to-face meetings with medical/nursing staff (76%) or via phone calls (50%).

Overall, more than 60% of the respondents from Italy felt to a high degree that they had received adequate information about how to protect themselves and their newborn from a COVID-19 transmission. In China, 50% felt that they knew how to prevent transmission. A similar result could be observed at discharge from the hospital: in Italy and China where about 40% of the respondents indicated that they received adequate information about COVID-19 to a high degree. In Poland, almost 40% of the respondents felt they had not received any information about COVID-19 when being discharged from the hospital (Supplementary Table S5).

Parents' mental health and support

More than three-quarters of the respondents indicated being worried about the COVID-19 situation during pregnancy. For 9% of the respondents, COVID-19 was not an issue, and 10% did not worry about the virus at all. While most respondents from Mexico worried about COVID-19 during pregnancy to a high degree (71%), this was only the case for 18% of the respondents from China (Figure 2A). After birth, 90% of the total respondents worried about the COVID-19 situation to a high or to some degree. Parents from Brazil worried to a high degree (94%), while more than half of the parents from China were not at all concerned (Figure 2A).

Overall, 42% of the respondents felt they were adequately informed about mental health support to a high or some degree (Figure 2B). However, 38% felt they were not at all informed, and in 17% of the

cases there was no mental health support. The results show that proportions of having received adequate information were highest in Australia and lowest in Turkey and Mexico. The absence of mental health support was highest in Ukraine and Poland (34%). If support was offered, most parents received psychological counselling (29%) and help from a social worker (19%). In total, 48% of the respondents answered that no support was offered (Supplementary Table S6).

[Figure 2 here]

DISCUSSION

The COVID-19 pandemic has disrupted healthcare systems, and further challenged the already inadequate application of an IFCDC approach in many countries worldwide. Measures to stem virus transmission have resulted in (additional) restrictions affecting preterm, sick, and low birthweight infants, one of the most vulnerable groups of patients [16,18]. Highlighting the importance of IFCDC and by taking a patient/parent-centred approach, this study has identified parents' perceptions to different policy measures across 12 countries, with severe implications for both IFCDC as well as the health outcomes of vulnerable infants born during the pandemic [24–26]. In what follows, we will reflect upon the key findings that emerged from our multi-country research, covering data from Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, and Ukraine.

Perinatal care was impacted by the pandemic and respective restrictions, in particular with regard to having support persons present during both pregnancy-related appointments and birth. Our findings have shown that while some countries have hardly restricted the presence of accompanying persons during birth (such as Australia, New Zealand, Canada and Sweden), in many other countries it was not permitted to have a support person present (as for example in >60% in China, Ukraine, Turkey, and >85% in Poland and Mexico). This restriction finally leaves the person giving birth without any emotional, informational, and practical support from a person of trust. In contrast with such pandemic-related restrictions, previous research showed that having a support person present fulfilling these tasks facilitates non-pharmacological pain relief as well as bonding, and improves maternal well-being [25,26,32,33], which clearly highlights the benefits as well as the importance of labour companionship. In its recommendations on "Intrapartum care for a positive childbirth experience", the WHO advocates for a companion of choice for all women throughout labour and childbirth [34] also during the pandemic [35]. Thus, global health agendas do no longer exclusively focus on the reduction of birth complications, yet they have expanded their scope and have started to emphasise the importance of maternal and newborn health and well-being, and that mother and child should also thrive and enjoy their full potential of health [33]. Partners should therefore be allowed access to enable a respectful childbirth experience, yet this opportunity is too often being withheld as our research showed.

This study also revealed shortcomings regarding presence and involvement of family members while the newborn needed special/intensive care, which confirms results of similar studies [14,18,20,29,36]. As we have learned from our findings [16], restrictions were implemented and, besides some exceptions (e.g. in Australia, Canada, France, New Zealand and Sweden), in seven out of 12 countries, partly only the mother was allowed to be present with the newborn. The other parent, however, was less likely to have access with strict access restrictions e.g. in Poland and Ukraine, and siblings as well as other family members were hardly ever allowed in the neonatal intensive care unit in any country. Most importantly, our results showed that there are countries (e.g. Turkey and China) where nobody (not even father or mother) was allowed to be with the hospitalised infant. Thus, extremely strict access measures following a severe separation policy between parents and their vulnerable infant were implemented. Parental-infant bonding, however, can only take place if the parents are present and given the opportunity to care for their newborn [30,37–39]. Not including parents in caring, planning, and participation in decision-making processes pertaining to their newborn, will less likely establish feelings of competency and a healthy parent-child relationship [37]. Research shows that if the parents feel empowered to care for the child, maternal stress and anxiety can be reduced and hospital stays may be shorter [40,41]. Despite this, involving parents and seeing them as primary caregivers also depends on the mind-set of healthcare professionals [42].

Separating family members, and in particular parents from their newborns has severe consequences for the care provision and health outcomes of the vulnerable infant, for example due to limited possibilities for skin-to-skin care and KMC [18,39]. For almost one quarter of the total respondents, skin-to-skin contact with the newborn was not initiated during the time in the hospital, with particular strict measures in Mexico and Turkey, even though the benefits of practices such as KMC are undisputed [42–47]. The positive influence on developmental outcomes far outweighs the potential risk of death due to COVID-19 as research highlights [27]. Survival benefits of immediate KMC seem to be higher compared to those of conventional care in an incubator or a radiant warmer, as a recent randomised control trial conducted in low-resource hospital shows [47], making further research also in well-resourced settings necessary. These findings highlight that newborns should not be separated from their parents; our study unfortunately shows that the separation of parents and their newborn is (still) common practice as a minimum during the pandemic.

Even though a large majority of parents felt adequately informed about their newborn, almost 40% of the total respondents were not involved at all in the care of their baby (e.g. nappy changing, feeding, temperature taking) and almost 60% indicated that their partner was not involved in caring for the newborn, leaving them without any practice when the infant was discharged. Strong country-specific differences show that the involvement of the parents was encouraged more in Australia, Canada, France, Italy, New Zealand and Sweden in comparison to China, Poland, Turkey and Ukraine. Moreover, the implemented measures during COVID-19 made parental presence and interaction with the baby more difficult for parents in Mexico, Poland and Turkey than in Australia, France, New Zealand and Sweden. Although we could observe considerable country-specific differences on specific elements of IFCDC, overall, some countries such as New Zealand and Sweden, performed uniformly well, while other countries fell behind. These differences can also be interpreted as a prioritisation of a holistic IFCDC approach in some countries which might have already put a greater focus on this care approach in the pre-pandemic phase, however, further research is necessary.

In contrast to parental presence and skin-to-skin contact, breastfeeding does not seem to have been impacted to the same degree. Despite various implemented restrictions, our data did not suggest that the ability to breastfeed or breastfeeding in general was discouraged by nursing staff across the 12 countries. Although about 30% of the parents from Italy and Mexico indicated that breastfeeding was not encouraged at all by nursing staff – against the current WHO recommendation [48] – this did not influence the number of infants being breastfed or provided with mother's own pumped or expressed breastmilk in the first weeks after birth (>90%). It has been outlined that globally, breastfeeding has not been prioritised and encouraged during the pandemic, e.g. due to early discharge and limited lactation support, with possible negative implications for its initiation [28,49,50]. Our data, however, implies that breastfeeding, as one element of IFCDC, was somewhat less affected by the restrictions, at least in the hospital. However, this study does not show the long-term trend and potential continuation of breastfeeding, e.g. also in case of early discharge which frequently occurred during the pandemic [17].

Having a newborn requiring special/intensive care is in itself a stressful situation for parents, and even more so during a pandemic. Preterm birth can be associated with a number of adverse maternal psychological outcomes, among others anxiety and psychological distress [51,52]. The COVID-19 pandemic, as an additional contributing factor to emotional distress and with an increased risk for psychiatric illness [53] and postnatal depression [54], makes parents of a preterm, sick or low birthweight infant increasingly vulnerable to developing mental health issues. Our results show that the COVID-19 situation was especially worrisome for parents from Brazil, Canada and Mexico after the birth of their baby, and at the same time these parents, together with those from Turkey, did not feel well informed about mental health and support. Early intervention is however important, and mental health support should be offered as early as possible and already during the hospital stay [51]. In an emergency situation, such as the COVID-19 pandemic, the focus on health and early supportive measures should be even more pronounced.

This study has several strengths that merit attention, and contextual factors that need to be outlined. The cross-country approach, data collection in 12 countries and extensive outreach allowed us to acquire

valuable and in-depth insights into parents' perspectives and experiences regarding IFCDC during the first year of the COVID-19 pandemic. Pre-testing of the questionnaire reduced methodological inaccuracies and ensured that data was collected in a sensitive way. The findings comprehensively reflect the parent perspective across multiple countries giving insights into country-specific differences which are worthwhile to derive suggestions for improvements on the global and country-specific policy level.

The study has limitations that need to be acknowledged. Due to limited access and outreach possibilities in our network, we were not able to collect a representative set of data in particularly African and Southeast-Asian countries. In many countries in these regions, parent representative organisations do either not exist or do not have a strong lobby, which is in itself an important finding and worthwhile to investigate further. Setting up the study in an online format furthermore bears the risk of selection bias [55], and response rates could not be calculated as information on non-responders, in particular, during the pandemic state is not available. Due to missing demographics on neonates receiving special/intensive care in the different countries, we were unable to assess the representativeness of the sample. We are aware that participants completed the survey at different care stages (i.e. during/after hospitalisation) with a potential impact on the parents' perceived experiences. It also needs to be acknowledged that different countries, cultures, settings, income levels, political- and health care systems, as well as the individual countries' contribution to the full sample comprise a potential risk of confounding bias. Moreover, the study reflects a point in time and we are unable to compare our findings to pre-pandemic contexts. We acknowledge that strong variation has already existed between and within countries in the field of newborn care, which is not exclusively related to the COVID-19 pandemic. Additionally, the respective pandemic situation, geographical, climatic and environmental aspects, as well as containment strategies vary between (and sometimes even within) countries and might have influenced on the one hand, the COVID-19 related policy approach and on the other hand, the results in the respective countries [56]. This has to be acknowledged when comparing results between countries and interpreting potential implications of the COVID-19 incidence on IFCDC on a country level.

CONCLUSION

To the best of our knowledge, this is the first multi-country comparison of parents' experiences regarding special/intensive care for newborns during the first year of the COVID-19 pandemic on a country level. The pandemic has challenged healthcare systems leading to disruptions in the care of the most vulnerable groups of patients, namely preterm, sick, and low birthweight infants. Pandemic related restrictions are certainly necessary to prevent and reduce transmission of SARS-CoV-2. However, restrictions in parental presence and the missing possibility for skin-to-skin contact, together with lacking mental health support are global health drawbacks threatening newborn survival, quality of life of survivors and their families, and hinder the achievement of the 2030 Development Agenda. This study provides unique opportunities for public health experts, policy makers, and healthcare professionals alike to learn from country-specific differences and in-depth insights and consequences from different approaches. It is essential to listen to and acknowledge parents' voices and experiences. Immediate action is necessary, including the reconsideration of implemented restrictions to strengthen an IFCDC approach, both during and in the absence of a global crisis.

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Contributors

The EFCNI scientific team conceptualised the study and set up the online-survey under the lead of JK and with critical feedback by LZ, SM, and the members of the COVID-19 Zero Separation Collaborative Group. The COVID-19 Zero Separation Collaborative Group substantially supported the recruitment of respondents. CRP and JH were responsible for the statistical analysis, with feedback by JK, AW, and LZ. JK, CRP, and JH drafted the manuscript which was shared with and continuously reviewed by AW, SM, and LZ. JK, JH, CRP, AW, LZ, and SM interpreted and had full access to the data. All authors critically revised and have read and approved the final manuscript.

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Competing interests

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Patient consent for publication

Not required.

Ethics approval

The Ethics Committee of Maastricht UMC+, the Netherlands, has waived the need for ethical approval for this study (MECT 2020-1336).

Data availability statement

Data are available from the corresponding author on reasonable request.

Figures

Figure 1. Distribution of respondents by country and parental presence with newborn per country (A), presence of support persons during pregnancy-related appointments (B), and labour companionship (C)

Figure 2. Country-specific proportions on A. the concern about the COVID-19 situation and B. mental health support

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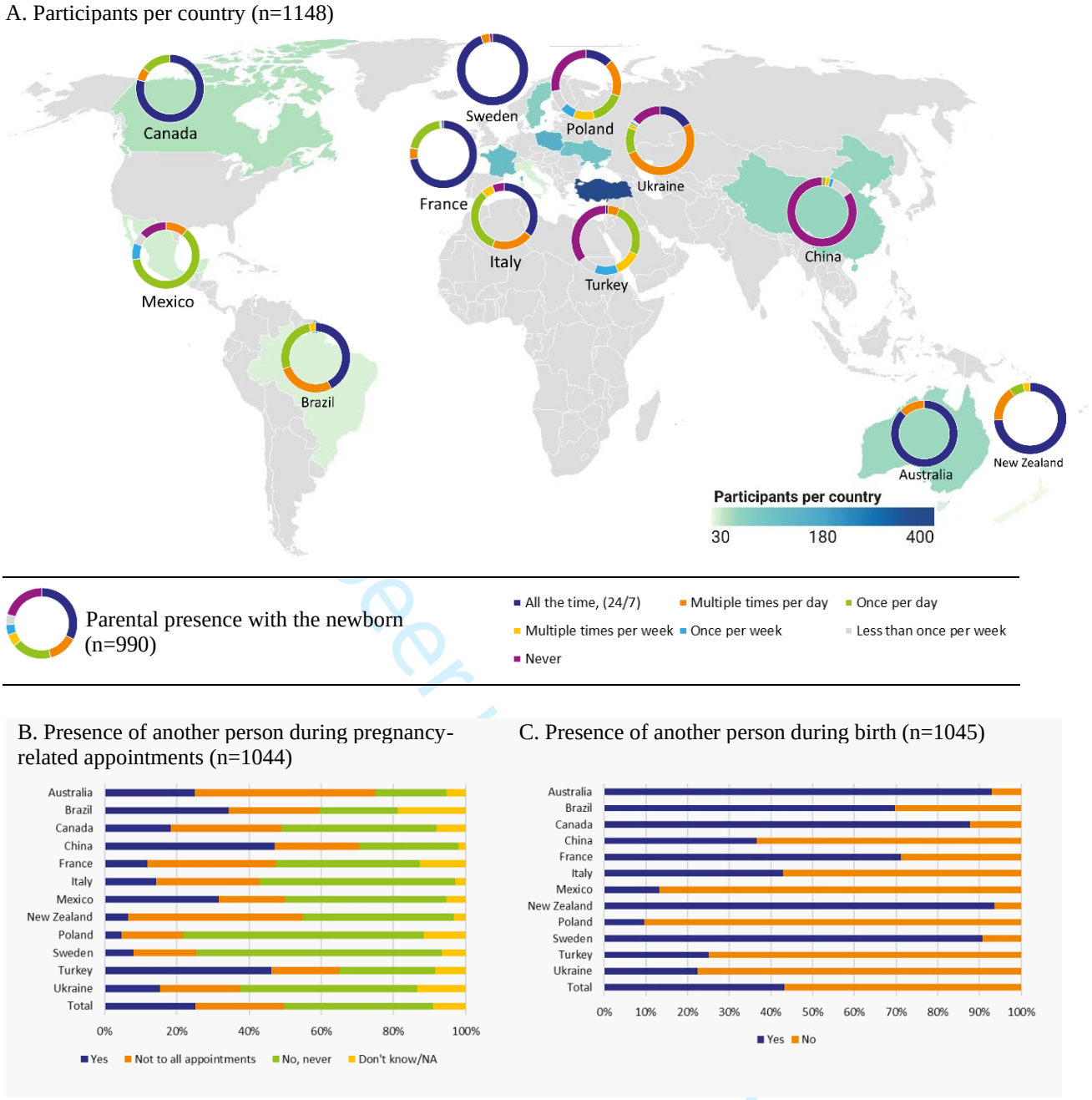

Figure 1. Distribution of respondents by country and parental presence with newborn per country (A), presence of support persons during pregnancy-related appointments (B), and labour companionship (C)

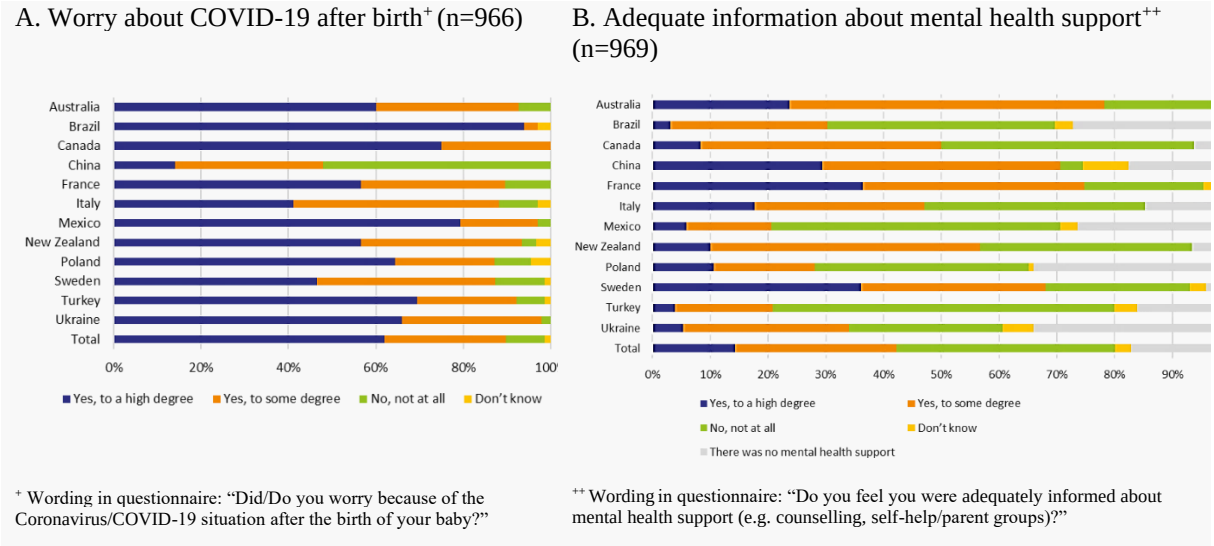

Figure 2. Country-specific proportions on A. the concern about the COVID-19 situation and B. mental health support

SUPPLEMENTARY MATERIAL

Supplementary Table S1
Title: Baseline and COVID-19 related characteristics of participants

Supplementary Table S2
Title: Prenatal care and birth

Supplementary Table S3
Title: Presence with the newborn

Supplementary Table S4
Title: Information on breastfeeding/nutrition

Supplementary Table S5
Title: Information on health communication

Supplementary Table S6
Title: Information on mental health status

Supplementary Table S1. Baseline and COVID-19 related characteristics of participants

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Age of respondent (years)													
	n = 1146	**n = 58**	**n = 38**	**n = 52**	**n = 60**	**n = 125**	**n = 38**	**n = 40**	**n = 31**	**n = 160**	**n = 78**	**n = 357**	**n = 109**
<20	5 (0%)	1 (2%)	0 (0%)	0 (0%)	1 (2%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)
20-29	468 (41%)	14 (24%)	15 (39%)	15 (29%)	16 (27%)	40 (32%)	2 (5%)	18 (45%)	15 (48%)	70 (44%)	24 (31%)	205 (57%)	34 (31%)
30-39	608 (53%)	39 (67%)	20 (53%)	30 (58%)	38 (63%)	78 (62%)	30 (79%)	18 (45%)	15 (48%)	84 (53%)	46 (59%)	136 (38%)	74 (68%)
>40	65 (6%)	4 (7%)	3 (8%)	7 (13%)	5 (8%)	6 (5%)	6 (16%)	3 (8%)	1 (3%)	6 (4%)	8 (10%)	15 (4%)	1 (1%)
Gestational age at birth (weeks)													
	n = 1107	**n = 58**	**n = 37**	**n = 49**	**n = 53**	**n = 123**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 106**
Early preterm: <28	270 (24%)	22 (38%)	9 (24%)	15 (31%)	18 (34%)	40 (33%)	9 (25%)	4 (10%)	6 (19%)	40 (26%)	23 (31%)	67 (19%)	17 (16%)
Very preterm: 28–<32	389 (35%)	10 (17%)	16 (43%)	14 (29%)	29 (55%)	36 (29%)	10 (28%)	20 (49%)	7 (23%)	48 (31%)	27 (36%)	140 (41%)	32 (30%)
Moderate to late preterm: 32–<37	412 (37%)	20 (34%)	12 (32%)	20 (41%)	6 (11%)	43 (35%)	15 (42%)	15 (37%)	15 (48%)	64 (42%)	19 (25%)	131 (38%)	52 (49%)
Term: 37–42	36 (3%)	6 (10%)	0 (0%)	0 (0%)	0 (0%)	4 (3%)	2 (6%)	2 (5%)	3 (10%)	2 (1%)	6 (8%)	6 (2%)	5 (5%)
Multiple pregnancy													
	n = 1112	**n = 58**	**n = 37**	**n = 49**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 109**
Yes	180 (16%)	12 (21%)	7 (19%)	6 (12%)	18 (33%)	14 (11%)	5 (14%)	4 (10%)	3 (10%)	14 (9%)	16 (21%)	65 (19%)	16 (15%)
No	932 (84%)	46 (79%)	30 (81%)	43 (88%)	36 (67%)	110 (89%)	31 (86%)	37 (90%)	28 (90%)	140 (91%)	59 (79%)	279 (81%)	93 (85%)
Birth mode													
	n = 1111	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 30**	**n = 153**	**n = 75**	**n = 344**	**n = 109**
Vaginal birth	301 (27%)	18 (31%)	6 (16%)	22 (44%)	24 (44%)	62 (50%)	14 (39%)	6 (15%)	6 (20%)	42 (27%)	28 (37%)	38 (11%)	35 (32%)
C-section	804 (72%)	39 (67%)	31 (84%)	28 (56%)	29 (54%)	62 (50%)	21 (58%)	35 (85%)	24 (80%)	111 (73%)	47 (63%)	304 (88%)	73 (67%)
Both (e.g. in case of multiple pregnancy)	6 (1%)	1 (2%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)	1 (1%)
Birth weight of the baby (grams)													
	n = 1110	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 342**	**n = 108**
<1000	290 (26%)	20 (34%)	10 (27%)	18 (36%)	15 (28%)	45 (36%)	14 (39%)	6 (15%)	8 (26%)	35 (23%)	27 (36%)	78 (23%)	14 (13%)
1000-1500	373 (34%)	14 (24%)	15 (41%)	11 (22%)	28 (52%)	28 (23%)	5 (14%)	18 (44%)	7 (23%)	57 (37%)	18 (24%)	130 (38%)	42 (39%)
>1500-2500	374 (34%)	16 (28%)	12 (32%)	15 (30%)	10 (19%)	45 (36%)	16 (44%)	13 (32%)	10 (32%)	53 (34%)	19 (25%)	120 (35%)	45 (42%)
>2500	71 (6%)	8 (14%)	0 (0%)	6 (12%)	1 (2%)	6 (5%)	1 (3%)	4 (10%)	6 (19%)	9 (6%)	10 (13%)	14 (4%)	6 (6%)
Don't know the birth weight	2 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1 (1%)
Duration of special/intensive care (weeks)													
	n = 1112	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 108**
<1	81 (7%)	3 (5%)	0 (0%)	5 (10%)	5 (9%)	4 (3%)	4 (11%)	3 (7%)	1 (3%)	10 (6%)	4 (5%)	13 (4%)	29 (27%)
1-3	251 (23%)	10 (17%)	5 (14%)	11 (22%)	17 (31%)	24 (19%)	11 (31%)	7 (17%)	3 (10%)	29 (19%)	20 (27%)	73 (21%)	41 (38%)
>3-5	277 (25%)	12 (21%)	10 (27%)	2 (4%)	17 (31%)	61 (49%)	3 (8%)	10 (24%)	9 (29%)	43 (28%)	13 (17%)	83 (24%)	14 (13%)
>5	503 (45%)	33 (57%)	22 (59%)	32 (64%)	15 (28%)	35 (28%)	18 (50%)	21 (51%)	18 (58%)	72 (47%)	38 (51%)	175 (51%)	24 (22%)

Supplementary Table S1. Baseline and COVID-19 related characteristics of participants *(continued)*

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Different countries and regions have been addressing the threat of Coronavirus/COVID-19 in different ways. Which of the following best describes the situation in your country/region around the time of your baby's birth?													
	n = 1071	**n = 58**	**n = 33**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 41**	**n = 30**	**n = 151**	**n = 75**	**n = 322**	**n = 107**
No major concern	49 (5%)	0 (0%)	3 (9%)	4 (8%)	14 (27%)	6 (5%)	1 (3%)	2 (5%)	0 (0%)	1 (1%)	1 (1%)	14 (4%)	3 (3%)
Precautions	137 (13%)	6 (10%)	2 (6%)	4 (8%)	30 (58%)	12 (10%)	2 (6%)	5 (12%)	5 (17%)	12 (8%)	5 (7%)	44 (14%)	10 (9%)
Social distancing	325 (30%)	17 (29%)	8 (24%)	14 (29%)	7 (13%)	38 (32%)	9 (26%)	7 (17%)	6 (20%)	48 (32%)	69 (92%)	80 (25%)	22 (21%)
Lockdown	438 (41%)	31 (53%)	16 (48%)	26 (53%)	1 (2%)	16 (14%)	16 (46%)	27 (66%)	18 (60%)	73 (48%)	0 (0%)	147 (46%)	67 (63%)
Quarantine	122 (11%)	4 (7%)	4 (12%)	1 (2%)	0 (0%)	46 (39%)	7 (20%)	0 (0%)	1 (3%)	17 (11%)	0 (0%)	37 (11%)	5 (5%)
Have you tested positive for Coronavirus/COVID-19?													
	n = 1084	**n = 58**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 35**	**n = 41**	**n = 31**	**n = 150**	**n = 75**	**n = 326**	**n = 109**
Yes	27 (2%)	1 (2%)	1 (3%)	0 (0%)	0 (0%)	1 (1%)	1 (3%)	5 (12%)	0 (0%)	1 (1%)	4 (5%)	8 (2%)	5 (5%)
No	1057 (98%)	57 (98%)	34 (97%)	50 (100%)	53 (100%)	120 (99%)	34 (97%)	36 (88%)	31 (100%)	149 (99%)	71 (95%)	318 (98%)	104 (95%)
Has your partner tested positive for Coronavirus/COVID-19?													
	n = 1086	**n = 57**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 36**	**n = 41**	**n = 31**	**n = 152**	**n = 75**	**n = 326**	**n = 109**
Yes	25 (2%)	1 (2%)	2 (6%)	0 (0%)	0 (0%)	1 (1%)	1 (3%)	5 (12%)	0 (0%)	0 (0%)	1 (1%)	8 (2%)	6 (6%)
No	1039 (96%)	56 (98%)	27 (77%)	50 (100%)	53 (100%)	117 (97%)	35 (97%)	36 (88%)	31 (100%)	147 (97%)	74 (99%)	312 (96%)	101 (93%)
Don't know	22 (2%)	0 (0%)	6 (17%)	0 (0%)	0 (0%)	3 (2%)	0 (0%)	0 (0%)	0 (0%)	5 (3%)	0 (0%)	6 (2%)	2 (2%)
Has your baby tested positive for Coronavirus/COVID-19?													
	n = 1087	**n = 58**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 36**	**n = 41**	**n = 31**	**n = 152**	**n = 75**	**n = 326**	**n = 109**
Yes	5 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	1 (1%)
No	1035 (95%)	57 (98%)	31 (89%)	50 (100%)	50 (94%)	113 (93%)	35 (97%)	39 (95%)	31 (100%)	145 (95%)	74 (99%)	303 (93%)	107 (98%)
Don't know	47 (4%)	0 (0%)	4 (11%)	0 (0%)	3 (6%)	8 (7%)	0 (0%)	1 (2%)	0 (0%)	7 (5%)	1 (1%)	22 (7%)	1 (1%)

Supplementary Table S2. Prenatal care and birth

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
How was the timing of pregnancy-related appointments affected, if at all, by Coronavirus/Covid-19?													
	n = 1045	**n = 56**	**n = 33**	**n = 48**	**n = 51**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 147**	**n = 75**	**n = 308**	**n = 105**
It was done as usual	117 (11%)	7 (13%)	3 (9%)	7 (15%)	1 (2%)	8 (7%)	4 (11%)	4 (11%)	2 (6%)	12 (8%)	24 (32%)	40 (13%)	5 (5%)
No appointments took place	510 (49%)	23 (41%)	21 (64%)	22 (46%)	49 (96%)	70 (59%)	20 (57%)	10 (26%)	3 (10%)	75 (51%)	30 (40%)	147 (48%)	40 (38%)
Fewer appointments took place	47 (4%)	0 (0%)	2 (6%)	1 (2%)	0 (0%)	10 (8%)	1 (3%)	4 (11%)	2 (6%)	9 (6%)	3 (4%)	8 (3%)	7 (7%)
Other	371 (36%)	26 (46%)	7 (21%)	18 (38%)	1 (2%)	30 (25%)	10 (29%)	20 (53%)	24 (77%)	51 (35%)	18 (24%)	113 (37%)	53 (50%)
If you were permitted to have another person present with you during birth, for how long was this person permitted to stay with you?													
	n = 481	**n = 51**	**n = 24**	**n = 44**	**n = 20**	**n = 85**	**n = 18**	**n = 6**	**n = 29**	**n = 14**	**n = 71**	**n = 96**	**n = 23**
For the entire labour	367 (76%)	46 (90%)	23 (96%)	38 (86%)	17 (85%)	67 (79%)	7 (39%)	1 (17%)	25 (86%)	9 (64%)	59 (83%)	60 (63%)	15 (65%)
For a part of it	114 (24%)	5 (10%)	1 (4%)	6 (14%)	3 (15%)	18 (21%)	11 (61%)	5 (83%)	4 (14%)	5 (36%)	12 (17%)	36 (38%)	8 (35%)

Supplementary Table S3. Presence with the newborn

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Were you permitted to touch your baby in the incubator or bed?													
	n = 1047	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 147**	**n = 75**	**n = 308**	**n = 105**
Yes	754 (72%)	55 (98%)	33 (100%)	49 (100%)	4 (8%)	116 (98%)	32 (91%)	31 (82%)	31 (100%)	119 (81%)	74 (99%)	124 (40%)	86 (82%)
No	293 (28%)	1 (2%)	0 (0%)	0 (0%)	48 (92%)	2 (2%)	3 (9%)	7 (18%)	0 (0%)	28 (19%)	1 (1%)	184 (60%)	19 (18%)
How often were you permitted to touch your baby in the incubator or bed?													
	n = 1046	**n = 56**	**n = 34**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 74**	**n = 308**	**n = 105**
As often as I wanted	491 (47%)	46 (82%)	29 (85%)	42 (86%)	0 (0%)	110 (93%)	20 (57%)	5 (13%)	31 (100%)	54 (37%)	72 (97%)	20 (6%)	62 (59%)
At least once per day	174 (17%)	9 (16%)	5 (15%)	7 (14%)	2 (4%)	6 (5%)	11 (31%)	20 (53%)	0 (0%)	33 (23%)	2 (3%)	57 (19%)	22 (21%)
At least once per week	43 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (8%)	0 (0%)	15 (10%)	0 (0%)	24 (8%)	0 (0%)
Less than once per week	73 (7%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)	0 (0%)	2 (6%)	3 (8%)	0 (0%)	22 (15%)	0 (0%)	37 (12%)	7 (7%)
Not so far	265 (25%)	0 (0%)	0 (0%)	0 (0%)	48 (92%)	2 (2%)	2 (6%)	7 (18%)	0 (0%)	22 (15%)	0 (0%)	170 (55%)	14 (13%)
Were sleeping facilities provided so you could stay with the baby (24/7)?													
	n = 984	**n = 55**	**n = 33**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 129**	**n = 74**	**n = 286**	**n = 96**
Yes, sleeping facilities were provided next to my baby in the unit	179 (18%)	5 (9%)	4 (12%)	15 (31%)	5 (10%)	49 (45%)	4 (12%)	0 (0%)	1 (3%)	18 (14%)	41 (55%)	11 (4%)	26 (27%)
Yes, sleeping facilities were provided outside the unit (e.g. in an apartment house nearby, in another unit)	125 (13%)	5 (9%)	0 (0%)	6 (13%)	2 (4%)	8 (7%)	9 (26%)	0 (0%)	4 (13%)	18 (14%)	30 (41%)	11 (4%)	32 (33%)
No, sleeping facilities were not provided	680 (69%)	45 (82%)	29 (88%)	27 (56%)	44 (86%)	53 (48%)	21 (62%)	37 (100%)	26 (84%)	93 (72%)	3 (4%)	264 (92%)	38 (40%)
Which alternatives to being present were provided with your baby receiving special/intensive care? (multiple answers possible)													
	n = 982	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 109**	**n = 34**	**n = 37**	**n = 29**	**n = 130**	**n = 72**	**n = 287**	**n = 96**
Sum of multiple answers	**1122 (114%)**	**57 (104%)**	**39 (115%)**	**63 (131%)**	**59 (116%)**	**123 (113%)**	**35 (103%)**	**38 (103%)**	**30 (103%)**	**155 (119%)**	**100 (139%)**	**318 (111%)**	**105 (109%)**
Photos	309 (32%)	6 (11%)	12 (35%)	12 (25%)	14 (27%)	28 (26%)	10 (29%)	5 (14%)	4 (14%)	69 (53%)	22 (31%)	114 (40%)	13 (14%)
Livestream	42 (4%)	6 (11%)	1 (3%)	5 (10%)	4 (8%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	16 (12%)	6 (8%)	0 (0%)	2 (2%)
Recorded video	74 (8%)	0 (0%)	2 (6%)	6 (13%)	3 (6%)	3 (3%)	1 (3%)	0 (0%)	0 (0%)	16 (12%)	12 (17%)	24 (8%)	7 (7%)
Video calls	52 (5%)	2 (4%)	2 (6%)	9 (19%)	1 (2%)	6 (6%)	1 (3%)	1 (3%)	5 (17%)	5 (4%)	14 (19%)	5 (2%)	1 (1%)
None	542 (55%)	39 (71%)	19 (56%)	23 (48%)	26 (51%)	64 (59%)	20 (59%)	29 (78%)	20 (69%)	35 (27%)	30 (42%)	159 (55%)	78 (81%)
Other	103 (11%)	4 (7%)	3 (9%)	8 (17%)	11 (22%)	21 (19%)	3 (9%)	2 (5%)	1 (3%)	14 (11%)	16 (22%)	16 (6%)	4 (4%)

Supplementary Table S4. Information on breastfeeding/nutrition

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Was initiation of breastfeeding encouraged by medical/nursing staff?													
	n = 1024	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 140**	**n = 75**	**n = 299**	**n = 103**
Yes, highly encouraged	515 (50%)	48 (87%)	23 (68%)	30 (61%)	50 (98%)	78 (68%)	13 (38%)	20 (53%)	23 (74%)	52 (37%)	35 (47%)	95 (32%)	48 (47%)
Yes, somewhat encouraged	265 (26%)	5 (9%)	6 (18%)	12 (24%)	0 (0%)	24 (21%)	9 (26%)	15 (39%)	5 (16%)	41 (29%)	31 (41%)	82 (27%)	35 (34%)
No, not encouraged at all	189 (18%)	1 (2%)	4 (12%)	5 (10%)	0 (0%)	10 (9%)	11 (32%)	3 (8%)	0 (0%)	39 (28%)	9 (12%)	89 (30%)	18 (17%)
Don't know	55 (5%)	1 (2%)	1 (3%)	2 (4%)	1 (2%)	3 (3%)	1 (3%)	0 (0%)	3 (10%)	8 (6%)	0 (0%)	33 (11%)	2 (2%)
Was your baby breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth?													
	n = 1023	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 114**	**n = 34**	**n = 38**	**n = 30**	**n = 141**	**n = 75**	**n = 299**	**n = 103**
Yes, exclusively	506 (49%)	38 (69%)	14 (41%)	25 (51%)	31 (61%)	53 (46%)	15 (44%)	9 (24%)	22 (73%)	67 (48%)	24 (32%)	178 (60%)	30 (29%)
Yes, partly	436 (43%)	16 (29%)	17 (50%)	22 (45%)	18 (35%)	46 (40%)	16 (47%)	24 (63%)	7 (23%)	54 (38%)	45 (60%)	116 (39%)	55 (53%)
No, not at all	76 (7%)	1 (2%)	3 (9%)	1 (2%)	2 (4%)	14 (12%)	3 (9%)	5 (13%)	1 (3%)	18 (13%)	6 (8%)	4 (1%)	18 (17%)
Don't know	5 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)	0 (0%)	1 (0%)	0 (0%)
When did the initiation of breastfeeding or provision of mother's own pumped/expressed breastmilk take place?													
	n = 1026	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 75**	**n = 300**	**n = 103**
Not applicable; baby was not breastfed	56 (5%)	1 (2%)	2 (6%)	0 (0%)	2 (4%)	12 (10%)	2 (6%)	4 (11%)	0 (0%)	19 (13%)	3 (4%)	1 (0%)	10 (10%)
On the first day	348 (34%)	29 (53%)	5 (15%)	28 (57%)	8 (16%)	60 (52%)	10 (29%)	1 (3%)	17 (55%)	39 (28%)	23 (31%)	112 (37%)	16 (16%)
After the first day but during the first week	409 (40%)	21 (38%)	18 (53%)	18 (37%)	34 (67%)	10 (9%)	14 (41%)	13 (34%)	9 (29%)	64 (45%)	41 (55%)	125 (42%)	42 (41%)
After the first week	172 (17%)	4 (7%)	9 (26%)	2 (4%)	4 (8%)	26 (23%)	7 (21%)	19 (50%)	4 (13%)	13 (9%)	7 (9%)	45 (15%)	32 (31%)
Don't know	41 (4%)	0 (0%)	0 (0%)	1 (2%)	3 (6%)	7 (6%)	1 (3%)	1 (3%)	1 (3%)	6 (4%)	1 (1%)	17 (6%)	3 (3%)
Were you allowed to bring expressed milk from home to the unit?													
	n = 1024	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 74**	**n = 299**	**n = 103**
Not applicable; baby was not breastfed	41 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	12 (10%)	1 (3%)	2 (5%)	1 (3%)	7 (5%)	4 (5%)	3 (1%)	10 (10%)
Yes	782 (76%)	52 (95%)	8 (24%)	46 (94%)	51 (100%)	79 (69%)	30 (88%)	26 (68%)	25 (81%)	99 (70%)	46 (62%)	282 (94%)	38 (37%)
No, the milk had to be expressed at the hospital	121 (12%)	1 (2%)	24 (71%)	1 (2%)	0 (0%)	16 (14%)	3 (9%)	8 (21%)	2 (6%)	11 (8%)	15 (20%)	7 (2%)	33 (32%)
No, other	80 (8%)	1 (2%)	2 (6%)	2 (4%)	0 (0%)	8 (7%)	0 (0%)	2 (5%)	3 (10%)	24 (17%)	9 (12%)	7 (2%)	22 (21%)
How was your baby fed? (multiple answers possible)													
	n = 1027	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 75**	**n = 300**	**n = 103**
Sum of multiple answers	**1505 (147%)**	**83 (151%)**	**57 (168%)**	**91 (186%)**	**79 (152%)**	**192 (167%)**	**57 (168%)**	**59 (155%)**	**39 (126%)**	**214 (152%)**	**122 (163%)**	**366 (122%)**	**146 (142%)**
With breastmilk (breastfeeding or pumped milk)	912 (89%)	54 (98%)	30 (88%)	48 (98%)	50 (96%)	97 (84%)	30 (88%)	32 (84%)	30 (97%)	123 (87%)	60 (80%)	286 (95%)	72 (70%)
With donor milk	229 (22%)	14 (25%)	6 (18%)	29 (59%)	14 (27%)	51 (44%)	11 (32%)	2 (5%)	4 (13%)	38 (27%)	44 (59%)	4 (1%)	12 (12%)
With formula milk	352 (34%)	15 (27%)	20 (59%)	14 (29%)	15 (29%)	44 (38%)	15 (44%)	25 (66%)	5 (16%)	53 (38%)	18 (24%)	68 (23%)	60 (58%)
Don't know	12 (1%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (3%)	2 (2%)

Supplementary Table S5. Information on health communication

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you feel you received or are receiving adequate general health information about your baby during the hospital stay?													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Yes, to a high degree	451 (46%)	36 (65%)	18 (53%)	29 (59%)	20 (39%)	62 (56%)	18 (53%)	13 (37%)	20 (67%)	50 (38%)	57 (77%)	96 (34%)	32 (34%)
Yes, to some degree	424 (43%)	15 (27%)	14 (41%)	18 (37%)	23 (45%)	37 (34%)	15 (44%)	16 (46%)	9 (30%)	60 (45%)	14 (19%)	156 (55%)	47 (49%)
No, not at all	83 (8%)	4 (7%)	1 (3%)	2 (4%)	2 (4%)	9 (8%)	1 (3%)	5 (14%)	1 (3%)	21 (16%)	3 (4%)	24 (8%)	10 (11%)
Don't know	9 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (1%)	4 (4%)
I didn't receive any information	15 (2%)	0 (0%)	1 (3%)	0 (0%)	5 (10%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	1 (1%)	0 (0%)	4 (1%)	2 (2%)
How did you receive health information about your baby during the time your baby received or is receiving special/intensive care? (multiple answers possible)													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 282**	**n = 95**
Sum of multiple answers	**1392 (142%)**	**96 (175%)**	**40 (118%)**	**96 (196%)**	**78 (150%)**	**166 (151%)**	**47 (138%)**	**40 (114%)**	**54 (180%)**	**180 (136%)**	**111 (150%)**	**359 (127%)**	**125 (132%)**
Meetings with medical/nursing staff (face to face)	743 (76%)	50 (91%)	34 (100%)	46 (94%)	24 (46%)	96 (87%)	31 (91%)	28 (80%)	28 (93%)	79 (60%)	74 (100%)	164 (58%)	89 (94%)
Meetings with medical/nursing staff (video conference)	28 (3%)	2 (4%)	0 (0%)	8 (16%)	2 (4%)	4 (4%)	1 (3%)	0 (0%)	2 (7%)	1 (1%)	4 (5%)	4 (1%)	0 (0%)
Phone calls	491 (50%)	28 (51%)	5 (15%)	28 (57%)	48 (92%)	51 (46%)	8 (24%)	7 (20%)	11 (37%)	88 (67%)	12 (16%)	178 (63%)	27 (28%)
E-Mails	8 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)	0 (0%)	0 (0%)	4 (3%)	0 (0%)	1 (0%)	1 (1%)
Letters	2 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Information material (e.g. brochure, website)	84 (9%)	13 (24%)	0 (0%)	11 (22%)	3 (6%)	9 (8%)	3 (9%)	2 (6%)	10 (33%)	5 (4%)	21 (28%)	2 (1%)	5 (5%)
I didn't receive information	10 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	2 (6%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	4 (1%)	2 (2%)
Other	26 (3%)	3 (5%)	1 (3%)	3 (6%)	1 (2%)	3 (3%)	2 (6%)	3 (9%)	1 (3%)	2 (2%)	0 (0%)	6 (2%)	1 (1%)
How often did you receive information about your baby during the time your baby received or is receiving special/intensive care?													
	n = 983	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Multiple times per day	261 (27%)	30 (55%)	5 (15%)	23 (47%)	1 (2%)	59 (54%)	9 (26%)	5 (14%)	15 (50%)	22 (17%)	42 (57%)	28 (10%)	22 (23%)
Once per day	494 (50%)	19 (35%)	27 (79%)	21 (43%)	2 (4%)	40 (36%)	15 (44%)	27 (77%)	10 (33%)	72 (55%)	22 (30%)	176 (62%)	63 (66%)
Multiple times per week	168 (17%)	4 (7%)	2 (6%)	2 (4%)	32 (62%)	6 (5%)	7 (21%)	2 (6%)	3 (10%)	34 (26%)	9 (12%)	59 (21%)	8 (8%)
Once per week	33 (3%)	1 (2%)	0 (0%)	0 (0%)	9 (17%)	2 (2%)	2 (6%)	0 (0%)	1 (3%)	2 (2%)	0 (0%)	15 (5%)	1 (1%)
Less than once per week	13 (1%)	1 (2%)	0 (0%)	1 (2%)	3 (6%)	2 (2%)	1 (3%)	1 (3%)	0 (0%)	1 (1%)	0 (0%)	2 (1%)	1 (1%)
Never	8 (1%)	0 (0%)	0 (0%)	1 (2%)	2 (4%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	1 (1%)	2 (1%)	0 (0%)
Don't know	6 (1%)	0 (0%)	0 (0%)	1 (2%)	3 (6%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)

Supplementary Table S5. Information on health communication *(continued)*

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you feel you received or are receiving adequate information about how to protect yourself and your baby from Coronavirus/COVID-19 transmission while your baby received or is receiving special/intensive care?													
	n = 983	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Yes, to a high degree	321 (33%)	22 (40%)	12 (35%)	13 (27%)	26 (50%)	43 (39%)	21 (62%)	12 (34%)	11 (37%)	30 (23%)	31 (42%)	73 (26%)	27 (28%)
Yes, to some degree	334 (34%)	23 (42%)	14 (41%)	22 (45%)	15 (29%)	38 (35%)	8 (24%)	15 (43%)	12 (40%)	37 (28%)	23 (31%)	92 (33%)	35 (37%)
No, not at all	187 (19%)	3 (5%)	4 (12%)	11 (22%)	2 (4%)	18 (16%)	3 (9%)	5 (14%)	3 (10%)	29 (22%)	14 (19%)	80 (28%)	15 (16%)
Don't know	49 (5%)	2 (4%)	0 (0%)	1 (2%)	5 (10%)	2 (2%)	1 (3%)	2 (6%)	0 (0%)	15 (11%)	5 (7%)	9 (3%)	7 (7%)
I didn't receive any information	92 (9%)	5 (9%)	4 (12%)	2 (4%)	4 (8%)	9 (8%)	1 (3%)	1 (3%)	4 (13%)	21 (16%)	1 (1%)	29 (10%)	11 (12%)
Do you feel you received adequate information about Coronavirus/COVID-19 when discharged from the hospital?													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 282**	**n = 95**
Yes, to a high degree	204 (21%)	14 (25%)	6 (18%)	5 (10%)	20 (38%)	29 (26%)	14 (41%)	6 (17%)	2 (7%)	22 (17%)	18 (24%)	51 (18%)	17 (18%)
Yes, to some degree	224 (23%)	16 (29%)	14 (41%)	19 (39%)	15 (29%)	21 (19%)	10 (29%)	9 (26%)	8 (27%)	15 (11%)	16 (22%)	62 (22%)	19 (20%)
No, not at all	217 (22%)	7 (13%)	5 (15%)	12 (24%)	1 (2%)	29 (26%)	6 (18%)	10 (29%)	7 (23%)	20 (15%)	20 (27%)	77 (27%)	23 (24%)
Don't know	35 (4%)	1 (2%)	0 (0%)	0 (0%)	3 (6%)	3 (3%)	0 (0%)	2 (6%)	0 (0%)	8 (6%)	2 (3%)	8 (3%)	8 (8%)
I didn't receive any information	157 (16%)	10 (18%)	4 (12%)	6 (12%)	2 (4%)	15 (14%)	2 (6%)	4 (11%)	5 (17%)	50 (38%)	8 (11%)	34 (12%)	17 (18%)
No discharge yet	145 (15%)	7 (13%)	5 (15%)	7 (14%)	11 (21%)	13 (12%)	2 (6%)	4 (11%)	8 (27%)	17 (13%)	10 (14%)	50 (18%)	11 (12%)

Supplementary Table S6. Information on mental health status

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Did you worry because of the Coronavirus/COVID-19 situation during pregnancy?													
	n = 966	**n = 55**	**n = 33**	**n = 48**	**n = 50**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 132**	**n = 71**	**n = 278**	**n = 94**
Yes, to a high degree	459 (48%)	25 (45%)	17 (52%)	20 (42%)	9 (18%)	35 (33%)	13 (38%)	24 (71%)	11 (37%)	66 (50%)	25 (35%)	157 (56%)	57 (61%)
Yes, to some degree	304 (31%)	19 (35%)	7 (21%)	19 (40%)	17 (34%)	44 (41%)	17 (50%)	6 (18%)	15 (50%)	39 (30%)	27 (38%)	66 (24%)	28 (30%)
No, not at all	100 (10%)	5 (9%)	0 (0%)	5 (10%)	20 (40%)	11 (10%)	1 (3%)	1 (3%)	3 (10%)	11 (8%)	14 (20%)	23 (8%)	6 (6%)
Don't know	12 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3%)	1 (3%)	0 (0%)	0 (0%)	5 (4%)	0 (0%)	3 (1%)	0 (0%)
Coronavirus/ COVID-19 was not an issue then	91 (9%)	6 (11%)	9 (27%)	4 (8%)	4 (8%)	14 (13%)	2 (6%)	3 (9%)	1 (3%)	11 (8%)	5 (7%)	29 (10%)	3 (3%)
Did (or do) you struggle to be present with your baby who received or is receiving special care due to other obligations you have (e.g. for other children, family member/s)?													
	n = 966	**n = 55**	**n = 33**	**n = 48**	**n = 51**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 131**	**n = 72**	**n = 278**	**n = 93**
Yes, to a high degree	207 (21%)	13 (24%)	5 (15%)	12 (25%)	7 (14%)	16 (15%)	2 (6%)	13 (38%)	4 (13%)	21 (16%)	24 (33%)	70 (25%)	20 (22%)
Yes, to some degree	261 (27%)	12 (22%)	8 (24%)	15 (31%)	12 (24%)	28 (26%)	7 (21%)	7 (21%)	12 (40%)	22 (17%)	27 (38%)	81 (29%)	30 (32%)
No, not at all	440 (46%)	30 (55%)	20 (61%)	21 (44%)	27 (53%)	62 (58%)	25 (74%)	13 (38%)	14 (47%)	66 (50%)	19 (26%)	108 (39%)	35 (38%)
Don't know	58 (6%)	0 (0%)	0 (0%)	0 (0%)	5 (10%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	22 (17%)	2 (3%)	19 (7%)	8 (9%)
What kind of support was offered? (multiple answers possible)													
	n = 967	**n = 55**	**n = 32**	**n = 48**	**n = 51**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 132**	**n = 72**	**n = 278**	**n = 94**
Sum of multiple answers	**1239 (128%)**	**94 (171%)**	**36 (113%)**	**80 (167%)**	**84 (165%)**	**150 (140%)**	**41 (121%)**	**38 (112%)**	**41 (137%)**	**149 (113%)**	**97 (135%)**	**313 (113%)**	**116 (123%)**
Psychological counselling	280 (29%)	18 (33%)	11 (34%)	10 (21%)	9 (18%)	87 (81%)	15 (44%)	5 (15%)	6 (20%)	46 (35%)	29 (40%)	26 (9%)	18 (19%)
Self-help groups	30 (3%)	2 (4%)	0 (0%)	4 (8%)	3 (6%)	3 (3%)	2 (6%)	1 (3%)	1 (3%)	4 (3%)	1 (1%)	7 (3%)	2 (2%)
Parent groups	133 (14%)	18 (33%)	2 (6%)	15 (31%)	26 (51%)	8 (7%)	3 (9%)	2 (6%)	5 (17%)	12 (9%)	5 (7%)	17 (6%)	20 (21%)
Peer-to-peer support	101 (10%)	4 (7%)	0 (0%)	9 (19%)	23 (45%)	0 (0%)	2 (6%)	2 (6%)	3 (10%)	11 (8%)	1 (1%)	30 (11%)	16 (17%)
Social worker	182 (19%)	42 (76%)	2 (6%)	27 (56%)	7 (14%)	33 (31%)	1 (3%)	5 (15%)	16 (53%)	0 (0%)	44 (61%)	4 (1%)	1 (1%)
None	462 (48%)	9 (16%)	21 (66%)	11 (23%)	9 (18%)	13 (12%)	17 (50%)	21 (62%)	8 (27%)	72 (55%)	11 (15%)	213 (77%)	57 (61%)
Don't know	33 (3%)	1 (2%)	0 (0%)	1 (2%)	6 (12%)	2 (2%)	0 (0%)	2 (6%)	1 (3%)	3 (2%)	2 (3%)	14 (5%)	1 (1%)
Other	18 (2%)	0 (0%)	0 (0%)	3 (6%)	1 (2%)	4 (4%)	1 (3%)	0 (0%)	1 (3%)	1 (1%)	4 (6%)	2 (1%)	1 (1%)

STROBE statement - checklist of items that should be included in reports of observational/population/cohort studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	4-5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	5
		(*e*) Describe any sensitivity analyses	n/a

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	6
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	n/a
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	7-12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-12
		(*b*) Report category boundaries when continuous variables were categorized	n/a
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7-12
Discussion			
Key results	18	Summarise key results with reference to study objectives	12-14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Parents' experiences regarding neonatal care during the COVID-19 pandemic – country-specific findings of a multi-national survey

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Parents' experiences regarding neonatal care during the COVID-19 pandemic – country-specific findings of a multi-national survey

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ABSTRACT

Objectives

The COVID-19 pandemic has disrupted healthcare systems, challenging neonatal care provision globally. Curtailed visitation policies are known to negatively affect the medical and emotional care of sick, preterm, and low birthweight infants, compromising the achievement of the 2030 Development Agenda. Focusing on infant and family-centred developmental care (IFCDC), we explored parents' experiences of the disruptions affecting newborns in need of special or intensive care during the first year of the pandemic.

Design

Cross-sectional study using an electronic, web-based questionnaire.

Setting

Multi-country online-survey.

Methods

Data were collected between August and November 2020 using a pre-tested online, multi-lingual questionnaire. The target group consisted of parents of preterm, sick or low birthweight infants born during the first year of the COVID-19 pandemic and who received special/intensive care. The analysis followed a descriptive quantitative approach.

Results

In total, 1148 participants from 12 countries (Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, Ukraine) were eligible for analysis. We identified significant country-specific differences, showing that the application of IFCDC is less prone to disruptions in some countries than in others. For example, parental presence was affected: 27% of the total respondents indicated that no-one was allowed to be present with the infant receiving special/intensive care. In Australia, Canada, France, New Zealand and Sweden, both the mother and the father (in more than 90% of cases) was allowed access to the newborn, whereas participants indicated that no-one was allowed to be present in China (52%), Poland (39%), Turkey (49%), and Ukraine (32%).

Conclusions

The application of IFCDC during the COVID-19 pandemic differs between countries. There is an urgent need to reconsider separation policies and to strengthen the infant and family-centred developmental care approach worldwide to ensure the 2030 Development Agenda is achieved.

Strengths and limitations of this study

- This is the first multi-national survey exploring parents' experiences of the disruptions affecting newborns in need of special or intensive care during the first year of the pandemic.
- The cross-country approach, data collection in 12 countries and extensive outreach allowed us to acquire in-depth insights into parents' experiences.
- The online format of the study bears the risk of selection bias, and response rates could not be calculated.
- The respective pandemic situation, geographical, climatic and environmental aspects, as well as containment strategies vary between (and sometimes even within) countries.
- The findings comprehensively reflect the parent perspective across multiple countries giving insights into country-specific differences.

INTRODUCTION

During the last decades, major achievements have been made in the field of maternal and newborn health, particularly in light of the United Nations Sustainable Development Goals [1]. While efforts have resulted in a reduction of maternal and neonatal deaths and better health outcomes for newborns worldwide, progress in particular affecting preterm, sick, and low birthweight infants has been slow [1,2]. Pandemic-related shortages in maternal and newborn care provision have severe consequences for vulnerable infants and their families [3–5], continuing to threaten the achievement of the 2030 Development Agenda [6].

Worldwide, one in ten infants is born preterm every year, with increasing rates in almost all countries where reliable epidemiologic datasets are available, making it a truly global problem [7]. Preterm birth is the leading cause of death under five years of age, and together with birth complications, it is the leading cause of neonatal death [6,8,9]. The extremely fragile group of patients requires highly specialised care, which is labour and cost intense, and thus, stark regional discrepancies in the availability of specialised care are well described [10]. However, whilst international agreements, like the United Nations Convention on the Rights of the Child or the European Association for Children in Hospital (EACH), foster the right of children to be close to their parents [11,12], these rights have not yet been implemented in the majority of neonatal units across the globe where parents and their newborns have often been separated – already in pre-pandemic times – yet increasingly as a response to the ongoing global health crisis [13–15]. Before the COVID-19 pandemic hit the globe, an increasing number of neonatal units worldwide had adopted the principles of infant- and family-centred developmental care (IFCDC), such as unrestricted parental access, active parental participation and involvement and Kangaroo Mother Care (KMC) [16,17]. However, IFCDC is so far still a new concept and its implementation remains to be one of the biggest challenges in neonatal care as it also requires a fundamental change in the mentality of neonatal caregivers [16–20].

The COVID-19 pandemic and related restrictions have resulted in severe limitations in neonatal care provision [18], especially regarding acknowledged elements of IFCDC [15,21–27]. The frequently implemented separation of parents and their newborns has negative implications for the health outcomes of newborns [28–30], interfering with acknowledged practices such as KMC, skin-to-skin contact [31], and breastfeeding [32]. The reduction of parental presence in the neonatal intensive care units (NICU) has led to increased stress and mental health problems among parents and families, raising the risk of postnatal depression and posttraumatic stress syndrome, and limited opportunities for parent-infant bonding [14,15], while staff shortages and the lack of available guidelines have led to high levels of stress and anxiety among health professionals [21,33]. Few studies and reports have provided insights into parents' experiences regarding some of the implemented restrictions [14,15,34]. However, a comparative and holistic approach, emphasising the cornerstones of IFCDC, has been missing so far, which is the focus of this research.

With this study, we explored parents' experiences of disruptions to neonatal care during the first year of the COVID-19 pandemic across the globe, focusing on individual country actions. We aimed to document the challenges experienced by parents, spanning wide variations across countries and regions. The analysis and corresponding findings shall provide an incentive for policy makers, public health experts, and healthcare professionals alike to learn from the different approaches and subsequent implications of the outcomes of single countries and underline the importance of parents' involvement in the care of vulnerable newborns. It is imperative that this occurs, irrespective of the ongoing pandemic or future emergency situations.

METHODS

Study design and population

We conducted a cross-sectional study using an electronic, web-based questionnaire with the aim to explore parents' experiences during the first year of the COVID-19 pandemic with regard to the core

elements of IFCDC. Eligible for participation were parents of preterm, sick or low birthweight infants born during the first year of the COVID-19 pandemic (as of December 1, 2019) and who were receiving special or intensive care (inclusion criteria). The term "parent" was broadly defined, encompassing biological and/or social parents, allowing for self-definition as "mother," "father," or "other parent." We conducted and reported the study according to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [35].

Participants were recruited by the European Foundation for the Care of Newborn Infants (EFCNI), and its initiative, the Global Alliance for Newborn Care (GLANCE), through social media activities, newsletters, website outreach, and mailings. In addition, national parent organisations and the collaborating professional healthcare associations and their members, namely the Council of International Neonatal Nurses (COINN), the European Society for Paediatric Research (ESPR), the Neonatal Individualised Developmental Care and Assessment Project (NIDCAP), and the Union of European Neonatal and Perinatal Societies (UENPS), supported the dissemination of the survey link by promoting the study across their networks. Participation was voluntary, data collection occurred anonymously.

Questionnaire development and pre-testing

Researchers of the EFCNI scientific department developed the questionnaire in collaboration with the members of the COVID-19 Zero Separation Collaborative Group – an interdisciplinary stakeholder group including medical experts and parent/patient representatives. The survey was pre-tested among n=8 parents who met the target group criteria who did not request any changes of the questionnaire.

The questionnaire consisted of 52 questions with pre-defined answers and single or multiple response answer options (Supplementary Material S9). It encompassed information about the respondent and infant, and COVID-19-related topics as well as categories of IFCDC [25], including the following elements: (1) background information, (2) COVID-19 testing and measures in the respective country/region (3) access to perinatal care, (4) presence with the newborn receiving special/intensive care, (5) breastfeeding/infant nutrition, (6) health communication, and (7) mental health and support. Parent representatives from EFCNI's international parent network supported the translations of the final version into 23 languages, which were all reviewed and approved by native medical professionals.

Data collection and statistical analysis

Data were collected between August and November 2020 using the SurveyMonkey® online survey tool. The analysis included answers from all respondents who met the inclusion criteria, regardless of whether they completed the survey to the end. The subsequent analysis was performed as sub-analysis based on a global survey with available data from 56 countries as previously described elsewhere [18]. For this sub-analysis, countries having a minimum of at least 30 answers per country were considered eligible for inclusion. A subsequent country selection depending on pre-defined criteria, such as sample size, geographical variation (continent, north/south), and COVID-19 situation [36,37] was conducted by the five main authors of this study using a consensus approach with ranking and voting. Recently published scientific articles on different countries' COVID-19-related preparedness, responses and implemented restrictions [38–42] acted as a basis for a comprehensive and diverse country selection resulting in the following included countries: Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, and Ukraine.

Data analysis was conducted using an exploratory approach with descriptive statistics (number of answers and proportion (n (%)). Multiple-answer questions were analysed as the sum of the number of responses per answer choice (n (%)) and may exceed 100%. A 95% CI was calculated (CI for proportions) for questions related to presence with the newborn and skin-to-skin care using one answer option in order to determine statistically significant deviations between countries and the overall total. A colour-coding indicated countries whose 95% CI did not overlap and was significantly different from the CI of all countries (country higher (blue) or country lower (green)). All analyses presented herein

were carried out using SPSS software (IBM SPSS Statistics for Windows, version 27-0, IBM Corp, Armonk, New York) and Microsoft Excel (version 16).

Ethical considerations

Data collection, processing and storage conformed to the General Data Protection Regulation and the Declaration of Helsinki. Informed consent was given by ticking a confirmation box. For those who declined to participate, the web-interface was terminated. Respondents were informed that some of the questions might cause distressing reactions in view of their personal experiences, and they had the opportunity to stop participation at any time. No financial or other incentives were offered to the participants. The Ethics Committee of Maastricht UMC+, the Netherlands, has waived the need for ethical approval for this study (MECT 2020-1336).

Patient and public involvement

EFCNI, as a pan-European network of parent organisations, was the initiator of this research project and responsible for all phases of the study. In addition, representatives from national parent organisations worldwide were involved in the review of the questionnaire and in manuscript writing (as part of the COVID-19 Zero Separation Collaborative Group). Additionally, they supported the translation and dissemination of the survey in their network, and will again be involved in the dissemination of the results.

RESULTS

Background, baseline and COVID-19 related characteristics

In total, 1148 participants from Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey and Ukraine were eligible for analysis (Figure 1A). Baseline characteristics of participants are shown in Table 1. Nearly all answers were obtained from mothers of the infant (n=1093; 95%) and the majority of participants was between 30 and 39 years old (53%). Most infants were born very preterm (28–<32 weeks of gestation; 35%) or moderate to late preterm infants (32–<37 weeks of gestation; 37%), and were born through caesarean section (72%). Almost 50% of the infants required special/intensive care for over five weeks at the time of answering the questionnaire (Table 1). Baseline characteristics of participants per country are pre-specified in Supplementary Table S1 and partly differed on country-level.

Overall, 41% of the respondents faced lockdown measures in their country/region at the time of birth, 30% were encouraged to adhere to social distancing and 13% were located in countries/regions where precautions were advised or quarantine was implemented (11%, Table 1). In total, 2% of the respondents and 2% of the respondents' partners had tested positive for COVID-19, with the highest numbers in Mexico (12% for both options). Overall, five newborns tested positive for COVID-19 (Table 1).

Supplementary Table S2 provides an overview on each countries' demographics, including GDP per capita, the preterm birth rate, female educational attainment, maternal and under-5 mortality, sanitation, COVID-19 cases as of 29 November 2020 and the average government response stringency index based on the Oxford COVID-19 Government Response Tracker (OxCGRT) [43] between August and November 2020. Overall, Turkey (12%) and Brazil (11%) have the highest observed preterm birth rate, while it is lowest in Sweden (6%) [9]. Data from the World Bank [44] and the UN Inter-agency Group for Child Mortality Estimation [45] from 2019 shows that Brazil also has the highest rate of maternal mortality per 100,000 live births (60) and the highest under-5 mortality rate per 1,000 live births, together with Mexico (14). As of 29 November 2020, cumulative COVID-19 cases per 1 million population were highest in France (33,242), followed by Brazil (29,349). Cases were lowest in China (63) and New Zealand (352). The average government response stringency index [43] was highest in China (80) and lowest in New Zealand (22).

Table 1. Baseline and COVID-19 characteristics of participants

	Total
Age of respondent (years)	**n = 1146**
<20	5 (0%)
20–29	468 (41%)
30–39	608 (53%)
>40	65 (6%)
Gestational age at birth (weeks)	**n = 1107**
Early preterm: <28	270 (24%)
Very preterm: 28–<32	389 (35%)
Moderate to late preterm: 32–<37	412 (37%)
Term: 37–42	36 (3%)
Multiple pregnancy	**n = 1112**
Yes	180 (16%)
No	932 (84%)
Birth mode	**n = 1111**
Vaginal birth	301 (27%)
C-section	804 (72%)
Both (e.g. in case of multiple pregnancy)	6 (1%)
Birth weight of the baby (grams)	**n = 1110**
<1000	290 (26%)
1000–1500	373 (34%)
>1500–2500	374 (34%)
>2500	71 (6%)
Don't know the birth weight	2 (0%)
Duration of special/intensive care (weeks) (at time of data collection)	**n = 1112**
<1	81 (7%)
1–3	251 (23%)
>3–5	277 (25%)
>5	503 (45%)
COVID-19 situation in country/region at time of baby's birth	**n = 1071**
No major concern	49 (5%)
Precautions	137 (13%)
Social distancing	325 (30%)
Lockdown	438 (41%)
Quarantine	122 (11%)
Have you tested positive for Coronavirus/COVID-19?	**n = 1084**
Yes	27 (2%)
No	1057 (98%)
Has your partner tested positive for Coronavirus/COVID-19?	**n = 1086**
Yes	25 (2%)
No	1039 (96%)
Don't know	22 (2%)
Has your baby tested positive for Coronavirus/COVID-19?	**n = 1087**
Yes	5 (0%)
No	1035 (95%)
Don't know	47 (4%)

Prenatal care and birth

Significant variations regarding the presence of support persons during pregnancy-related appointments and birth could be observed (Figure 1B and Figure 1C). In total, 41% of all participants were not allowed to have a companion present during pregnancy-related appointments. This number was highest in Sweden and Poland (>60%) and lowest in Australia (20%). During birth, 57% of the respondents were not permitted to have another person present (Figure 1C). In Mexico, 87% of the women gave birth without a supporting companion. In Poland, this applied to 90% of the respondents. In Australia, New Zealand and Sweden >90% of the women were permitted to have another person present, and in Australia 90% of the accompanying persons could stay for the entire labour (Supplementary Table S3). Likewise, in Brazil, China and New Zealand >85% of the accompanying persons could stay during the entire labour (Supplementary Table S3).

[Figure 1 here]

Presence with the newborn and skin-to-skin care

In total, 82% of the participants responded that the COVID-19 pandemic affected the facility policy around their ability to be present with the newborn receiving special/intensive care (Table 2). Parental presence was one of the areas affected most, with 27% percent of the total respondents indicating that no-one was allowed to be present with the newborn, with highest numbers in China (52%) and Turkey (49%).

Analysis showed country-specific differences regarding access of family members to the hospitalised infant: around 80–>90% of participants from Australia, Canada, France, New Zealand and Sweden answered that both parents were allowed access. Lower proportions were observed for the remaining countries, with the lowest numbers in China where 35% of the mothers and 29% of the fathers were permitted to be present with the newborn (Table 2). More than half of the participants in Australia, China, France, New Zealand, and Sweden indicated that more than one person was allowed to be present with the newborn at the same time (Table 2).

Overall, 32% of the respondents could see their newborn all the time (24/7), and 13% multiple times per day (Figure 1A). More than 20% were not allowed to see their newborn at any time, which was particularly observed in China (85%) and also reported by respondents from Mexico (14%), Poland (28%), Turkey (36%) and Ukraine (15%, Figure 1A). While more than half of the respondents from Poland were provided with either photos, livestream options or recorded videos as alternative tools to being present, parents from Mexico (78%), Turkey (55%) and Ukraine (81%) were mostly not offered any alternatives (Supplementary Table S4).

While in Australia, Canada, France, New Zealand and Sweden more than 80% of the respondents had unlimited access to their newborn, other countries implemented duration restrictions (Table 2). Significantly high proportions of being “not at all” allowed to be present with the infant were noted in China (87%) and Turkey (34%) (Supplementary Table S5). In Mexico, Turkey and Ukraine more than half of the respondents indicated that they were allowed to see their baby for up to one hour. More than 70% of the respondents from Canada, China, Mexico, Poland, Turkey and Ukraine felt that the measures implemented due to COVID-19 made it more difficult for them to be present, and more than 70% from China, Mexico, Poland and Turkey to be interactive with their newborn, e.g. regarding skin-to-skin contact (Table 2).

The possibilities to have skin-to-skin contact with the infant differed between countries, with significantly high proportions of respondents in Mexico (47%) and Turkey (49%) indicating that skin-to-skin care was not initiated during the time in the hospital (Supplementary Table S5). In China, most respondents (85%) answered that skin-to-skin care had not yet been initiated (if still in the hospital). In the remaining countries, skin-to-skin care was mainly initiated after the first day but during the first week with few exceptions having high answer rates with regards to an early initiation (immediately after birth or on the first day) such as France. In Sweden and France >80% of the mothers were permitted to have skin-to-skin contact with their newborn as often as they wanted. While >95% of the respondents from Australia, Brazil, Canada, France, New Zealand and Sweden could touch their newborn in the incubator or bed as often as they wanted or at least once per day, 92% of the participants in China, and 60% in Turkey were not permitted to do so (Table 2).

The involvement in the care was perceived differently by parents across countries. While participants from Australia, France, New Zealand and Sweden felt they were highly involved in the care by medical and nursing staff (>80%), more than 70% of participants in China, Poland, Turkey and Ukraine felt that staff did neither include them nor their partner in the care. In addition, while the majority of participants from Sweden (85%) responded that also their partner was highly involved by medical and nursing staff, this was not the case for participants in Turkey.

Table 2. Presence with the newborn and skin-to-skin care

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you know if the Coronavirus/COVID-19 situation affected the facility policy around your ability to be present with the baby receiving special/intensive care?													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
There were no changes	80 (8%)	7 (13%)	2 (6%)	2 (4%)	5 (10%)	12 (11%)	4 (12%)	2 (5%)	4 (13%)	4 (3%)	23 (32%)	10 (3%)	5 (5%)
Restrictions were implemented	816 (82%)	44 (80%)	30 (88%)	44 (90%)	36 (69%)	94 (85%)	27 (79%)	34 (92%)	25 (81%)	118 (89%)	44 (60%)	241 (84%)	79 (82%)
I don't know if there were changes	95 (10%)	4 (7%)	2 (6%)	3 (6%)	11 (21%)	4 (4%)	3 (9%)	1 (3%)	2 (6%)	10 (8%)	6 (8%)	37 (13%)	12 (13%)
Who was allowed to be present with your baby receiving special/intensive care? (multiple answers possible)													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
Sum of multiple answers	**1497 (151%)**	**112 (204%)**	**57 (168%)**	**89 (182%)**	**73 (140%)**	**215 (195%)**	**59 (174%)**	**57 (154%)**	**56 (181%)**	**155 (117%)**	**145 (199%)**	**368 (128%)**	**111 (116%)**
Mother	680 (69%)	52 (95%)	30 (88%)	44 (90%)	18 (35%)	101 (92%)	30 (88%)	25 (68%)	28 (90%)	84 (64%)	60 (82%)	142 (49%)	66 (69%)
Father/partner	501 (51%)	54 (98%)	24 (71%)	42 (86%)	15 (29%)	106 (96%)	27 (79%)	23 (62%)	26 (84%)	19 (14%)	68 (93%)	84 (29%)	13 (14%)
Sibling/s	27 (3%)	3 (5%)	0 (0%)	1 (2%)	3 (6%)	6 (5%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	12 (16%)	0 (0%)	1 (1%)
Other family members	14 (1%)	3 (5%)	2 (6%)	1 (2%)	3 (6%)	0 (0%)	0 (0%)	1 (3%)	1 (3%)	0 (0%)	3 (4%)	0 (0%)	0 (0%)
Friends	2 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
No one	265 (27%)	0 (0%)	1 (3%)	0 (0%)	27 (52%)	2 (2%)	2 (6%)	8 (22%)	0 (0%)	52 (39%)	1 (1%)	141 (49%)	31 (32%)
I don't know	8 (1%)	0 (0%)	0 (0%)	0 (0%)	7 (13%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)
Could more than one person be present with the baby at the same time?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 130**	**n = 74**	**n = 288**	**n = 96**
Yes	326 (33%)	31 (56%)	9 (26%)	20 (41%)	27 (52%)	70 (64%)	2 (6%)	2 (5%)	16 (52%)	5 (4%)	62 (84%)	66 (23%)	16 (17%)
No	664 (67%)	24 (44%)	25 (74%)	29 (59%)	25 (48%)	40 (36%)	32 (94%)	35 (95%)	15 (48%)	125 (96%)	12 (16%)	222 (77%)	80 (83%)
How long were you allowed to see your baby per visit?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 109**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 73**	**n = 288**	**n = 96**
Up to an hour	338 (34%)	1 (2%)	11 (32%)	0 (0%)	2 (4%)	0 (0%)	11 (32%)	31 (84%)	0 (0%)	44 (34%)	0 (0%)	186 (65%)	52 (54%)
More than one hour, up to three hours	41 (4%)	2 (4%)	1 (3%)	0 (0%)	4 (8%)	5 (5%)	3 (9%)	1 (3%)	0 (0%)	22 (17%)	0 (0%)	2 (1%)	1 (1%)
More than three hours, but not unlimited	51 (5%)	5 (9%)	5 (15%)	2 (4%)	1 (2%)	15 (14%)	3 (9%)	0 (0%)	4 (13%)	4 (3%)	2 (3%)	1 (0%)	9 (9%)
Unlimited	360 (36%)	47 (85%)	16 (47%)	47 (96%)	0 (0%)	88 (81%)	15 (44%)	1 (3%)	27 (87%)	27 (21%)	70 (96%)	2 (1%)	20 (21%)
Not at all	199 (20%)	0 (0%)	1 (3%)	0 (0%)	45 (87%)	1 (1%)	2 (6%)	4 (11%)	0 (0%)	34 (26%)	1 (1%)	97 (34%)	14 (15%)
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be present with your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 288**	**n = 96**
Yes	726 (73%)	33 (60%)	18 (53%)	37 (77%)	39 (76%)	61 (55%)	19 (56%)	35 (95%)	20 (65%)	112 (85%)	14 (19%)	263 (91%)	75 (78%)
No, not more difficult	192 (19%)	17 (31%)	15 (44%)	10 (21%)	3 (6%)	42 (38%)	14 (41%)	1 (3%)	7 (23%)	17 (13%)	46 (62%)	11 (4%)	9 (9%)
No, there were no restrictive measures in place	39 (4%)	4 (7%)	1 (3%)	1 (2%)	0 (0%)	4 (4%)	1 (3%)	1 (3%)	3 (10%)	2 (2%)	11 (15%)	3 (1%)	8 (8%)
Don't know	33 (3%)	1 (2%)	0 (0%)	0 (0%)	9 (18%)	3 (3%)	0 (0%)	0 (0%)	1 (3%)	1 (1%)	3 (4%)	11 (4%)	4 (4%)
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be interactive with your baby (e.g. skin-to-skin contact or being involved in the care of your baby)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 286**	**n = 96**
Yes	634 (64%)	13 (24%)	15 (44%)	27 (55%)	38 (75%)	41 (37%)	21 (62%)	36 (97%)	9 (29%)	106 (80%)	9 (12%)	266 (93%)	53 (55%)

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
No, not more difficult	258 (26%)	31 (56%)	16 (47%)	16 (33%)	4 (8%)	53 (48%)	11 (32%)	0 (0%)	13 (42%)	22 (17%)	46 (62%)	11 (4%)	35 (36%)
No, there were no restrictive measures in place	72 (7%)	10 (18%)	2 (6%)	5 (10%)	0 (0%)	15 (14%)	1 (3%)	1 (3%)	9 (29%)	3 (2%)	18 (24%)	4 (1%)	4 (4%)
Don't know	25 (3%)	1 (2%)	1 (3%)	1 (2%)	9 (18%)	1 (1%)	1 (3%)	0 (0%)	0 (0%)	1 (1%)	1 (1%)	5 (2%)	4 (4%)
When was skin-to-skin contact with your baby and one of the parents initiated (e.g. holding the baby on the chest, kangaroo mother care)?													
	n = 1044	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 117**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
Immediately after birth	65 (6%)	7 (13%)	1 (3%)	8 (16%)	2 (4%)	13 (11%)	1 (3%)	0 (0%)	5 (16%)	7 (5%)	11 (15%)	4 (1%)	6 (6%)
On the first day	99 (9%)	14 (25%)	0 (0%)	7 (14%)	0 (0%)	43 (37%)	1 (3%)	0 (0%)	5 (16%)	4 (3%)	19 (25%)	4 (1%)	2 (2%)
After the first day but during the first week	236 (23%)	23 (41%)	8 (24%)	21 (43%)	0 (0%)	45 (38%)	8 (23%)	3 (8%)	14 (45%)	36 (25%)	35 (47%)	17 (6%)	26 (25%)
After the first week	244 (23%)	11 (20%)	21 (64%)	13 (27%)	4 (8%)	14 (12%)	18 (51%)	13 (34%)	7 (23%)	32 (22%)	10 (13%)	60 (19%)	41 (39%)
Not so far (If still in hospital)	156 (15%)	1 (2%)	2 (6%)	0 (0%)	44 (85%)	1 (1%)	0 (0%)	4 (11%)	0 (0%)	19 (13%)	0 (0%)	72 (23%)	13 (13%)
Not during the time in the hospital if discharged	244 (23%)	0 (0%)	1 (3%)	0 (0%)	2 (4%)	1 (1%)	7 (20%)	18 (47%)	0 (0%)	48 (33%)	0 (0%)	151 (49%)	16 (15%)
How often were you permitted to have skin-to-skin contact (kangaroo mother care) with your baby?													
	n = 1043	**n = 56**	**n = 32**	**n = 49**	**n = 52**	**n = 118**	**n = 34**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
As often as I wanted	302 (29%)	18 (32%)	14 (44%)	25 (51%)	0 (0%)	99 (84%)	8 (24%)	0 (0%)	16 (52%)	12 (8%)	63 (84%)	11 (4%)	36 (35%)
At least once per day	227 (22%)	31 (55%)	11 (34%)	21 (43%)	2 (4%)	15 (13%)	13 (38%)	12 (32%)	12 (39%)	31 (21%)	9 (12%)	43 (14%)	27 (26%)
At least once per week	64 (6%)	6 (11%)	3 (9%)	2 (4%)	0 (0%)	2 (2%)	3 (9%)	4 (11%)	3 (10%)	17 (12%)	3 (4%)	18 (6%)	3 (3%)
Less than once per week	77 (7%)	0 (0%)	1 (3%)	1 (2%)	2 (4%)	1 (1%)	4 (12%)	7 (18%)	0 (0%)	24 (16%)	0 (0%)	29 (9%)	8 (8%)
Not so far	373 (36%)	1 (2%)	3 (9%)	0 (0%)	48 (92%)	1 (1%)	6 (18%)	15 (39%)	0 (0%)	62 (42%)	0 (0%)	207 (67%)	30 (29%)
Did medical/nursing staff involve you in the care of your baby (e.g. nappy changing, feeding, temperature taking)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 287**	**n = 96**
Yes, to a high degree	438 (44%)	44 (80%)	15 (44%)	34 (69%)	4 (8%)	102 (93%)	22 (65%)	6 (16%)	27 (87%)	48 (37%)	67 (91%)	22 (8%)	47 (49%)
Yes, to some degree	180 (18%)	10 (18%)	10 (29%)	15 (31%)	3 (6%)	7 (6%)	10 (29%)	11 (30%)	4 (13%)	29 (22%)	7 (9%)	53 (18%)	21 (22%)
No, not at all	364 (37%)	1 (2%)	9 (26%)	0 (0%)	40 (78%)	1 (1%)	2 (6%)	20 (54%)	0 (0%)	53 (40%)	0 (0%)	211 (74%)	27 (28%)
Don't know	7 (1%)	0 (0%)	0 (0%)	0 (0%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1 (0%)	1 (1%)
Did medical/nursing staff involve your partner in the care of your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 288**	**n = 96**
Yes, to a high degree	274 (28%)	35 (64%)	4 (12%)	29 (59%)	3 (6%)	87 (79%)	19 (56%)	5 (14%)	18 (58%)	2 (2%)	63 (85%)	4 (1%)	5 (5%)
Yes, to some degree	121 (12%)	18 (33%)	9 (26%)	14 (29%)	4 (8%)	15 (14%)	8 (24%)	6 (16%)	6 (19%)	10 (8%)	7 (9%)	18 (6%)	6 (6%)
No, not at all	567 (57%)	1 (2%)	19 (56%)	6 (12%)	39 (76%)	6 (5%)	6 (18%)	24 (65%)	5 (16%)	114 (87%)	3 (4%)	263 (91%)	81 (84%)
Don't know	17 (2%)	0 (0%)	2 (6%)	0 (0%)	5 (10%)	0 (0%)	1 (3%)	1 (3%)	0 (0%)	4 (3%)	0 (0%)	1 (0%)	3 (3%)
I don't have a partner	11 (1%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)	1 (3%)	2 (6%)	1 (1%)	1 (1%)	2 (1%)	1 (1%)

Blue: 95% confidence interval: significantly higher than total (for detailed results see Supplementary Table S5)
Green: 95% confidence interval: significantly lower than total (for detailed results see Supplementary Table S5)

Nutrition and breastfeeding

In total, 89% of the respondents answered that their newborns were fed with breastmilk (breastfeeding or pumped milk), 22% received donor human milk and 34% were fed with infant formula (multiple response question; Supplementary Table S6). Initiation of breastfeeding was highly (50%) or somewhat (26%) encouraged by medical/nursing staff in most countries (Supplementary Table S6). Overall, 18% indicated that breastfeeding was not encouraged at all. This lack of encouragement was especially noted in Italy (32%), Poland and Turkey (>25%). However, newborns in Italy and Turkey were in over 90% of cases still exclusively or partly breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth (Supplementary Table S6).

Also, the initiation of breastfeeding differed across countries. In Canada, first breastfeeding or provision of mother's own pumped/expressed breastmilk took place on the first day (57%) or after the first day but during the first week (37%). Likewise, in Australia, France and New Zealand, >50% of the respondents indicated that breastfeeding was initiated on the first day. In Mexico, 50% of the babies received first breastmilk after the first week. In Brazil, France, Italy and Ukraine more than 20% of the babies were first breastfed after the first week (Supplementary Table S6).

In most countries, the respondents were allowed to bring expressed milk from home to the unit (76%). In Brazil, the milk had to be expressed at the hospital (71%). In New Zealand, Poland, Sweden and Ukraine more than 10% of the respondents indicated that they were not allowed to bring expressed milk from home to the unit.

Health information and communication

Almost 90% of the respondents felt that they had received adequate general health information about their newborn during the hospital stay either to a high or some degree (Supplementary Table S7). Parents from Australia, Brazil, Canada, France, Italy, New Zealand and Sweden indicated to a high degree of having received general health information (>50%). While 84% of the respondents from China indicated that they received general health information to a high or to some degree, 10% answered that they did not receive any information.

Almost 80% of the respondents received information about their newborn multiple times per day or once per day (Supplementary Table S7). General health information was mostly communicated to the parents in face-to-face meetings with medical/nursing staff (76%) or via phone calls (50%).

Overall, more than 60% of the respondents from Italy felt to a high degree that they had received adequate information about how to protect themselves and their newborn from a COVID-19 transmission. In China, 50% felt that they knew how to prevent transmission. A similar result could be observed at discharge from the hospital: in Italy and China where about 40% of the respondents indicated that they received adequate information about COVID-19 to a high degree. In Poland, almost 40% of the respondents felt they had not received any information about COVID-19 when being discharged from the hospital (Supplementary Table S7).

Parents' mental health and support

More than three-quarters of the respondents indicated being worried about the COVID-19 situation during pregnancy. For 9% of the respondents, COVID-19 was not an issue, and 10% did not worry about the virus at all. While most respondents from Mexico worried about COVID-19 during pregnancy to a high degree (71%), this was only the case for 18% of the respondents from China (Figure 2A). After birth, 90% of the total respondents worried about the COVID-19 situation to a high or to some degree. Parents from Brazil worried to a high degree (94%), while more than half of the parents from China were not at all concerned (Figure 2A).

Overall, 42% of the respondents felt they were adequately informed about mental health support to a high or some degree (Figure 2B). However, 38% felt they were not at all informed, and in 17% of the

cases there was no mental health support. The results show that proportions of having received adequate information were highest in Australia and lowest in Turkey and Mexico. The absence of mental health support was highest in Ukraine and Poland (34%). If support was offered, most parents received psychological counselling (29%) and help from a social worker (19%). In total, 48% of the respondents answered that no support was offered (Supplementary Table S8).

[Figure 2 here]

DISCUSSION

The COVID-19 pandemic has disrupted healthcare systems, and further challenged the already inadequate application of an IFCDC approach in many countries worldwide. Measures to stem virus transmission have resulted in (additional) restrictions affecting preterm, sick, and low birthweight infants, one of the most vulnerable groups of patients [18,22]. Highlighting the importance of IFCDC and by taking a patient/parent-centred approach, this study has identified parents' perceptions to different policy measures across 12 countries, with severe implications for both IFCDC as well as the health outcomes of vulnerable infants born during the pandemic [28–30]. In what follows, we will reflect upon the key findings that emerged from our multi-country research, covering data from Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, and Ukraine.

Perinatal care was impacted by the pandemic and respective restrictions, in particular with regard to having support persons present during both pregnancy-related appointments and birth. Our findings have shown that while some countries have hardly restricted the presence of accompanying persons during birth (such as Australia, New Zealand, Canada and Sweden), in many other countries it was not permitted to have a support person present (as for example in >60% in China, Ukraine, Turkey, and >85% in Poland and Mexico). This restriction finally leaves the person giving birth without any emotional, informational, and practical support from a person of trust. In contrast with such pandemic-related restrictions, previous research showed that having a support person present fulfilling these tasks facilitates non-pharmacological pain relief as well as bonding, and improves maternal well-being [29,30,46,47], which clearly highlights the benefits as well as the importance of labour companionship. In its recommendations on "Intrapartum care for a positive childbirth experience", the WHO advocates for a companion of choice for all women throughout labour and childbirth [48] also during the pandemic [49]. Thus, global health agendas do no longer exclusively focus on the reduction of birth complications, yet they have expanded their scope and have started to emphasise the importance of maternal and newborn health and well-being, and that mother and child should also thrive and enjoy their full potential of health [33]. Partners should therefore be allowed access to enable a respectful childbirth experience, yet this opportunity is too often being withheld as our research showed.

This study also revealed shortcomings regarding presence and involvement of family members while the newborn needed special/intensive care, which confirms results of similar studies [14,22,24,33,50]. As we have learned from our findings [18], restrictions were implemented and, besides some exceptions (e.g. in Australia, Canada, France, New Zealand and Sweden), in seven out of 12 countries, partly only the mother was allowed to be present with the newborn. The other parent, however, was less likely to have access with strict access restrictions e.g. in Poland and Ukraine, and siblings as well as other family members were hardly ever allowed in the neonatal intensive care unit in any country. Most importantly, our results showed that there are countries (e.g. Turkey and China) where nobody (not even father or mother) was allowed to be with the hospitalised infant. Thus, extremely strict access measures following a severe separation policy between parents and their vulnerable infant were implemented. Parental-infant bonding, however, can only take place if the parents are present and given the opportunity to care for their newborn [34,51–53]. Not including parents in caring, planning, and participation in decision-making processes pertaining to their newborn, will less likely establish feelings of competency and a healthy parent-child relationship [51]. Research shows that if the parents feel empowered to care for the child, maternal stress and anxiety can be reduced and hospital stays may be shorter [54,55]. Despite this, involving parents and seeing them as primary caregivers also depends on the mind-set of healthcare professionals [16].

Separating family members, and in particular parents from their newborns has severe consequences for the care provision and health outcomes of the vulnerable infant, for example due to limited possibilities for skin-to-skin care and KMC [22,53]. For almost one quarter of the total respondents, skin-to-skin contact with the newborn was not initiated during the time in the hospital, with particular strict measures in Mexico and Turkey, even though the benefits of practices such as KMC are undisputed [16,56–60]. The positive influence on developmental outcomes far outweighs the potential risk of death due to COVID-19 as research highlights [31]. Survival benefits of immediate KMC seem to be higher compared to those of conventional care in an incubator or a radiant warmer, as a recent randomised control trial conducted in low-resource hospital shows [60], making further research also in well-resourced settings necessary. These findings highlight that newborns should not be separated from their parents; our study unfortunately shows that the separation of parents and their newborn is (still) common practice as a minimum during the pandemic.

Even though a large majority of parents felt adequately informed about their newborn, almost 40% of the total respondents were not involved at all in the care of their baby (e.g. nappy changing, feeding, temperature taking) and almost 60% indicated that their partner was not involved in caring for the newborn, leaving them without any practice when the infant was discharged. Strong country-specific differences show that the involvement of the parents was encouraged more in Australia, Canada, France, Italy, New Zealand and Sweden in comparison to China, Poland, Turkey and Ukraine. Moreover, the implemented measures during COVID-19 made parental presence and interaction with the baby more difficult for parents in Mexico, Poland and Turkey than in Australia, France, New Zealand and Sweden. Although we could observe considerable country-specific differences on specific elements of IFCDC, overall, some countries such as New Zealand and Sweden, performed uniformly well, while other countries fell behind. These differences could be partly explained by the government response stringency indexes between August and November 2020 (lowest in New Zealand; highest in China; Supplementary Table S2) [43]. The differences can also be interpreted as a prioritisation of a holistic IFCDC approach in some countries which might have already put a greater focus on this care approach in the pre-pandemic phase compared to others, e.g. China [20]. However, comprehensive data on the national and international implementation of the different aspects of IFCDC is lacking [61] and thus, the results need to be interpreted with caution.

In contrast to parental presence and skin-to-skin contact, breastfeeding does not seem to have been impacted to the same degree. Despite various implemented restrictions, our data did not suggest that the ability to breastfeed or breastfeeding in general was discouraged by nursing staff across the 12 countries. Although about 30% of the parents from Italy and Mexico indicated that breastfeeding was not encouraged at all by nursing staff – against the current WHO recommendation [62] – this did not influence the number of infants being breastfed or provided with mother's own pumped or expressed breastmilk at least in the first weeks after birth (>90%). It has been outlined that globally, breastfeeding has not been prioritised and encouraged during the pandemic, e.g. due to early discharge and limited lactation support, with possible negative implications for its initiation [32,63,64]. Our data, however, implies that breastfeeding, as one element of IFCDC, was somewhat less affected by the restrictions, at least in the hospital. However, this study does not show the long-term trend and potential continuation of breastfeeding, e.g. also in case of early discharge which frequently occurred during the pandemic [21].

Having a newborn requiring special/intensive care is in itself a stressful situation for parents, and even more so during a pandemic. Preterm birth can be associated with a number of adverse maternal psychological outcomes, among others anxiety and psychological distress [65,66]. The COVID-19 pandemic, as an additional contributing factor to emotional distress and with an increased risk for psychiatric illness [67] and postnatal depression [68], makes parents of a preterm, sick or low birthweight infant increasingly vulnerable to developing mental health issues. Our results show that the COVID-19 situation was especially worrisome for parents in Brazil, Canada and Mexico after the birth of their baby. These results do not seem to be related to the cumulative COVID-19 cases or the government response stringency index in the respective countries (Supplementary Table S2). At the same time, parents from Brazil, Canada and Mexico, together with those from Turkey, did not feel well

informed about mental health and support. Early intervention is however important, and mental health support should be offered as early as possible and already during the hospital stay [65]. In an emergency situation, such as the COVID-19 pandemic, the focus on health and early supportive measures should be even more pronounced.

This study has several strengths that merit attention, and contextual factors that need to be outlined. The cross-country approach, data collection in 12 countries and extensive outreach allowed us to acquire valuable and in-depth insights into parents' perspectives and experiences regarding IFCDC during the first year of the COVID-19 pandemic. Pre-testing of the questionnaire reduced methodological inaccuracies and ensured that data was collected in a sensitive way. The findings comprehensively reflect the parent perspective across multiple countries giving insights into country-specific differences which are worthwhile to derive suggestions for improvements on the global and country-specific policy level.

The study has limitations that need to be acknowledged. Due to limited access and outreach possibilities in our network, we were not able to collect a representative set of data in particularly African and Southeast-Asian countries. In many countries in these regions, parent representative organisations do either not exist or do not have a strong lobby, which is in itself an important finding and worthwhile to investigate further. Setting up the study in an online format furthermore bears the risk of selection bias [69], and response rates could not be calculated as information on non-responders, in particular, during the pandemic state is not available. Due to missing demographics on neonates receiving special/intensive care in the different countries, we were unable to assess the representativeness of the sample. We furthermore acknowledge the high c-section rate in the sample, which, however, must be put in context as we study a high-risk population requiring admission of the infant to the NICU or special care unit (inclusion criterium). We are aware that participants completed the survey at different care stages (i.e. during/after hospitalisation) with a potential impact on the parents' perceived experiences. It also needs to be acknowledged that different countries, cultures, settings, income levels, political- and health care systems, as well as the individual countries' contribution to the full sample comprise a potential risk of confounding bias. The reported overall percentages are influenced by the number of responses per country (countries with more responses influence the total more) and could not be weighed in another meaningful way. Thereby, country comparison with overall percentages needs to be interpreted with caution. Moreover, the calculation of confidence intervals has limitations as only one answer option per question was selected for further analysis to aid readability.

The study reflects a point in time and we are unable to compare our findings to pre-pandemic contexts. We acknowledge that strong variation has already existed between and within countries in the field of newborn care, in particular regarding IFCDC implementation [61], which is not exclusively related to the COVID-19 pandemic. Additionally, the respective pandemic situation, geographical, climatic and environmental aspects, as well as containment strategies vary between (and sometimes even within) countries and might have influenced on the one hand, the COVID-19 related policy approach and on the other hand, the results in the respective countries [43,70]. This has to be acknowledged when comparing results between countries and interpreting potential implications of the COVID-19 incidence on IFCDC on a country level.

CONCLUSION

To the best of our knowledge, this is the first multi-country comparison of parents' experiences regarding special/intensive care for newborns during the first year of the COVID-19 pandemic on a country level. The pandemic has challenged healthcare systems leading to disruptions in the care of the most vulnerable groups of patients, namely preterm, sick, and low birthweight infants. Pandemic related restrictions are certainly necessary to prevent and reduce transmission of SARS-CoV-2. However, restrictions in parental presence and the missing possibility for skin-to-skin contact, together with lacking mental health support are global health drawbacks threatening newborn survival, quality of life of survivors and their families, and hinder the achievement of the 2030 Development Agenda. This study provides unique opportunities for public health experts, policy makers, and healthcare professionals

alike to learn from country-specific differences and in-depth insights and consequences from different approaches. It is essential to listen to and acknowledge parents' voices and experiences. Immediate action is necessary, including the reconsideration of implemented restrictions to strengthen an IFCDC approach, both during and in the absence of a global crisis [71,72]. This action requires a set of measures, including a safe and supportive care environment during and after pregnancy, labour and birth, and the implementation of a zero separation and family-inclusive policy in hospitals.

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Contributors
The EFCNI scientific team conceptualised the study and set up the online-survey under the lead of JK and with critical feedback by LZ, SM, and the members of the COVID-19 Zero Separation Collaborative Group. The COVID-19 Zero Separation Collaborative Group substantially supported the recruitment of respondents. CRP and JH were responsible for the statistical analysis, with feedback by JK, AW, and LZ. JK, CRP, and JH drafted the manuscript which was shared with and continuously reviewed by AW, SM, and LZ. JK, JH, CRP, AW, LZ, and SM interpreted and had full access to the data. All authors critically revised and have read and approved the final manuscript.

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Patient consent for publication
Not required.

Ethics approval
The Ethics Committee of Maastricht UMC+, the Netherlands, has waived the need for ethical approval for this study (MECT 2020-1336).

Data availability statement
Deidentified participant data are available from the corresponding author on reasonable request (S.MaderOffice@efcni.org).

Figures

Figure 1. Distribution of respondents by country and parental presence with newborn per country (A), presence of support persons during pregnancy-related appointments (B), and labour companionship (C)

Figure 2. Country-specific proportions on A. the concern about the COVID-19 situation and B. mental health support

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SUPPLEMENTARY MATERIAL

Supplementary Table S1
Title: Baseline and COVID-19 related characteristics of participants

Supplementary Table S2
Title: Country demographics and COVID-19 related characteristics

Supplementary Table S3
Title: Prenatal care and birth

Supplementary Table S4
Title: Presence with the newborn

Supplementary Table S5
Title: 95% confidence interval of questions related to presence with the newborn and skin-to-skin care

Supplementary Table S6
Title: Information on breastfeeding/nutrition

Supplementary Table S7
Title: Information on health communication

Supplementary Table S8
Title: Information on mental health status

Supplementary Material S9
Title: Survey

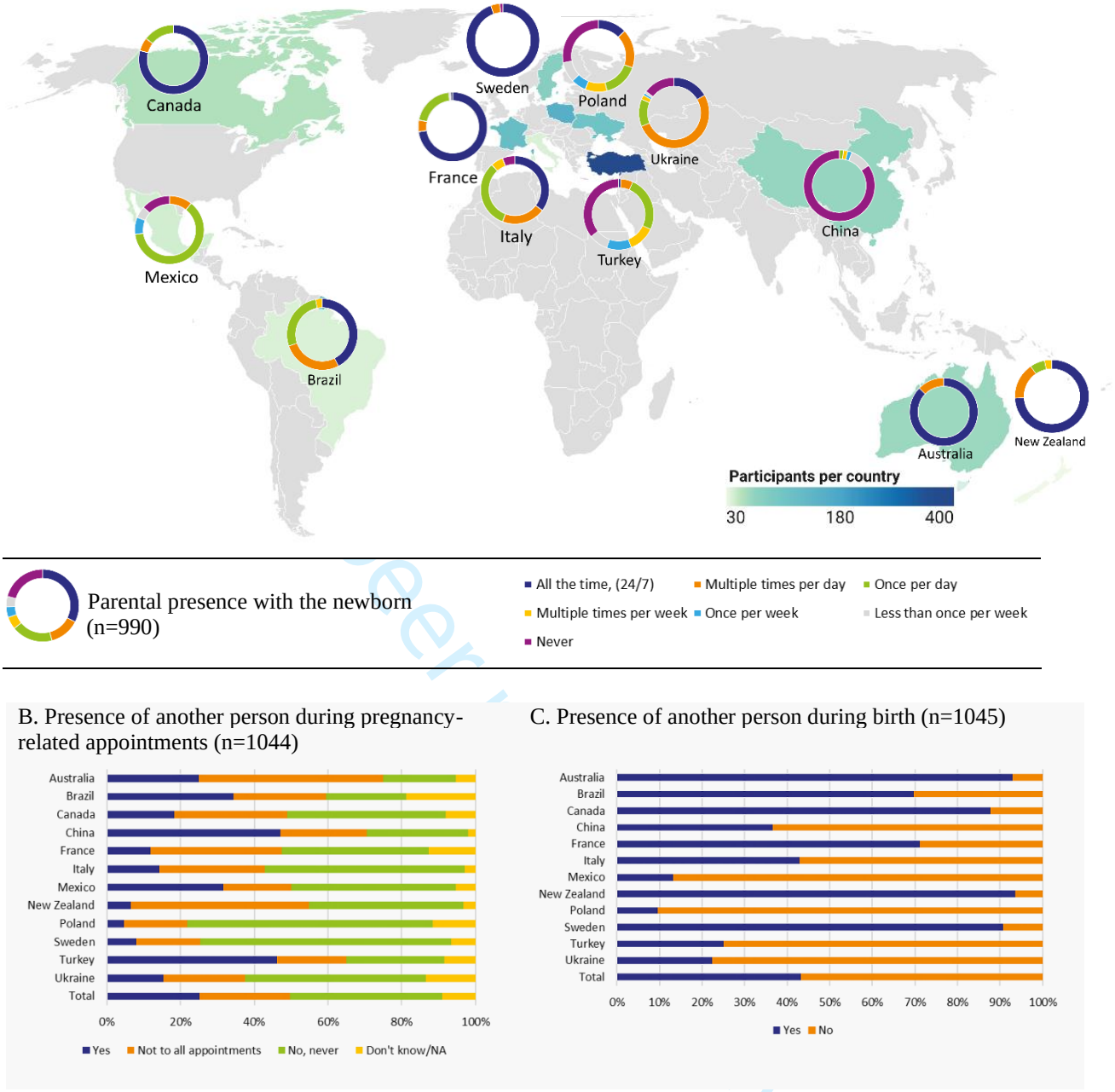

Figure 1. Distribution of respondents by country and parental presence with newborn per country (A), presence of support persons during pregnancy-related appointments (B), and labour companionship (C)

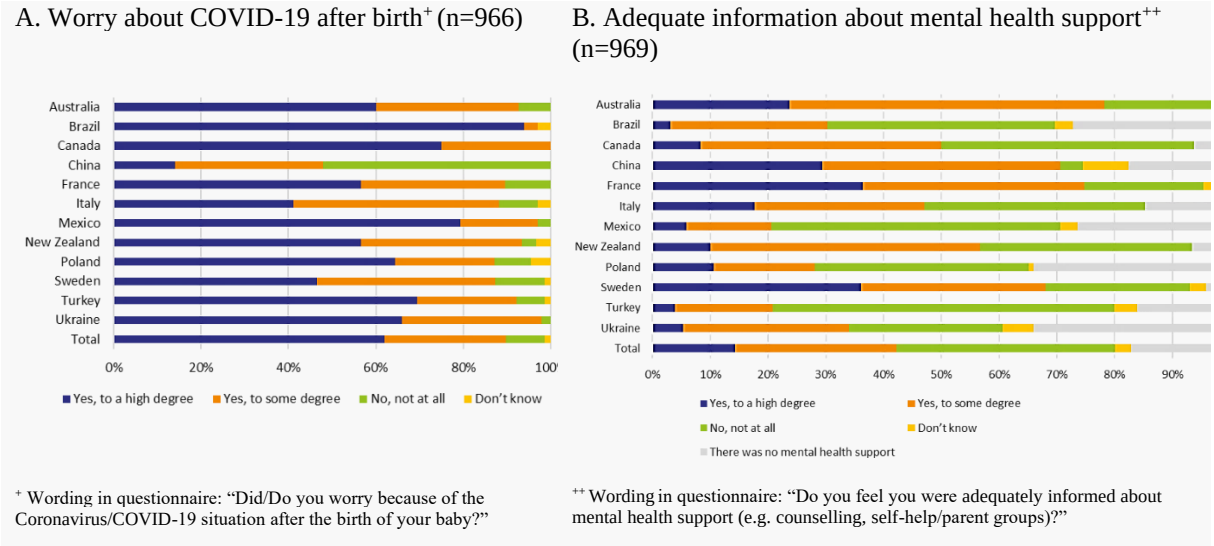

Figure 2. Country-specific proportions on A. the concern about the COVID-19 situation and B. mental health support

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Supplementary Table S1. Baseline and COVID-19 related characteristics of participants

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Age of respondent (years)													
	n = 1146	**n = 58**	**n = 38**	**n = 52**	**n = 60**	**n = 125**	**n = 38**	**n = 40**	**n = 31**	**n = 160**	**n = 78**	**n = 357**	**n = 109**
<20	5 (0%)	1 (2%)	0 (0%)	0 (0%)	1 (2%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)
20-29	468 (41%)	14 (24%)	15 (39%)	15 (29%)	16 (27%)	40 (32%)	2 (5%)	18 (45%)	15 (48%)	70 (44%)	24 (31%)	205 (57%)	34 (31%)
30-39	608 (53%)	39 (67%)	20 (53%)	30 (58%)	38 (63%)	78 (62%)	30 (79%)	18 (45%)	15 (48%)	84 (53%)	46 (59%)	136 (38%)	74 (68%)
>40	65 (6%)	4 (7%)	3 (8%)	7 (13%)	5 (8%)	6 (5%)	6 (16%)	3 (8%)	1 (3%)	6 (4%)	8 (10%)	15 (4%)	1 (1%)
Gestational age at birth (weeks)													
	n = 1107	**n = 58**	**n = 37**	**n = 49**	**n = 53**	**n = 123**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 106**
Early preterm: <28	270 (24%)	22 (38%)	9 (24%)	15 (31%)	18 (34%)	40 (33%)	9 (25%)	4 (10%)	6 (19%)	40 (26%)	23 (31%)	67 (19%)	17 (16%)
Very preterm: 28–<32	389 (35%)	10 (17%)	16 (43%)	14 (29%)	29 (55%)	36 (29%)	10 (28%)	20 (49%)	7 (23%)	48 (31%)	27 (36%)	140 (41%)	32 (30%)
Moderate to late preterm: 32–<37	412 (37%)	20 (34%)	12 (32%)	20 (41%)	6 (11%)	43 (35%)	15 (42%)	15 (37%)	15 (48%)	64 (42%)	19 (25%)	131 (38%)	52 (49%)
Term: 37–42	36 (3%)	6 (10%)	0 (0%)	0 (0%)	0 (0%)	4 (3%)	2 (6%)	2 (5%)	3 (10%)	2 (1%)	6 (8%)	6 (2%)	5 (5%)
Multiple pregnancy													
	n = 1112	**n = 58**	**n = 37**	**n = 49**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 109**
Yes	180 (16%)	12 (21%)	7 (19%)	6 (12%)	18 (33%)	14 (11%)	5 (14%)	4 (10%)	3 (10%)	14 (9%)	16 (21%)	65 (19%)	16 (15%)
No	932 (84%)	46 (79%)	30 (81%)	43 (88%)	36 (67%)	110 (89%)	31 (86%)	37 (90%)	28 (90%)	140 (91%)	59 (79%)	279 (81%)	93 (85%)
Birth mode													
	n = 1111	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 30**	**n = 153**	**n = 75**	**n = 344**	**n = 109**
Vaginal birth	301 (27%)	18 (31%)	6 (16%)	22 (44%)	24 (44%)	62 (50%)	14 (39%)	6 (15%)	6 (20%)	42 (27%)	28 (37%)	38 (11%)	35 (32%)
C-section	804 (72%)	39 (67%)	31 (84%)	28 (56%)	29 (54%)	62 (50%)	21 (58%)	35 (85%)	24 (80%)	111 (73%)	47 (63%)	304 (88%)	73 (67%)
Both (e.g. in case of multiple pregnancy)	6 (1%)	1 (2%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)	1 (1%)
Birth weight of the baby (grams)													
	n = 1110	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 342**	**n = 108**
<1000	290 (26%)	20 (34%)	10 (27%)	18 (36%)	15 (28%)	45 (36%)	14 (39%)	6 (15%)	8 (26%)	35 (23%)	27 (36%)	78 (23%)	14 (13%)
1000-1500	373 (34%)	14 (24%)	15 (41%)	11 (22%)	28 (52%)	28 (23%)	5 (14%)	18 (44%)	7 (23%)	57 (37%)	18 (24%)	130 (38%)	42 (39%)
>1500-2500	374 (34%)	16 (28%)	12 (32%)	15 (30%)	10 (19%)	45 (36%)	16 (44%)	13 (32%)	10 (32%)	53 (34%)	19 (25%)	120 (35%)	45 (42%)
>2500	71 (6%)	8 (14%)	0 (0%)	6 (12%)	1 (2%)	6 (5%)	1 (3%)	4 (10%)	6 (19%)	9 (6%)	10 (13%)	14 (4%)	6 (6%)
Don't know the birth weight	2 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1 (1%)
Duration of special/intensive care (weeks)													
	n = 1112	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 108**
<1	81 (7%)	3 (5%)	0 (0%)	5 (10%)	5 (9%)	4 (3%)	4 (11%)	3 (7%)	1 (3%)	10 (6%)	4 (5%)	13 (4%)	29 (27%)
1-3	251 (23%)	10 (17%)	5 (14%)	11 (22%)	17 (31%)	24 (19%)	11 (31%)	7 (17%)	3 (10%)	29 (19%)	20 (27%)	73 (21%)	41 (38%)
>3-5	277 (25%)	12 (21%)	10 (27%)	2 (4%)	17 (31%)	61 (49%)	3 (8%)	10 (24%)	9 (29%)	43 (28%)	13 (17%)	83 (24%)	14 (13%)
>5	503 (45%)	33 (57%)	22 (59%)	32 (64%)	15 (28%)	35 (28%)	18 (50%)	21 (51%)	18 (58%)	72 (47%)	38 (51%)	175 (51%)	24 (22%)

Supplementary Table S1. Baseline and COVID-19 related characteristics of participants *(continued)*

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Different countries and regions have been addressing the threat of Coronavirus/COVID-19 in different ways. Which of the following best describes the situation in your country/region around the time of your baby's birth?													
	n = 1071	**n = 58**	**n = 33**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 41**	**n = 30**	**n = 151**	**n = 75**	**n = 322**	**n = 107**
No major concern	49 (5%)	0 (0%)	3 (9%)	4 (8%)	14 (27%)	6 (5%)	1 (3%)	2 (5%)	0 (0%)	1 (1%)	1 (1%)	14 (4%)	3 (3%)
Precautions	137 (13%)	6 (10%)	2 (6%)	4 (8%)	30 (58%)	12 (10%)	2 (6%)	5 (12%)	5 (17%)	12 (8%)	5 (7%)	44 (14%)	10 (9%)
Social distancing	325 (30%)	17 (29%)	8 (24%)	14 (29%)	7 (13%)	38 (32%)	9 (26%)	7 (17%)	6 (20%)	48 (32%)	69 (92%)	80 (25%)	22 (21%)
Lockdown	438 (41%)	31 (53%)	16 (48%)	26 (53%)	1 (2%)	16 (14%)	16 (46%)	27 (66%)	18 (60%)	73 (48%)	0 (0%)	147 (46%)	67 (63%)
Quarantine	122 (11%)	4 (7%)	4 (12%)	1 (2%)	0 (0%)	46 (39%)	7 (20%)	0 (0%)	1 (3%)	17 (11%)	0 (0%)	37 (11%)	5 (5%)
Have you tested positive for Coronavirus/COVID-19?													
	n = 1084	**n = 58**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 35**	**n = 41**	**n = 31**	**n = 150**	**n = 75**	**n = 326**	**n = 109**
Yes	27 (2%)	1 (2%)	1 (3%)	0 (0%)	0 (0%)	1 (1%)	1 (3%)	5 (12%)	0 (0%)	1 (1%)	4 (5%)	8 (2%)	5 (5%)
No	1057 (98%)	57 (98%)	34 (97%)	50 (100%)	53 (100%)	120 (99%)	34 (97%)	36 (88%)	31 (100%)	149 (99%)	71 (95%)	318 (98%)	104 (95%)
Has your partner tested positive for Coronavirus/COVID-19?													
	n = 1086	**n = 57**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 36**	**n = 41**	**n = 31**	**n = 152**	**n = 75**	**n = 326**	**n = 109**
Yes	25 (2%)	1 (2%)	2 (6%)	0 (0%)	0 (0%)	1 (1%)	1 (3%)	5 (12%)	0 (0%)	0 (0%)	1 (1%)	8 (2%)	6 (6%)
No	1039 (96%)	56 (98%)	27 (77%)	50 (100%)	53 (100%)	117 (97%)	35 (97%)	36 (88%)	31 (100%)	147 (97%)	74 (99%)	312 (96%)	101 (93%)
Don't know	22 (2%)	0 (0%)	6 (17%)	0 (0%)	0 (0%)	3 (2%)	0 (0%)	0 (0%)	0 (0%)	5 (3%)	0 (0%)	6 (2%)	2 (2%)
Has your baby tested positive for Coronavirus/COVID-19?													
	n = 1087	**n = 58**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 36**	**n = 41**	**n = 31**	**n = 152**	**n = 75**	**n = 326**	**n = 109**
Yes	5 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	1 (1%)
No	1035 (95%)	57 (98%)	31 (89%)	50 (100%)	50 (94%)	113 (93%)	35 (97%)	39 (95%)	31 (100%)	145 (95%)	74 (99%)	303 (93%)	107 (98%)
Don't know	47 (4%)	0 (0%)	4 (11%)	0 (0%)	3 (6%)	8 (7%)	0 (0%)	1 (2%)	0 (0%)	7 (5%)	1 (1%)	22 (7%)	1 (1%)

Supplementary Table S2. Country demographics and COVID-19 related characteristics

Country	**GDP per capita** [1]	**Preterm birth rate (%)** [2]	**Female educational attainment at least completed upper secondary (%) (cumulative)** [3]	**Maternal mortality per 100,000 live births** [4]	**Under-5 mortality rate per 1,000 live births** [5]	**% of population using safely managed sanitation services** [6]	**Cumulative COVID-19 cases per 1 million population as of 29 November 2020** [7]	**Average government response stringency index between 1 August and 29 November 2020** [8]
Australia	51,812.2	8.6	79.1 (2020)	6	4	74	1,094	66.21
Brazil	6,796.8	11.18	49.5 (2018)	60	14	49	29,349	65.28
Canada	43,258.2	8.15	84.9 (2016)	10	5	84	9,514	68.98
China	10,500.4	6.94	19.2 (2010)	29	8	70	63	80.09
France	39,030.4	8.42	70.0 (2019)	8	5	79	33,242	60.65
Italy	31,676.2	7.79	51.8 (2020)	2	3	96	25,876	73.61
Mexico	8,346.7	7.04	37.7 (2020)	33	14	57	8,459	71.30
New Zealand	41,477.9	7.47	74.6 (2020)	9	5	82	352	22.22
Poland	15,656.2	7.25	85.9 (2020)	2	4	91	25,725	57.41
Sweden	52,259.3	6.31	77.2 (2019)	4	3	95	24,074	62.04
Turkey	8,538.2	12.41	36.0 (2019)	17	10	78	5,785	54.40
Ukraine	3,726.9	8.72	71.1 (2001)	19	8	72	16,525	55.09

Note: Average government response stringency index is a score from 0 (no restrictions) to 100 (maximal restrictions) related to the severity of restrictions in the country [8]

References in the table:

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Supplementary Table S3. Prenatal care and birth

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
How was the timing of pregnancy-related appointments affected, if at all, by Coronavirus/Covid-19?													
	n = 1045	**n = 56**	**n = 33**	**n = 48**	**n = 51**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 147**	**n = 75**	**n = 308**	**n = 105**
It was done as usual	117 (11%)	7 (13%)	3 (9%)	7 (15%)	1 (2%)	8 (7%)	4 (11%)	4 (11%)	2 (6%)	12 (8%)	24 (32%)	40 (13%)	5 (5%)
No appointments took place	510 (49%)	23 (41%)	21 (64%)	22 (46%)	49 (96%)	70 (59%)	20 (57%)	10 (26%)	3 (10%)	75 (51%)	30 (40%)	147 (48%)	40 (38%)
Fewer appointments took place	47 (4%)	0 (0%)	2 (6%)	1 (2%)	0 (0%)	10 (8%)	1 (3%)	4 (11%)	2 (6%)	9 (6%)	3 (4%)	8 (3%)	7 (7%)
Other	371 (36%)	26 (46%)	7 (21%)	18 (38%)	1 (2%)	30 (25%)	10 (29%)	20 (53%)	24 (77%)	51 (35%)	18 (24%)	113 (37%)	53 (50%)
If you were permitted to have another person present with you during birth, for how long was this person permitted to stay with you?													
	n = 481	**n = 51**	**n = 24**	**n = 44**	**n = 20**	**n = 85**	**n = 18**	**n = 6**	**n = 29**	**n = 14**	**n = 71**	**n = 96**	**n = 23**
For the entire labour	367 (76%)	46 (90%)	23 (96%)	38 (86%)	17 (85%)	67 (79%)	7 (39%)	1 (17%)	25 (86%)	9 (64%)	59 (83%)	60 (63%)	15 (65%)
For a part of it	114 (24%)	5 (10%)	1 (4%)	6 (14%)	3 (15%)	18 (21%)	11 (61%)	5 (83%)	4 (14%)	5 (36%)	12 (17%)	36 (38%)	8 (35%)

Supplementary Table S4. Presence with the newborn

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Were you permitted to touch your baby in the incubator or bed?													
	n = 1047	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 147**	**n = 75**	**n = 308**	**n = 105**
Yes	754 (72%)	55 (98%)	33 (100%)	49 (100%)	4 (8%)	116 (98%)	32 (91%)	31 (82%)	31 (100%)	119 (81%)	74 (99%)	124 (40%)	86 (82%)
No	293 (28%)	1 (2%)	0 (0%)	0 (0%)	48 (92%)	2 (2%)	3 (9%)	7 (18%)	0 (0%)	28 (19%)	1 (1%)	184 (60%)	19 (18%)
How often were you permitted to touch your baby in the incubator or bed?													
	n = 1046	**n = 56**	**n = 34**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 74**	**n = 308**	**n = 105**
As often as I wanted	491 (47%)	46 (82%)	29 (85%)	42 (86%)	0 (0%)	110 (93%)	20 (57%)	5 (13%)	31 (100%)	54 (37%)	72 (97%)	20 (6%)	62 (59%)
At least once per day	174 (17%)	9 (16%)	5 (15%)	7 (14%)	2 (4%)	6 (5%)	11 (31%)	20 (53%)	0 (0%)	33 (23%)	2 (3%)	57 (19%)	22 (21%)
At least once per week	43 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (8%)	0 (0%)	15 (10%)	0 (0%)	24 (8%)	0 (0%)
Less than once per week	73 (7%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)	0 (0%)	2 (6%)	3 (8%)	0 (0%)	22 (15%)	0 (0%)	37 (12%)	7 (7%)
Not so far	265 (25%)	0 (0%)	0 (0%)	0 (0%)	48 (92%)	2 (2%)	2 (6%)	7 (18%)	0 (0%)	22 (15%)	0 (0%)	170 (55%)	14 (13%)
Were sleeping facilities provided so you could stay with the baby (24/7)?													
	n = 984	**n = 55**	**n = 33**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 129**	**n = 74**	**n = 286**	**n = 96**
Yes, sleeping facilities were provided next to my baby in the unit	179 (18%)	5 (9%)	4 (12%)	15 (31%)	5 (10%)	49 (45%)	4 (12%)	0 (0%)	1 (3%)	18 (14%)	41 (55%)	11 (4%)	26 (27%)
Yes, sleeping facilities were provided outside the unit (e.g. in an apartment house nearby, in another unit)	125 (13%)	5 (9%)	0 (0%)	6 (13%)	2 (4%)	8 (7%)	9 (26%)	0 (0%)	4 (13%)	18 (14%)	30 (41%)	11 (4%)	32 (33%)
No, sleeping facilities were not provided	680 (69%)	45 (82%)	29 (88%)	27 (56%)	44 (86%)	53 (48%)	21 (62%)	37 (100%)	26 (84%)	93 (72%)	3 (4%)	264 (92%)	38 (40%)
Which alternatives to being present were provided with your baby receiving special/intensive care? (multiple answers possible)													
	n = 982	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 109**	**n = 34**	**n = 37**	**n = 29**	**n = 130**	**n = 72**	**n = 287**	**n = 96**
Sum of multiple answers	**1122 (114%)**	**57 (104%)**	**39 (115%)**	**63 (131%)**	**59 (116%)**	**123 (113%)**	**35 (103%)**	**38 (103%)**	**30 (103%)**	**155 (119%)**	**100 (139%)**	**318 (111%)**	**105 (109%)**
Photos	309 (32%)	6 (11%)	12 (35%)	12 (25%)	14 (27%)	28 (26%)	10 (29%)	5 (14%)	4 (14%)	69 (53%)	22 (31%)	114 (40%)	13 (14%)
Livestream	42 (4%)	6 (11%)	1 (3%)	5 (10%)	4 (8%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	16 (12%)	6 (8%)	0 (0%)	2 (2%)
Recorded video	74 (8%)	0 (0%)	2 (6%)	6 (13%)	3 (6%)	3 (3%)	1 (3%)	0 (0%)	0 (0%)	16 (12%)	12 (17%)	24 (8%)	7 (7%)
Video calls	52 (5%)	2 (4%)	2 (6%)	9 (19%)	1 (2%)	6 (6%)	1 (3%)	1 (3%)	5 (17%)	5 (4%)	14 (19%)	5 (2%)	1 (1%)
None	542 (55%)	39 (71%)	19 (56%)	23 (48%)	26 (51%)	64 (59%)	20 (59%)	29 (78%)	20 (69%)	35 (27%)	30 (42%)	159 (55%)	78 (81%)
Other	103 (11%)	4 (7%)	3 (9%)	8 (17%)	11 (22%)	21 (19%)	3 (9%)	2 (5%)	1 (3%)	14 (11%)	16 (22%)	16 (6%)	4 (4%)

Supplementary Table S5. 95% confidence interval of questions related to presence with the newborn and skin-to-skin care

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you know if the Coronavirus/COVID-19 situation affected the facility policy around your ability to be present with the baby receiving special/intensive care?													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
Restrictions were implemented	0.80; 0.85	0.69; 0.91	0.77; 0.99	0.81; 0.98	0.57; 0.82	0.79; 0.92	0.66; 0.93	0.83; 1.01	0.67; 0.95	0.84; 0.95	0.49; 0.71	0.79; 0.88	0.75; 0.90
Could more than one person be present with the baby at the same time?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 130**	**n = 74**	**n = 288**	**n = 96**
Yes	0.30; 0.36	0.43; 0.69	0.12; 0.41	0.27; 0.55	0.38; 0.66	0.55; 0.73	-0.02; 0.14	-0.02; 0.13	0.34; 0.69	0.01; 0.07	0.75; 0.92	0.18; 0.28	0.09; 0.24
How long were you allowed to see your baby per visit?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 109**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 73**	**n = 288**	**n = 96**
Not at all	0.18; 0.23	n.a.	-0.03; 0.09	n.a.	0.77; 0.96	-0.01; 0.03	-0.02; 0.14	0.01; 0.21	n.a.	0.18; 0.33	-0.01; 0.04	0.28; 0.39	0.08; 0.22
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be present with your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 288**	**n = 96**
Yes	0.71; 0.76	0.47; 0.73	0.36; 0.70	0.65; 0.89	0.65; 0.88	0.46; 0.65	0.39; 0.73	0.87; 1.02	0.48; 0.81	0.79; 0.91	0.1; 0.28	0.88; 0.95	0.7; 0.86
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be interactive with your baby (e.g. skin-to-skin contact or being involved in the care of your baby)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 286**	**n = 96**
Yes	0.61; 0.67	0.12; 0.35	0.27; 0.61	0.41; 0.69	0.63; 0.86	0.28; 0.46	0.45; 0.78	0.92; 1.03	0.13; 0.45	0.74; 0.87	0.05; 0.20	0.90; 0.96	0.45; 0.65
When was skin-to-skin contact with your baby and one of the parents initiated (e.g. holding the baby on the chest, kangaroo mother care)?													
	n = 1044	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 117**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
Not during the time in the hospital if discharged	0.21; 0.26	n.a.	-0.03; 0.09	n.a.	-0.01; 0.09	-0.01; 0.03	0.07; 0.33	0.31; 0.63	n.a.	0.25; 0.40	n.a.	0.43; 0.55	0.08; 0.22
How often were you permitted to have skin-to-skin contact (kangaroo mother care) with your baby?													
	n = 1043	**n = 56**	**n = 32**	**n = 49**	**n = 52**	**n = 118**	**n = 34**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
As often as I wanted	0.26; 0.32	0.20; 0.44	0.27; 0.61	0.37; 0.65	n.a.	0.77; 0.91	0.09; 0.38	n.a.	0.34; 0.69	0.04; 0.13	0.76; 0.92	0.01; 0.06	0.25; 0.44
Did medical/nursing staff involve you in the care of your baby (e.g. nappy changing, feeding, temperature taking)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 287**	**n = 96**
No, not at all	0.34; 0.40	-0.02; 0.05	0.12; 0.41	n.a.	0.67; 0.90	-0.01; 0.03	-0.02; 0.14	0.38; 0.70	n.a.	0.32; 0.49	n.a.	0.68; 0.79	0.19; 0.37
Did medical/nursing staff involve your partner in the care of your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 288**	**n = 96**
No, not at all	0.54; 0.60	-0.02; 0.05	0.39; 0.73	0.03; 0.21	0.65; 0.88	0.01; 0.10	0.05; 0.30	0.49; 0.80	0.03; 0.29	0.81; 0.93	0.00; 0.09	0.88; 0.95	0.77; 0.92

Supplementary Table S6. Information on breastfeeding/nutrition

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Was initiation of breastfeeding encouraged by medical/nursing staff?													
	n = 1024	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 140**	**n = 75**	**n = 299**	**n = 103**
Yes, highly encouraged	515 (50%)	48 (87%)	23 (68%)	30 (61%)	50 (98%)	78 (68%)	13 (38%)	20 (53%)	23 (74%)	52 (37%)	35 (47%)	95 (32%)	48 (47%)
Yes, somewhat encouraged	265 (26%)	5 (9%)	6 (18%)	12 (24%)	0 (0%)	24 (21%)	9 (26%)	15 (39%)	5 (16%)	41 (29%)	31 (41%)	82 (27%)	35 (34%)
No, not encouraged at all	189 (18%)	1 (2%)	4 (12%)	5 (10%)	0 (0%)	10 (9%)	11 (32%)	3 (8%)	0 (0%)	39 (28%)	9 (12%)	89 (30%)	18 (17%)
Don't know	55 (5%)	1 (2%)	1 (3%)	2 (4%)	1 (2%)	3 (3%)	1 (3%)	0 (0%)	3 (10%)	8 (6%)	0 (0%)	33 (11%)	2 (2%)
Was your baby breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth?													
	n = 1023	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 114**	**n = 34**	**n = 38**	**n = 30**	**n = 141**	**n = 75**	**n = 299**	**n = 103**
Yes, exclusively	506 (49%)	38 (69%)	14 (41%)	25 (51%)	31 (61%)	53 (46%)	15 (44%)	9 (24%)	22 (73%)	67 (48%)	24 (32%)	178 (60%)	30 (29%)
Yes, partly	436 (43%)	16 (29%)	17 (50%)	22 (45%)	18 (35%)	46 (40%)	16 (47%)	24 (63%)	7 (23%)	54 (38%)	45 (60%)	116 (39%)	55 (53%)
No, not at all	76 (7%)	1 (2%)	3 (9%)	1 (2%)	2 (4%)	14 (12%)	3 (9%)	5 (13%)	1 (3%)	18 (13%)	6 (8%)	4 (1%)	18 (17%)
Don't know	5 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)	0 (0%)	1 (0%)	0 (0%)
When did the initiation of breastfeeding or provision of mother's own pumped/expressed breastmilk take place?													
	n = 1026	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 75**	**n = 300**	**n = 103**
Not applicable; baby was not breastfed	56 (5%)	1 (2%)	2 (6%)	0 (0%)	2 (4%)	12 (10%)	2 (6%)	4 (11%)	0 (0%)	19 (13%)	3 (4%)	1 (0%)	10 (10%)
On the first day	348 (34%)	29 (53%)	5 (15%)	28 (57%)	8 (16%)	60 (52%)	10 (29%)	1 (3%)	17 (55%)	39 (28%)	23 (31%)	112 (37%)	16 (16%)
After the first day but during the first week	409 (40%)	21 (38%)	18 (53%)	18 (37%)	34 (67%)	10 (9%)	14 (41%)	13 (34%)	9 (29%)	64 (45%)	41 (55%)	125 (42%)	42 (41%)
After the first week	172 (17%)	4 (7%)	9 (26%)	2 (4%)	4 (8%)	26 (23%)	7 (21%)	19 (50%)	4 (13%)	13 (9%)	7 (9%)	45 (15%)	32 (31%)
Don't know	41 (4%)	0 (0%)	0 (0%)	1 (2%)	3 (6%)	7 (6%)	1 (3%)	1 (3%)	1 (3%)	6 (4%)	1 (1%)	17 (6%)	3 (3%)
Were you allowed to bring expressed milk from home to the unit?													
	n = 1024	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 74**	**n = 299**	**n = 103**
Not applicable; baby was not breastfed	41 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	12 (10%)	1 (3%)	2 (5%)	1 (3%)	7 (5%)	4 (5%)	3 (1%)	10 (10%)
Yes	782 (76%)	52 (95%)	8 (24%)	46 (94%)	51 (100%)	79 (69%)	30 (88%)	26 (68%)	25 (81%)	99 (70%)	46 (62%)	282 (94%)	38 (37%)
No, the milk had to be expressed at the hospital	121 (12%)	1 (2%)	24 (71%)	1 (2%)	0 (0%)	16 (14%)	3 (9%)	8 (21%)	2 (6%)	11 (8%)	15 (20%)	7 (2%)	33 (32%)
No, other	80 (8%)	1 (2%)	2 (6%)	2 (4%)	0 (0%)	8 (7%)	0 (0%)	2 (5%)	3 (10%)	24 (17%)	9 (12%)	7 (2%)	22 (21%)
How was your baby fed? (multiple answers possible)													
	n = 1027	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 75**	**n = 300**	**n = 103**
Sum of multiple answers	**1505 (147%)**	**83 (151%)**	**57 (168%)**	**91 (186%)**	**79 (152%)**	**192 (167%)**	**57 (168%)**	**59 (155%)**	**39 (126%)**	**214 (152%)**	**122 (163%)**	**366 (122%)**	**146 (142%)**
With breastmilk (breastfeeding or pumped milk)	912 (89%)	54 (98%)	30 (88%)	48 (98%)	50 (96%)	97 (84%)	30 (88%)	32 (84%)	30 (97%)	123 (87%)	60 (80%)	286 (95%)	72 (70%)
With donor milk	229 (22%)	14 (25%)	6 (18%)	29 (59%)	14 (27%)	51 (44%)	11 (32%)	2 (5%)	4 (13%)	38 (27%)	44 (59%)	4 (1%)	12 (12%)
With formula milk	352 (34%)	15 (27%)	20 (59%)	14 (29%)	15 (29%)	44 (38%)	15 (44%)	25 (66%)	5 (16%)	53 (38%)	18 (24%)	68 (23%)	60 (58%)
Don't know	12 (1%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (3%)	2 (2%)

Supplementary Table S7. Information on health communication

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you feel you received or are receiving adequate general health information about your baby during the hospital stay?													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Yes, to a high degree	451 (46%)	36 (65%)	18 (53%)	29 (59%)	20 (39%)	62 (56%)	18 (53%)	13 (37%)	20 (67%)	50 (38%)	57 (77%)	96 (34%)	32 (34%)
Yes, to some degree	424 (43%)	15 (27%)	14 (41%)	18 (37%)	23 (45%)	37 (34%)	15 (44%)	16 (46%)	9 (30%)	60 (45%)	14 (19%)	156 (55%)	47 (49%)
No, not at all	83 (8%)	4 (7%)	1 (3%)	2 (4%)	2 (4%)	9 (8%)	1 (3%)	5 (14%)	1 (3%)	21 (16%)	3 (4%)	24 (8%)	10 (11%)
Don't know	9 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (1%)	4 (4%)
I didn't receive any information	15 (2%)	0 (0%)	1 (3%)	0 (0%)	5 (10%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	1 (1%)	0 (0%)	4 (1%)	2 (2%)
How did you receive health information about your baby during the time your baby received or is receiving special/intensive care? (multiple answers possible)													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 282**	**n = 95**
Sum of multiple answers	**1392 (142%)**	**96 (175%)**	**40 (118%)**	**96 (196%)**	**78 (150%)**	**166 (151%)**	**47 (138%)**	**40 (114%)**	**54 (180%)**	**180 (136%)**	**111 (150%)**	**359 (127%)**	**125 (132%)**
Meetings with medical/nursing staff (face to face)	743 (76%)	50 (91%)	34 (100%)	46 (94%)	24 (46%)	96 (87%)	31 (91%)	28 (80%)	28 (93%)	79 (60%)	74 (100%)	164 (58%)	89 (94%)
Meetings with medical/nursing staff (video conference)	28 (3%)	2 (4%)	0 (0%)	8 (16%)	2 (4%)	4 (4%)	1 (3%)	0 (0%)	2 (7%)	1 (1%)	4 (5%)	4 (1%)	0 (0%)
Phone calls	491 (50%)	28 (51%)	5 (15%)	28 (57%)	48 (92%)	51 (46%)	8 (24%)	7 (20%)	11 (37%)	88 (67%)	12 (16%)	178 (63%)	27 (28%)
E-Mails	8 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)	0 (0%)	0 (0%)	4 (3%)	0 (0%)	1 (0%)	1 (1%)
Letters	2 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Information material (e.g. brochure, website)	84 (9%)	13 (24%)	0 (0%)	11 (22%)	3 (6%)	9 (8%)	3 (9%)	2 (6%)	10 (33%)	5 (4%)	21 (28%)	2 (1%)	5 (5%)
I didn't receive information	10 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	2 (6%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	4 (1%)	2 (2%)
Other	26 (3%)	3 (5%)	1 (3%)	3 (6%)	1 (2%)	3 (3%)	2 (6%)	3 (9%)	1 (3%)	2 (2%)	0 (0%)	6 (2%)	1 (1%)
How often did you receive information about your baby during the time your baby received or is receiving special/intensive care?													
	n = 983	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Multiple times per day	261 (27%)	30 (55%)	5 (15%)	23 (47%)	1 (2%)	59 (54%)	9 (26%)	5 (14%)	15 (50%)	22 (17%)	42 (57%)	28 (10%)	22 (23%)
Once per day	494 (50%)	19 (35%)	27 (79%)	21 (43%)	2 (4%)	40 (36%)	15 (44%)	27 (77%)	10 (33%)	72 (55%)	22 (30%)	176 (62%)	63 (66%)
Multiple times per week	168 (17%)	4 (7%)	2 (6%)	2 (4%)	32 (62%)	6 (5%)	7 (21%)	2 (6%)	3 (10%)	34 (26%)	9 (12%)	59 (21%)	8 (8%)
Once per week	33 (3%)	1 (2%)	0 (0%)	0 (0%)	9 (17%)	2 (2%)	2 (6%)	0 (0%)	1 (3%)	2 (2%)	0 (0%)	15 (5%)	1 (1%)
Less than once per week	13 (1%)	1 (2%)	0 (0%)	1 (2%)	3 (6%)	2 (2%)	1 (3%)	1 (3%)	0 (0%)	1 (1%)	0 (0%)	2 (1%)	1 (1%)
Never	8 (1%)	0 (0%)	0 (0%)	1 (2%)	2 (4%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	1 (1%)	2 (1%)	0 (0%)
Don't know	6 (1%)	0 (0%)	0 (0%)	1 (2%)	3 (6%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)

Supplementary Table S7. Information on health communication *(continued)*

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you feel you received or are receiving adequate information about how to protect yourself and your baby from Coronavirus/COVID-19 transmission while your baby received or is receiving special/intensive care?													
	n = 983	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Yes, to a high degree	321 (33%)	22 (40%)	12 (35%)	13 (27%)	26 (50%)	43 (39%)	21 (62%)	12 (34%)	11 (37%)	30 (23%)	31 (42%)	73 (26%)	27 (28%)
Yes, to some degree	334 (34%)	23 (42%)	14 (41%)	22 (45%)	15 (29%)	38 (35%)	8 (24%)	15 (43%)	12 (40%)	37 (28%)	23 (31%)	92 (33%)	35 (37%)
No, not at all	187 (19%)	3 (5%)	4 (12%)	11 (22%)	2 (4%)	18 (16%)	3 (9%)	5 (14%)	3 (10%)	29 (22%)	14 (19%)	80 (28%)	15 (16%)
Don't know	49 (5%)	2 (4%)	0 (0%)	1 (2%)	5 (10%)	2 (2%)	1 (3%)	2 (6%)	0 (0%)	15 (11%)	5 (7%)	9 (3%)	7 (7%)
I didn't receive any information	92 (9%)	5 (9%)	4 (12%)	2 (4%)	4 (8%)	9 (8%)	1 (3%)	1 (3%)	4 (13%)	21 (16%)	1 (1%)	29 (10%)	11 (12%)
Do you feel you received adequate information about Coronavirus/COVID-19 when discharged from the hospital?													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 282**	**n = 95**
Yes, to a high degree	204 (21%)	14 (25%)	6 (18%)	5 (10%)	20 (38%)	29 (26%)	14 (41%)	6 (17%)	2 (7%)	22 (17%)	18 (24%)	51 (18%)	17 (18%)
Yes, to some degree	224 (23%)	16 (29%)	14 (41%)	19 (39%)	15 (29%)	21 (19%)	10 (29%)	9 (26%)	8 (27%)	15 (11%)	16 (22%)	62 (22%)	19 (20%)
No, not at all	217 (22%)	7 (13%)	5 (15%)	12 (24%)	1 (2%)	29 (26%)	6 (18%)	10 (29%)	7 (23%)	20 (15%)	20 (27%)	77 (27%)	23 (24%)
Don't know	35 (4%)	1 (2%)	0 (0%)	0 (0%)	3 (6%)	3 (3%)	0 (0%)	2 (6%)	0 (0%)	8 (6%)	2 (3%)	8 (3%)	8 (8%)
I didn't receive any information	157 (16%)	10 (18%)	4 (12%)	6 (12%)	2 (4%)	15 (14%)	2 (6%)	4 (11%)	5 (17%)	50 (38%)	8 (11%)	34 (12%)	17 (18%)
No discharge yet	145 (15%)	7 (13%)	5 (15%)	7 (14%)	11 (21%)	13 (12%)	2 (6%)	4 (11%)	8 (27%)	17 (13%)	10 (14%)	50 (18%)	11 (12%)

Supplementary Table S8. Information on mental health status

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Did you worry because of the Coronavirus/COVID-19 situation during pregnancy?													
	n = 966	**n = 55**	**n = 33**	**n = 48**	**n = 50**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 132**	**n = 71**	**n = 278**	**n = 94**
Yes, to a high degree	459 (48%)	25 (45%)	17 (52%)	20 (42%)	9 (18%)	35 (33%)	13 (38%)	24 (71%)	11 (37%)	66 (50%)	25 (35%)	157 (56%)	57 (61%)
Yes, to some degree	304 (31%)	19 (35%)	7 (21%)	19 (40%)	17 (34%)	44 (41%)	17 (50%)	6 (18%)	15 (50%)	39 (30%)	27 (38%)	66 (24%)	28 (30%)
No, not at all	100 (10%)	5 (9%)	0 (0%)	5 (10%)	20 (40%)	11 (10%)	1 (3%)	1 (3%)	3 (10%)	11 (8%)	14 (20%)	23 (8%)	6 (6%)
Don't know	12 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3%)	1 (3%)	0 (0%)	0 (0%)	5 (4%)	0 (0%)	3 (1%)	0 (0%)
Coronavirus/ COVID-19 was not an issue then	91 (9%)	6 (11%)	9 (27%)	4 (8%)	4 (8%)	14 (13%)	2 (6%)	3 (9%)	1 (3%)	11 (8%)	5 (7%)	29 (10%)	3 (3%)
Did (or do) you struggle to be present with your baby who received or is receiving special care due to other obligations you have (e.g. for other children, family member/s)?													
	n = 966	**n = 55**	**n = 33**	**n = 48**	**n = 51**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 131**	**n = 72**	**n = 278**	**n = 93**
Yes, to a high degree	207 (21%)	13 (24%)	5 (15%)	12 (25%)	7 (14%)	16 (15%)	2 (6%)	13 (38%)	4 (13%)	21 (16%)	24 (33%)	70 (25%)	20 (22%)
Yes, to some degree	261 (27%)	12 (22%)	8 (24%)	15 (31%)	12 (24%)	28 (26%)	7 (21%)	7 (21%)	12 (40%)	22 (17%)	27 (38%)	81 (29%)	30 (32%)
No, not at all	440 (46%)	30 (55%)	20 (61%)	21 (44%)	27 (53%)	62 (58%)	25 (74%)	13 (38%)	14 (47%)	66 (50%)	19 (26%)	108 (39%)	35 (38%)
Don't know	58 (6%)	0 (0%)	0 (0%)	0 (0%)	5 (10%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	22 (17%)	2 (3%)	19 (7%)	8 (9%)
What kind of support was offered? (multiple answers possible)													
	n = 967	**n = 55**	**n = 32**	**n = 48**	**n = 51**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 132**	**n = 72**	**n = 278**	**n = 94**
Sum of multiple answers	**1239 (128%)**	**94 (171%)**	**36 (113%)**	**80 (167%)**	**84 (165%)**	**150 (140%)**	**41 (121%)**	**38 (112%)**	**41 (137%)**	**149 (113%)**	**97 (135%)**	**313 (113%)**	**116 (123%)**
Psychological counselling	280 (29%)	18 (33%)	11 (34%)	10 (21%)	9 (18%)	87 (81%)	15 (44%)	5 (15%)	6 (20%)	46 (35%)	29 (40%)	26 (9%)	18 (19%)
Self-help groups	30 (3%)	2 (4%)	0 (0%)	4 (8%)	3 (6%)	3 (3%)	2 (6%)	1 (3%)	1 (3%)	4 (3%)	1 (1%)	7 (3%)	2 (2%)
Parent groups	133 (14%)	18 (33%)	2 (6%)	15 (31%)	26 (51%)	8 (7%)	3 (9%)	2 (6%)	5 (17%)	12 (9%)	5 (7%)	17 (6%)	20 (21%)
Peer-to-peer support	101 (10%)	4 (7%)	0 (0%)	9 (19%)	23 (45%)	0 (0%)	2 (6%)	2 (6%)	3 (10%)	11 (8%)	1 (1%)	30 (11%)	16 (17%)
Social worker	182 (19%)	42 (76%)	2 (6%)	27 (56%)	7 (14%)	33 (31%)	1 (3%)	5 (15%)	16 (53%)	0 (0%)	44 (61%)	4 (1%)	1 (1%)
None	462 (48%)	9 (16%)	21 (66%)	11 (23%)	9 (18%)	13 (12%)	17 (50%)	21 (62%)	8 (27%)	72 (55%)	11 (15%)	213 (77%)	57 (61%)
Don't know	33 (3%)	1 (2%)	0 (0%)	1 (2%)	6 (12%)	2 (2%)	0 (0%)	2 (6%)	1 (3%)	3 (2%)	2 (3%)	14 (5%)	1 (1%)
Other	18 (2%)	0 (0%)	0 (0%)	3 (6%)	1 (2%)	4 (4%)	1 (3%)	0 (0%)	1 (3%)	1 (1%)	4 (6%)	2 (1%)	1 (1%)

Supplementary Material S9. Survey

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

The Coronavirus/COVID-19 pandemic creates exceptional challenges, especially for the care of the most vulnerable groups of patients – such as sick and preterm born children. With this survey, we aim to explore parents' experiences related to these challenges as they play a crucial role in the care of their babies – not only at home but also in the hospital setting.

We therefore kindly ask you as parents of sick and preterm infants who were born during this Coronavirus/COVID-19 pandemic to participate in this survey. Please be aware that some of the questions might cause distressing reactions considering your personal situation and experience. You may of course stop your participation at any time. Completing the survey will take approx. 15 minutes.

Ethics and data use: EFCNI handles your data lawfully and confidentially, in accordance with the General Data Protection Regulation (GDPR). No person-related data will be stored or published. Your data will be evaluated anonymously, it will not be stored or passed on to third parties and will not be used for any other purpose than the one mentioned above. Surveymonkey, the tool used for this survey, grants compliance with the GDPR and the Privacy Shield. In accordance with the GDPR, you have the right to information, the right to delete your data and can withdraw this declaration of consent at any time. The Ethics Committee of Maastricht UMC+ officially waived the need for ethics approval.

This survey is carried out by the Scientific Affairs Department of the European Foundation for the Care of Newborn Infants (EFCNI) (www.efcni.org) in collaboration with representatives of parent organisations, COINN (Council of International Neonatal Nurses), ESPR (European Society for Paediatric Research), NIDCAP (Newborn Individualized Developmental Care and Assessment Program), and UENPS (Union of European Neonatal & Perinatal Societies).

If you have any questions, comments or concerns regarding the study please contact: research@efcni.org

Thank you for your participation and support!

European Foundation for the Care of Newborn Infants (EFCNI)
and Global Alliance for Newborn Care (GLANCE)

* 1. I confirm to have read and understood the information provided above and consent to the use of my de-identified data.

- ○ Agree and continue
- ○ Do not agree and end survey

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Background information

* 2. How are you related to the newborn baby?

- ○ Mother
- ○ Father
- ○ Other
- ○ Other parent (please specify)

* 3. Was your baby born on 1st of Dec 2019 or after?

- ○ Yes
- ○ No

* 4. Did your baby receive special/intensive care after birth (exceeding regular care for healthy babies, e.g. oxygen therapy, incubator, intravenous infusions)?

- ○ Yes
- ○ No

5. Which country do you currently live in?

6. What is your age?

- ○ Younger than 20
- ○ Between 20 and 24
- ○ Between 25 and 29
- ○ Between 30 and 34
- ○ Between 35 and 39
- ○ Between 40 and 44
- ○ Older than 44

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

7. When was your baby born?

Date

Date

DD/MM/YYYY

8. What week of pregnancy was your baby born at (gestational age)?

9. Was this a multiple pregnancy?

- Yes (Please note: when answering the following questions refer to the first-born baby of the pregnancy)
- No

10. How was your baby born?

- Vaginal birth
- C-section
- Both (e.g. in case of multiple pregnancy)

11. What was the birth weight of your baby?

- Under 1000 g (2,2 lbs)
- Between 1000 g (2,2 lbs) and 1500 g (3,3 lbs)
- More than 1500 g (3,3 lbs) and up to 2500 g (5,5 lbs)
- More than 2500 g (5,5 lbs)
- Don't know the birth weight

12. Does your baby still receive special/intensive care today?

- Yes
- No

13. How long did your baby receive special/intensive care (or until today if your baby is still receiving it)?

- Under 1 week
- Between 1 to 3 weeks
- More than 3 and up to 5 weeks
- More than 5 weeks

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Coronavirus/COVID-19

14. Different countries and regions have been addressing the threat of Coronavirus/COVID-19 in different ways. Which of the following best describes the situation in your country/region around the time of your baby's birth?

- ○ There was no major concern about Coronavirus/COVID-19 in the country/region in which I live.
- ○ People were advised to take precautions (e.g. hand washing) but day-to-day life continued as usual.
- ○ Social distancing was strongly encouraged (e.g. keeping a distance, avoiding public gatherings) but no lockdowns were in place.
- ○ Lockdown had been implemented (e.g. advised to stay home except for essential activities; schools, restaurants and non-essential businesses were closed).
- ○ Quarantine was implemented and/or people were fined for leaving their homes without authorization.
- ○ Other (please elaborate):

15. Have you tested positive for Coronavirus/COVID-19?

- ○ Yes
- ○ No
- ○ No, but suspected case (based on symptoms)

16. Has your partner tested positive for Coronavirus/COVID-19?

- ○ Yes
- ○ No
- ○ No, but suspected case (based on symptoms)
- ○ Don't know

17. Has your baby tested positive for Coronavirus/COVID-19?

- ○ Yes
- ○ No
- ○ Don't know

18. Did you have contact with a person who tested positive for Coronavirus/COVID-19 during the 2 weeks prior to your baby's birth?

- Yes
- No
- No, but suspected case (based on symptoms)
- Don't know

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Before and after birth

19. How was the timing of pregnancy-related appointments affected, if at all, by Coronavirus/Covid-19?

- ◯ It was done as usual.
- ◯ No appointments took place.
- ◯ Fewer appointments took place.
- ◯ Other (please explain):

20. Was another person permitted to accompany you to pregnancy-related appointments during the Coronavirus/COVID-19 phase?

- ◯ Yes
- ◯ Not to all appointments
- ◯ No, never
- ◯ Don't know
- ◯ Not applicable (e.g. no appointments took place)

21. Were you permitted to have another person present with you during birth (e.g. partner)?

- ◯ Yes
- ◯ No

22. For how long was this person permitted to stay with you?

- ◯ Not applicable; no other person was permitted to be present
- ◯ For the entire labour
- ◯ For a part of it (please elaborate):

23. When was skin-to-skin contact with your baby and one of the parents initiated (e.g. holding the baby on the chest, kangaroo mother care)?

- Immediately after birth
- On the first day
- After the first day but during the first week
- After the first week
- Not so far (If you are still in the hospital with your baby)
- Not during the time in the hospital (if you are already at home with your baby)

24. How often were you permitted to have skin-to-skin contact (kangaroo mother care) with your baby?

- As often as I wanted
- At least once per day
- At least once per week
- Less than once per week
- Not so far

25. Were you permitted to touch your baby in the incubator or bed?

- Yes
- No

26. How often were you permitted to touch your baby in the incubator or bed?

- As often as I wanted
- At least once per day
- At least once per week
- Less than once per week
- Not so far

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Breastfeeding/nutrition

27. Was initiation of breastfeeding encouraged by medical/nursing staff?

- ○ Yes, highly encouraged
- ○ Yes, somewhat encouraged
- ○ No, not encouraged at all
- ○ Don't know

28. Was your baby breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth?

- ○ Yes, exclusively
- ○ Yes, partly
- ○ No, not at all
- ○ Don't know

29. When did the initiation of breastfeeding or provision of mother's own pumped/expressed breastmilk take place?

- ○ Not applicable; baby was not breastfed
- ○ On the first day
- ○ After the first day but during the first week
- ○ After the first week
- ○ Don't know

30. Were you allowed to bring expressed milk from home to the unit?

- ○ Not applicable; baby was not breastfed
- ○ Yes
- ○ No, the milk had to be expressed at the hospital
- ○ No, other

31. How was your baby fed? *(multiple answers possible)*

- ☐ With breastmilk (breastfeeding or pumped milk)
- ☐ With donor milk
- ☐ With formula milk
- ☐ Don't know

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Presence with the baby receiving special/intensive care

32. Do you know if the Coronavirus/COVID-19 situation affected the facility policy around your ability to be present with the baby receiving special/intensive care?

- ◯ There were no changes
- ◯ Restrictions were implemented
- ◯ I don't know if there were changes

33. Who was allowed to be present with your baby receiving special/intensive care? *(multiple answers possible)*

- ☐ Mother
- ☐ Father/partner
- ☐ Sibling/s
- ☐ Other family members
- ☐ Friends
- ☐ No one
- ☐ I don't know

34. Could more than one person be present with the baby at the same time?

- ◯ No
- ◯ Don't know
- ◯ Yes, both parents
- ◯ Yes, other (please explain):

35. How often were you allowed to see your baby receiving special/intensive care?

- ◯ All the time, (24/7)
- ◯ Multiple times per day
- ◯ Once per day
- ◯ Multiple times per week
- ◯ Once per week
- ◯ Less than once per week
- ◯ Never

36. How long were you allowed to see your baby per visit?

- ○ Up to 15 minutes
- ○ More than 15 minutes, up to one hour
- ○ More than one hour, up to three hours
- ○ More than three hours, but not unlimited
- ○ Unlimited
- ○ Not at all

37. Were sleeping facilities provided so you could stay with the baby (24/7)?

- ○ Yes, sleeping facilities were provided next to my baby in the unit
- ○ Yes, sleeping facilities were provided outside the unit (e.g. in an apartment house nearby, in another unit)
- ○ No, sleeping facilities were not provided

38. Which alternatives to being present were provided with your baby receiving special/intensive care? *(multiple answers possible)*

- ☐ Photos
- ☐ Livestream
- ☐ Recorded video
- ☐ Video calls
- ☐ None
- ☐ Other, please specify:

39. Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be **present** with your baby?

- ○ Yes, much more difficult
- ○ Yes, somewhat more difficult
- ○ No, not more difficult
- ○ No, there were no restrictive measures in place
- ○ Don't know

40. Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be **interactive** with your baby (e.g. skin-to-skin contact or being involved in the care of your baby)?

- Yes, much more difficult
- Yes, somewhat more difficult
- No, not more difficult
- No, there were no restrictive measures in place
- Don't know

41. Did medical/nursing staff involve you in the care of your baby (e.g. nappy changing, feeding, temperature taking)?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know

42. Did medical/nursing staff involve your partner in the care of your baby?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- I don't have a partner

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Communication

43. Do you feel you received or are receiving adequate general health information about your baby during the hospital stay?

- ◯ Yes, to a high degree
- ◯ Yes, to some degree
- ◯ No, not at all
- ◯ Don't know
- ◯ I didn't receive any information

44. How did you receive health information about your baby during the time your baby received or is receiving special/intensive care? *(multiple answers possible)*

- ☐ Meetings with medical/nursing staff (face to face)
- ☐ Meetings with medical/nursing staff (video conference)
- ☐ Phone calls
- ☐ E-Mails
- ☐ Letters
- ☐ Information material (e.g. brochure, website)
- ☐ I didn't receive information
- ☐ Other, please specify:

45. How often did you receive information about your baby during the time your baby received or is receiving special/intensive care?

- ◯ Multiple times per day
- ◯ Once per day
- ◯ Multiple times per week
- ◯ Once per week
- ◯ Less than once per week
- ◯ Never
- ◯ Don't know

46. Do you feel you received or are receiving adequate information about how to protect yourself and your baby from Coronavirus/COVID-19 transmission while your baby received or is receiving special/intensive care?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- I didn't receive any information

47. Do you feel you received adequate information about Coronavirus/COVID-19 when discharged from the hospital?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- I didn't receive any information
- No discharge yet

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Mental health and support

48. Did you worry because of the Coronavirus/COVID-19 situation during pregnancy?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- Coronavirus/COVID-19 was not an issue then.

49. Did/do you worry because of the Coronavirus/COVID-19 situation after the birth of your baby?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know

50. Did (or do) you struggle to be present with your baby who received or is receiving special care due to other obligations you have (e.g. for other children, family member/s)?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know

51. Do you feel you were adequately informed about mental health support (e.g. counselling, self-help/parent groups)?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- There was no mental health support

52. What kind of support was offered? *(multiple answers possible)*

- [ ] Psychological counselling
- [ ] Self-help groups
- [ ] Parent groups
- [ ] Peer-to-peer support
- [ ] Social worker
- [ ] None
- [ ] Don't know
- [ ] Other, please specify:

53. Do you have anything additional to share relating to the impact of Coronavirus/COVID-19 on special/intensive care for babies?

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Thank you very much for your interest in our study. The aim of this survey is to explore parents' experiences related to the challenges caused by the Coronavirus/COVID-19 pandemic regarding the care of sick and preterm born children receiving special/intensive care. In case you have questions or comments feel free to contact us: research@efcni.org

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Thank you very much for your interest and for taking part in our survey "Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective". In case you have any questions or would like to contact us in the future, please send an email to: research@efcni.org.

European Foundation for the Care of Newborn Infants (EFCNI): www.efcni.org

Global Alliance for Newborn Care (GLANCE): www.glance-network.org

STROBE statement - checklist of items that should be included in reports of observational/population/cohort studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	4-5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	5
		(*e*) Describe any sensitivity analyses	n/a

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	6
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	n/a
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	7-12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-12
		(*b*) Report category boundaries when continuous variables were categorized	n/a
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7-12
Discussion			
Key results	18	Summarise key results with reference to study objectives	12-14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Parents' experiences regarding neonatal care during the COVID-19 pandemic – country-specific findings of a multi-national survey

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Parents' experiences regarding neonatal care during the COVID-19 pandemic – country-specific findings of a multi-national survey

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ABSTRACT

Objectives

The COVID-19 pandemic has disrupted healthcare systems, challenging neonatal care provision globally. Curtailed visitation policies are known to negatively affect the medical and emotional care of sick, preterm, and low birthweight infants, compromising the achievement of the 2030 Development Agenda. Focusing on infant and family-centred developmental care (IFCDC), we explored parents' experiences of the disruptions affecting newborns in need of special or intensive care during the first year of the pandemic.

Design

Cross-sectional study using an electronic, web-based questionnaire.

Setting

Multi-country online-survey.

Methods

Data were collected between August and November 2020 using a pre-tested online, multi-lingual questionnaire. The target group consisted of parents of preterm, sick or low birthweight infants born during the first year of the COVID-19 pandemic and who received special/intensive care. The analysis followed a descriptive quantitative approach.

Results

In total, 1148 participants from 12 countries (Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, Ukraine) were eligible for analysis. We identified significant country-specific differences, showing that the application of IFCDC is less prone to disruptions in some countries than in others. For example, parental presence was affected: 27% of the total respondents indicated that no-one was allowed to be present with the infant receiving special/intensive care. In Australia, Canada, France, New Zealand and Sweden, both the mother and the father (in more than 90% of cases) was allowed access to the newborn, whereas participants indicated that no-one was allowed to be present in China (52%), Poland (39%), Turkey (49%), and Ukraine (32%).

Conclusions

The application of IFCDC during the COVID-19 pandemic differs between countries. There is an urgent need to reconsider separation policies and to strengthen the infant and family-centred developmental care approach worldwide to ensure the 2030 Development Agenda is achieved.

Strengths and limitations of this study

- With this survey, 1148 parents were asked about their experiences of the disruptions affecting newborns in need of special or intensive care during the first year of the pandemic.
- Data were collected in 12 countries via a pre-tested online survey with 52 questions.
- In a cross-country approach, differences in providing infant- and family-centred developmental care were analysed between countries.
- The pandemic situation, geographical, climatic and environmental aspects, and containment strategies were considered in between-country analyses.
- The online format of the study bears the risk of selection bias, and response rates could not be calculated.

INTRODUCTION

During the last decades, major achievements have been made in the field of maternal and newborn health, particularly in light of the United Nations Sustainable Development Goals [1]. While efforts have resulted in a reduction of maternal and neonatal deaths and better health outcomes for newborns worldwide, progress in particular affecting preterm, sick, and low birthweight infants has been slow [1,2]. Pandemic-related shortages in maternal and newborn care provision have severe consequences for vulnerable infants and their families [3–5], continuing to threaten the achievement of the 2030 Development Agenda [6].

Worldwide, one in ten infants is born preterm every year, with increasing rates in almost all countries where reliable epidemiologic datasets are available, making it a truly global problem [7]. Preterm birth is the leading cause of death under five years of age, and together with birth complications, it is the leading cause of neonatal death [6,8,9]. The extremely fragile group of patients requires highly specialised care, which is labour and cost intense, and thus, stark regional discrepancies in the availability of specialised care are well described [10]. However, whilst international agreements, like the United Nations Convention on the Rights of the Child or the European Association for Children in Hospital (EACH), foster the right of children to be close to their parents [11,12], these rights have not yet been implemented in the majority of neonatal units across the globe where parents and their newborns have often been separated – already in pre-pandemic times – yet increasingly as a response to the ongoing global health crisis [13–15]. Before the COVID-19 pandemic hit the globe, an increasing number of neonatal units worldwide had adopted the principles of infant- and family-centred developmental care (IFCDC), such as unrestricted parental access, active parental participation and involvement and Kangaroo Mother Care (KMC) [16,17]. However, IFCDC is so far still a new concept and its implementation remains to be one of the biggest challenges in neonatal care as it also requires a fundamental change in the mentality of neonatal caregivers [16–20].

The COVID-19 pandemic and related restrictions have resulted in severe limitations in neonatal care provision [18], especially regarding acknowledged elements of IFCDC [15,21–27]. The frequently implemented separation of parents and their newborns has negative implications for the health outcomes of newborns [28–30], interfering with acknowledged practices such as KMC, skin-to-skin contact [31], and breastfeeding [32]. The reduction of parental presence in the neonatal intensive care units (NICU) has led to increased stress and mental health problems among parents and families, raising the risk of postnatal depression and posttraumatic stress syndrome, and limited opportunities for parent-infant bonding [14,15], while staff shortages and the lack of available guidelines have led to high levels of stress and anxiety among health professionals [21,33]. Few studies and reports have provided insights into parents' experiences regarding some of the implemented restrictions [14,15,34]. However, a comparative and holistic approach, emphasising the cornerstones of IFCDC, has been missing so far, which is the focus of this research.

With this study, we explored parents' experiences of disruptions to neonatal care during the first year of the COVID-19 pandemic across the globe, focusing on individual country actions. We aimed to document the challenges experienced by parents, spanning wide variations across countries and regions. The analysis and corresponding findings shall provide an incentive for policy makers, public health experts, and healthcare professionals alike to learn from the different approaches and subsequent implications of the outcomes of single countries and underline the importance of parents' involvement in the care of vulnerable newborns. It is imperative that this occurs, irrespective of the ongoing pandemic or future emergency situations.

METHODS

Study design and population

We conducted a cross-sectional study using an electronic, web-based questionnaire with the aim to explore parents' experiences during the first year of the COVID-19 pandemic with regard to the core

elements of IFCDC. Eligible for participation were parents of preterm, sick or low birthweight infants born during the first year of the COVID-19 pandemic (as of December 1, 2019) and who were receiving special or intensive care (inclusion criteria). The term "parent" was broadly defined, encompassing biological and/or social parents, allowing for self-definition as "mother," "father," or "other parent." We conducted and reported the study according to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [35].

Participants were recruited by the European Foundation for the Care of Newborn Infants (EFCNI), and its initiative, the Global Alliance for Newborn Care (GLANCE), through social media activities, newsletters, website outreach, and mailings. In addition, national parent organisations and the collaborating professional healthcare associations and their members, namely the Council of International Neonatal Nurses (COINN), the European Society for Paediatric Research (ESPR), the Neonatal Individualised Developmental Care and Assessment Project (NIDCAP), and the Union of European Neonatal and Perinatal Societies (UENPS), supported the dissemination of the survey link by promoting the study across their networks. Participation was voluntary, data collection occurred anonymously.

Questionnaire development and pre-testing

Researchers of the EFCNI scientific department developed the questionnaire in collaboration with the members of the COVID-19 Zero Separation Collaborative Group – an interdisciplinary stakeholder group including medical experts and parent/patient representatives. The survey was pre-tested among n=8 parents who met the target group criteria who did not request any changes of the questionnaire.

The questionnaire consisted of 52 questions with pre-defined answers and single or multiple response answer options (Supplementary Material S9). It encompassed information about the respondent and infant, and COVID-19-related topics as well as categories of IFCDC [25], including the following elements: (1) background information, (2) COVID-19 testing and measures in the respective country/region (3) access to perinatal care, (4) presence with the newborn receiving special/intensive care, (5) breastfeeding/infant nutrition, (6) health communication, and (7) mental health and support. Parent representatives from EFCNI's international parent network supported the translations of the final version into 23 languages, which were all reviewed and approved by native medical professionals.

Data collection and statistical analysis

Data were collected between August and November 2020 using the SurveyMonkey® online survey tool. The analysis included answers from all respondents who met the inclusion criteria, regardless of whether they completed the survey to the end. The subsequent analysis was performed as sub-analysis based on a global survey with available data from 56 countries as previously described elsewhere [18]. For this sub-analysis, countries having a minimum of at least 30 answers per country were considered eligible for inclusion. A subsequent country selection depending on pre-defined criteria, such as sample size, geographical variation (continent, north/south), and COVID-19 situation [36,37] was conducted by the five main authors of this study using a consensus approach with ranking and voting. Recently published scientific articles on different countries' COVID-19-related preparedness, responses and implemented restrictions [38–42] acted as a basis for a comprehensive and diverse country selection resulting in the following included countries: Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, and Ukraine.

Data analysis was conducted using an exploratory approach with descriptive statistics (number of answers and proportion (n (%)). Multiple-answer questions were analysed as the sum of the number of responses per answer choice (n (%)) and may exceed 100%. A 95% CI was calculated (CI for proportions) for questions related to presence with the newborn and skin-to-skin care using one answer option in order to determine statistically significant deviations between countries and the overall total. A colour-coding indicated countries whose 95% CI did not overlap and was significantly different from the proportion of all countries (country higher (blue) or country lower (green)). All analyses presented

herein were carried out using SPSS software (IBM SPSS Statistics for Windows, version 27-0, IBM Corp, Armonk, New York) and Microsoft Excel (version 16).

Ethical considerations

Data collection, processing and storage conformed to the General Data Protection Regulation and the Declaration of Helsinki. Informed consent was given by ticking a confirmation box. For those who declined to participate, the web-interface was terminated. Respondents were informed that some of the questions might cause distressing reactions in view of their personal experiences, and they had the opportunity to stop participation at any time. No financial or other incentives were offered to the participants. The Ethics Committee of Maastricht UMC+, the Netherlands, has waived the need for ethical approval for this study (MECT 2020-1336).

Patient and public involvement

EFCNI, as a pan-European network of parent organisations, was the initiator of this research project and responsible for all phases of the study. In addition, representatives from national parent organisations worldwide were involved in the review of the questionnaire and in manuscript writing (as part of the COVID-19 Zero Separation Collaborative Group). Additionally, they supported the translation and dissemination of the survey in their network, and will again be involved in the dissemination of the results.

RESULTS

Background, baseline and COVID-19 related characteristics

In total, 1148 participants from Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey and Ukraine were eligible for analysis (Figure 1A). Baseline characteristics of participants are shown in Table 1. Nearly all answers were obtained from mothers of the infant (n=1093; 95%) and the majority of participants was between 30 and 39 years old (53%). Most infants were born very preterm (28–<32 weeks of gestation; 35%) or moderate to late preterm infants (32–<37 weeks of gestation; 37%), and were born through caesarean section (72%). Almost 50% of the infants required special/intensive care for over five weeks at the time of answering the questionnaire (Table 1). Baseline characteristics of participants per country are pre-specified in Supplementary Table S1 and partly differed on country-level.

Overall, 41% of the respondents faced lockdown measures in their country/region at the time of birth, 30% were encouraged to adhere to social distancing and 13% were located in countries/regions where precautions were advised or quarantine was implemented (11%, Table 1). In total, 2% of the respondents and 2% of the respondents' partners had tested positive for COVID-19, with the highest numbers in Mexico (12% for both options). Overall, five newborns tested positive for COVID-19 (Table 1).

Supplementary Table S2 provides an overview on each countries' demographics, including GDP per capita, the preterm birth rate, female educational attainment, maternal and under-5 mortality, sanitation, COVID-19 cases as of 29 November 2020 and the average government response stringency index based on the Oxford COVID-19 Government Response Tracker (OxCGRT) [43] between August and November 2020. Overall, Turkey (12%) and Brazil (11%) have the highest observed preterm birth rate, while it is lowest in Sweden (6%) [9]. Data from the World Bank [44] and the UN Inter-agency Group for Child Mortality Estimation [45] from 2019 shows that Brazil also has the highest rate of maternal mortality per 100,000 live births (60) and the highest under-5 mortality rate per 1,000 live births, together with Mexico (14). As of 29 November 2020, cumulative COVID-19 cases per 1 million population were highest in France (33,242), followed by Brazil (29,349). Cases were lowest in China (63) and New Zealand (352). The average government response stringency index [43] was highest in China (80) and lowest in New Zealand (22).

Table 1. Baseline and COVID-19 characteristics of participants

	Total
Age of respondent (years)	**n = 1146**
<20	5 (0%)
20–29	468 (41%)
30–39	608 (53%)
>40	65 (6%)
Gestational age at birth (weeks)	**n = 1107**
Early preterm: <28	270 (24%)
Very preterm: 28–<32	389 (35%)
Moderate to late preterm: 32–<37	412 (37%)
Term: 37–42	36 (3%)
Multiple pregnancy	**n = 1112**
Yes	180 (16%)
No	932 (84%)
Birth mode	**n = 1111**
Vaginal birth	301 (27%)
C-section	804 (72%)
Both (e.g. in case of multiple pregnancy)	6 (1%)
Birth weight of the baby (grams)	**n = 1110**
<1000	290 (26%)
1000–1500	373 (34%)
>1500–2500	374 (34%)
>2500	71 (6%)
Don't know the birth weight	2 (0%)
Duration of special/intensive care (weeks) (at time of data collection)	**n = 1112**
<1	81 (7%)
1–3	251 (23%)
>3–5	277 (25%)
>5	503 (45%)
COVID-19 situation in country/region at time of baby's birth	**n = 1071**
No major concern	49 (5%)
Precautions	137 (13%)
Social distancing	325 (30%)
Lockdown	438 (41%)
Quarantine	122 (11%)
Have you tested positive for Coronavirus/COVID-19?	**n = 1084**
Yes	27 (2%)
No	1057 (98%)
Has your partner tested positive for Coronavirus/COVID-19?	**n = 1086**
Yes	25 (2%)
No	1039 (96%)
Don't know	22 (2%)
Has your baby tested positive for Coronavirus/COVID-19?	**n = 1087**
Yes	5 (0%)
No	1035 (95%)
Don't know	47 (4%)

Prenatal care and birth

Significant variations regarding the presence of support persons during pregnancy-related appointments and birth could be observed (Figure 1B and Figure 1C). In total, 41% of all participants were not allowed to have a companion present during pregnancy-related appointments. This number was highest in Sweden and Poland (>60%) and lowest in Australia (20%). During birth, 57% of the respondents were not permitted to have another person present (Figure 1C). In Mexico, 87% of the women gave birth without a supporting companion. In Poland, this applied to 90% of the respondents. In Australia, New Zealand and Sweden >90% of the women were permitted to have another person present, and in Australia 90% of the accompanying persons could stay for the entire labour (Supplementary Table S3). Likewise, in Brazil, China and New Zealand >85% of the accompanying persons could stay during the entire labour (Supplementary Table S3).

[Figure 1 here]

Presence with the newborn and skin-to-skin care

In total, 82% of the participants responded that the COVID-19 pandemic affected the facility policy around their ability to be present with the newborn receiving special/intensive care (Table 2). Parental presence was one of the areas affected most, with 27% percent of the total respondents indicating that no-one was allowed to be present with the newborn, with highest numbers in China (52%) and Turkey (49%).

Analysis showed country-specific differences regarding access of family members to the hospitalised infant: Between 80% and more than 90% of participants from Australia, Canada, France, New Zealand and Sweden answered that both parents were allowed access. Lower proportions were observed for the remaining countries, with the lowest numbers in China where 35% of the mothers and 29% of the fathers were permitted to be present with the newborn (Table 2). More than half of the participants in Australia, China, France, New Zealand, and Sweden indicated that more than one person was allowed to be present with the newborn at the same time (Table 2).

Overall, 32% of the respondents could see their newborn all the time (24/7), and 13% multiple times per day (Figure 1A). More than 20% were not allowed to see their newborn at any time, which was particularly observed in China (85%) and also reported by respondents from Mexico (14%), Poland (28%), Turkey (36%) and Ukraine (15%, Figure 1A). While more than half of the respondents from Poland were provided with either photos, livestream options or recorded videos as alternative tools to being present, parents from Mexico (78%), Turkey (55%) and Ukraine (81%) were mostly not offered any alternatives (Supplementary Table S4).

While in Australia, Canada, France, New Zealand and Sweden more than 80% of the respondents had unlimited access to their newborn, other countries implemented duration restrictions (Table 2). Significantly high proportions of being “not at all” allowed to be present with the infant were noted in China (87%) and Turkey (34%) (Supplementary Table S5). In Mexico, Turkey and Ukraine more than half of the respondents indicated that they were allowed to see their baby for up to one hour. More than 70% of the respondents from Canada, China, Mexico, Poland, Turkey and Ukraine felt that the measures implemented due to COVID-19 made it more difficult for them to be present, and more than 70% from China, Mexico, Poland and Turkey to be interactive with their newborn, e.g. regarding skin-to-skin contact (Table 2).

The possibilities to have skin-to-skin contact with the infant differed between countries, with significantly high proportions of respondents in Mexico (47%) and Turkey (49%) indicating that skin-to-skin care was not initiated during the time in the hospital (Supplementary Table S5). In China, most respondents (85%) answered that skin-to-skin care had not yet been initiated (if still in the hospital). In the remaining countries, skin-to-skin care was mainly initiated after the first day but during the first week with few exceptions having high answer rates with regards to an early initiation (immediately after birth or on the first day) such as France. In Sweden and France >80% of the mothers were permitted to have skin-to-skin contact with their newborn as often as they wanted. While >95% of the respondents from Australia, Brazil, Canada, France, New Zealand and Sweden could touch their newborn in the incubator or bed as often as they wanted or at least once per day, 92% of the participants in China, and 60% in Turkey were not permitted to do so (Table 2).

The involvement in the care was perceived differently by parents across countries. While participants from Australia, France, New Zealand and Sweden felt they were highly involved in the care by medical and nursing staff (>80%), more than 70% of participants in China, Poland, Turkey and Ukraine felt that staff did neither include them nor their partner in the care. In addition, while the majority of participants from Sweden (85%) responded that also their partner was highly involved by medical and nursing staff, this was not the case for participants in Turkey.

314 Table 2. Presence with the newborn and skin-to-skin care

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you know if the Coronavirus/COVID-19 situation affected the facility policy around your ability to be present with the baby receiving special/intensive care?													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
There were no changes	80 (8%)	7 (13%)	2 (6%)	2 (4%)	5 (10%)	12 (11%)	4 (12%)	2 (5%)	4 (13%)	4 (3%)	23 (32%)	10 (3%)	5 (5%)
Restrictions were implemented	816 (82%)	44 (80%)	30 (88%)	44 (90%)	36 (69%)	94 (85%)	27 (79%)	34 (92%)	25 (81%)	118 (89%)	44 (60%)	241 (84%)	79 (82%)
I don't know if there were changes	95 (10%)	4 (7%)	2 (6%)	3 (6%)	11 (21%)	4 (4%)	3 (9%)	1 (3%)	2 (6%)	10 (8%)	6 (8%)	37 (13%)	12 (13%)
Who was allowed to be present with your baby receiving special/intensive care? (multiple answers possible)													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
Sum of multiple answers	**1497 (151%)**	**112 (204%)**	**57 (168%)**	**89 (182%)**	**73 (140%)**	**215 (195%)**	**59 (174%)**	**57 (154%)**	**56 (181%)**	**155 (117%)**	**145 (199%)**	**368 (128%)**	**111 (116%)**
Mother	680 (69%)	52 (95%)	30 (88%)	44 (90%)	18 (35%)	101 (92%)	30 (88%)	25 (68%)	28 (90%)	84 (64%)	60 (82%)	142 (49%)	66 (69%)
Father/partner	501 (51%)	54 (98%)	24 (71%)	42 (86%)	15 (29%)	106 (96%)	27 (79%)	23 (62%)	26 (84%)	19 (14%)	68 (93%)	84 (29%)	13 (14%)
Sibling/s	27 (3%)	3 (5%)	0 (0%)	1 (2%)	3 (6%)	6 (5%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	12 (16%)	0 (0%)	1 (1%)
Other family members	14 (1%)	3 (5%)	2 (6%)	1 (2%)	3 (6%)	0 (0%)	0 (0%)	1 (3%)	1 (3%)	0 (0%)	3 (4%)	0 (0%)	0 (0%)
Friends	2 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
No one	265 (27%)	0 (0%)	1 (3%)	0 (0%)	27 (52%)	2 (2%)	2 (6%)	8 (22%)	0 (0%)	52 (39%)	1 (1%)	141 (49%)	31 (32%)
I don't know	8 (1%)	0 (0%)	0 (0%)	0 (0%)	7 (13%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)
Could more than one person be present with the baby at the same time?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 130**	**n = 74**	**n = 288**	**n = 96**
Yes	326 (33%)	31 (56%)	9 (26%)	20 (41%)	27 (52%)	70 (64%)	2 (6%)	2 (5%)	16 (52%)	5 (4%)	62 (84%)	66 (23%)	16 (17%)
No	664 (67%)	24 (44%)	25 (74%)	29 (59%)	25 (48%)	40 (36%)	32 (94%)	35 (95%)	15 (48%)	125 (96%)	12 (16%)	222 (77%)	80 (83%)
How long were you allowed to see your baby per visit?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 109**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 73**	**n = 288**	**n = 96**
Up to an hour	338 (34%)	1 (2%)	11 (32%)	0 (0%)	2 (4%)	0 (0%)	11 (32%)	31 (84%)	0 (0%)	44 (34%)	0 (0%)	186 (65%)	52 (54%)
More than one hour, up to three hours	41 (4%)	2 (4%)	1 (3%)	0 (0%)	4 (8%)	5 (5%)	3 (9%)	1 (3%)	0 (0%)	22 (17%)	0 (0%)	2 (1%)	1 (1%)
More than three hours, but not unlimited	51 (5%)	5 (9%)	5 (15%)	2 (4%)	1 (2%)	15 (14%)	3 (9%)	0 (0%)	4 (13%)	4 (3%)	2 (3%)	1 (0%)	9 (9%)
Unlimited	360 (36%)	47 (85%)	16 (47%)	47 (96%)	0 (0%)	88 (81%)	15 (44%)	1 (3%)	27 (87%)	27 (21%)	70 (96%)	2 (1%)	20 (21%)
Not at all	199 (20%)	0 (0%)	1 (3%)	0 (0%)	45 (87%)	1 (1%)	2 (6%)	4 (11%)	0 (0%)	34 (26%)	1 (1%)	97 (34%)	14 (15%)
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be present with your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 288**	**n = 96**
Yes	726 (73%)	33 (60%)	18 (53%)	37 (77%)	39 (76%)	61 (55%)	19 (56%)	35 (95%)	20 (65%)	112 (85%)	14 (19%)	263 (91%)	75 (78%)
No, not more difficult	192 (19%)	17 (31%)	15 (44%)	10 (21%)	3 (6%)	42 (38%)	14 (41%)	1 (3%)	7 (23%)	17 (13%)	46 (62%)	11 (4%)	9 (9%)
No, there were no restrictive measures in place	39 (4%)	4 (7%)	1 (3%)	1 (2%)	0 (0%)	4 (4%)	1 (3%)	1 (3%)	3 (10%)	2 (2%)	11 (15%)	3 (1%)	8 (8%)
Don't know	33 (3%)	1 (2%)	0 (0%)	0 (0%)	9 (18%)	3 (3%)	0 (0%)	0 (0%)	1 (3%)	1 (1%)	3 (4%)	11 (4%)	4 (4%)
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be interactive with your baby (e.g. skin-to-skin contact or being involved in the care of your baby)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 286**	**n = 96**
Yes	634 (64%)	13 (24%)	15 (44%)	27 (55%)	38 (75%)	41 (37%)	21 (62%)	36 (97%)	9 (29%)	106 (80%)	9 (12%)	266 (93%)	53 (55%)

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
No, not more difficult	258 (26%)	31 (56%)	16 (47%)	16 (33%)	4 (8%)	53 (48%)	11 (32%)	0 (0%)	13 (42%)	22 (17%)	46 (62%)	11 (4%)	35 (36%)
No, there were no restrictive measures in place	72 (7%)	10 (18%)	2 (6%)	5 (10%)	0 (0%)	15 (14%)	1 (3%)	1 (3%)	9 (29%)	3 (2%)	18 (24%)	4 (1%)	4 (4%)
Don't know	25 (3%)	1 (2%)	1 (3%)	1 (2%)	9 (18%)	1 (1%)	1 (3%)	0 (0%)	0 (0%)	1 (1%)	1 (1%)	5 (2%)	4 (4%)
When was skin-to-skin contact with your baby and one of the parents initiated (e.g. holding the baby on the chest, kangaroo mother care)?													
	n = 1044	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 117**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
Immediately after birth	65 (6%)	7 (13%)	1 (3%)	8 (16%)	2 (4%)	13 (11%)	1 (3%)	0 (0%)	5 (16%)	7 (5%)	11 (15%)	4 (1%)	6 (6%)
On the first day	99 (9%)	14 (25%)	0 (0%)	7 (14%)	0 (0%)	43 (37%)	1 (3%)	0 (0%)	5 (16%)	4 (3%)	19 (25%)	4 (1%)	2 (2%)
After the first day but during the first week	236 (23%)	23 (41%)	8 (24%)	21 (43%)	0 (0%)	45 (38%)	8 (23%)	3 (8%)	14 (45%)	36 (25%)	35 (47%)	17 (6%)	26 (25%)
After the first week	244 (23%)	11 (20%)	21 (64%)	13 (27%)	4 (8%)	14 (12%)	18 (51%)	13 (34%)	7 (23%)	32 (22%)	10 (13%)	60 (19%)	41 (39%)
Not so far (If still in hospital)	156 (15%)	1 (2%)	2 (6%)	0 (0%)	44 (85%)	1 (1%)	0 (0%)	4 (11%)	0 (0%)	19 (13%)	0 (0%)	72 (23%)	13 (13%)
Not during the time in the hospital if discharged	244 (23%)	0 (0%)	1 (3%)	0 (0%)	2 (4%)	1 (1%)	7 (20%)	18 (47%)	0 (0%)	48 (33%)	0 (0%)	151 (49%)	16 (15%)
How often were you permitted to have skin-to-skin contact (kangaroo mother care) with your baby?													
	n = 1043	**n = 56**	**n = 32**	**n = 49**	**n = 52**	**n = 118**	**n = 34**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
As often as I wanted	302 (29%)	18 (32%)	14 (44%)	25 (51%)	0 (0%)	99 (84%)	8 (24%)	0 (0%)	16 (52%)	12 (8%)	63 (84%)	11 (4%)	36 (35%)
At least once per day	227 (22%)	31 (55%)	11 (34%)	21 (43%)	2 (4%)	15 (13%)	13 (38%)	12 (32%)	12 (39%)	31 (21%)	9 (12%)	43 (14%)	27 (26%)
At least once per week	64 (6%)	6 (11%)	3 (9%)	2 (4%)	0 (0%)	2 (2%)	3 (9%)	4 (11%)	3 (10%)	17 (12%)	3 (4%)	18 (6%)	3 (3%)
Less than once per week	77 (7%)	0 (0%)	1 (3%)	1 (2%)	2 (4%)	1 (1%)	4 (12%)	7 (18%)	0 (0%)	24 (16%)	0 (0%)	29 (9%)	8 (8%)
Not so far	373 (36%)	1 (2%)	3 (9%)	0 (0%)	48 (92%)	1 (1%)	6 (18%)	15 (39%)	0 (0%)	62 (42%)	0 (0%)	207 (67%)	30 (29%)
Did medical/nursing staff involve you in the care of your baby (e.g. nappy changing, feeding, temperature taking)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 287**	**n = 96**
Yes, to a high degree	438 (44%)	44 (80%)	15 (44%)	34 (69%)	4 (8%)	102 (93%)	22 (65%)	6 (16%)	27 (87%)	48 (37%)	67 (91%)	22 (8%)	47 (49%)
Yes, to some degree	180 (18%)	10 (18%)	10 (29%)	15 (31%)	3 (6%)	7 (6%)	10 (29%)	11 (30%)	4 (13%)	29 (22%)	7 (9%)	53 (18%)	21 (22%)
No, not at all	364 (37%)	1 (2%)	9 (26%)	0 (0%)	40 (78%)	1 (1%)	2 (6%)	20 (54%)	0 (0%)	53 (40%)	0 (0%)	211 (74%)	27 (28%)
Don't know	7 (1%)	0 (0%)	0 (0%)	0 (0%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1 (0%)	1 (1%)
Did medical/nursing staff involve your partner in the care of your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 288**	**n = 96**
Yes, to a high degree	274 (28%)	35 (64%)	4 (12%)	29 (59%)	3 (6%)	87 (79%)	19 (56%)	5 (14%)	18 (58%)	2 (2%)	63 (85%)	4 (1%)	5 (5%)
Yes, to some degree	121 (12%)	18 (33%)	9 (26%)	14 (29%)	4 (8%)	15 (14%)	8 (24%)	6 (16%)	6 (19%)	10 (8%)	7 (9%)	18 (6%)	6 (6%)
No, not at all	567 (57%)	1 (2%)	19 (56%)	6 (12%)	39 (76%)	6 (5%)	6 (18%)	24 (65%)	5 (16%)	114 (87%)	3 (4%)	263 (91%)	81 (84%)
Don't know	17 (2%)	0 (0%)	2 (6%)	0 (0%)	5 (10%)	0 (0%)	1 (3%)	1 (3%)	0 (0%)	4 (3%)	0 (0%)	1 (0%)	3 (3%)
I don't have a partner	11 (1%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)	1 (3%)	2 (6%)	1 (1%)	1 (1%)	2 (1%)	1 (1%)

Blue: 95% confidence interval: significantly higher than total (for detailed results see Supplementary Table S5)
Green: 95% confidence interval: significantly lower than total (for detailed results see Supplementary Table S5)

Nutrition and breastfeeding

In total, 89% of the respondents answered that their newborns were fed with breastmilk (breastfeeding or pumped milk), 22% received donor human milk and 34% were fed with infant formula (multiple response question; Supplementary Table S6). Initiation of breastfeeding was highly (50%) or somewhat (26%) encouraged by medical/nursing staff in most countries (Supplementary Table S6). Overall, 18% indicated that breastfeeding was not encouraged at all. This lack of encouragement was especially noted in Italy (32%), Poland and Turkey (>25%). However, newborns in Italy and Turkey were in over 90% of cases still exclusively or partly breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth (Supplementary Table S6).

Also, the initiation of breastfeeding differed across countries. In Canada, first breastfeeding or provision of mother's own pumped/expressed breastmilk took place on the first day (57%) or after the first day but during the first week (37%). Likewise, in Australia, France and New Zealand, >50% of the respondents indicated that breastfeeding was initiated on the first day. In Mexico, 50% of the babies received first breastmilk after the first week. In Brazil, France, Italy and Ukraine more than 20% of the babies were first breastfed after the first week (Supplementary Table S6).

In most countries, the respondents were allowed to bring expressed milk from home to the unit (76%). In Brazil, the milk had to be expressed at the hospital (71%). In New Zealand, Poland, Sweden and Ukraine more than 10% of the respondents indicated that they were not allowed to bring expressed milk from home to the unit.

Health information and communication

Almost 90% of the respondents felt that they had received adequate general health information about their newborn during the hospital stay either to a high or some degree (Supplementary Table S7). Parents from Australia, Brazil, Canada, France, Italy, New Zealand and Sweden indicated to a high degree of having received general health information (>50%). While 84% of the respondents from China indicated that they received general health information to a high or to some degree, 10% answered that they did not receive any information.

Almost 80% of the respondents received information about their newborn multiple times per day or once per day (Supplementary Table S7). General health information was mostly communicated to the parents in face-to-face meetings with medical/nursing staff (76%) or via phone calls (50%).

Overall, more than 60% of the respondents from Italy felt to a high degree that they had received adequate information about how to protect themselves and their newborn from a COVID-19 transmission. In China, 50% felt that they knew how to prevent transmission. A similar result could be observed at discharge from the hospital: in Italy and China where about 40% of the respondents indicated that they received adequate information about COVID-19 to a high degree. In Poland, almost 40% of the respondents felt they had not received any information about COVID-19 when being discharged from the hospital (Supplementary Table S7).

Parents' mental health and support

More than three-quarters of the respondents indicated being worried about the COVID-19 situation during pregnancy. For 9% of the respondents, COVID-19 was not an issue, and 10% did not worry about the virus at all. While most respondents from Mexico worried about COVID-19 during pregnancy to a high degree (71%), this was only the case for 18% of the respondents from China (Figure 2A). After birth, 90% of the total respondents worried about the COVID-19 situation to a high or to some degree. Parents from Brazil worried to a high degree (94%), while more than half of the parents from China were not at all concerned (Figure 2A).

Overall, 42% of the respondents felt they were adequately informed about mental health support to a high or some degree (Figure 2B). However, 38% felt they were not at all informed, and in 17% of the

cases there was no mental health support. The results show that proportions of having received adequate information were highest in Australia and lowest in Turkey and Mexico. The absence of mental health support was highest in Ukraine and Poland (34%). If support was offered, most parents received psychological counselling (29%) and help from a social worker (19%). In total, 48% of the respondents answered that no support was offered (Supplementary Table S8).

[Figure 2 here]

DISCUSSION

The COVID-19 pandemic has disrupted healthcare systems, and further challenged the already inadequate application of an IFCDC approach in many countries worldwide. Measures to stem virus transmission have resulted in (additional) restrictions affecting preterm, sick, and low birthweight infants, one of the most vulnerable groups of patients [18,22]. Highlighting the importance of IFCDC and by taking a patient/parent-centred approach, this study has identified parents' perceptions to different policy measures across 12 countries, with severe implications for both IFCDC as well as the health outcomes of vulnerable infants born during the pandemic [28–30]. In what follows, we will reflect upon the key findings that emerged from our multi-country research, covering data from Australia, Brazil, Canada, China, France, Italy, Mexico, New Zealand, Poland, Sweden, Turkey, and Ukraine.

Perinatal care was impacted by the pandemic and respective restrictions, in particular with regard to having support persons present during both pregnancy-related appointments and birth. Our findings have shown that while some countries have hardly restricted the presence of accompanying persons during birth (such as Australia, New Zealand, Canada and Sweden), in many other countries it was not permitted to have a support person present (as for example in >60% in China, Ukraine, Turkey, and >85% in Poland and Mexico). This restriction finally leaves the person giving birth without any emotional, informational, and practical support from a person of trust. In contrast with such pandemic-related restrictions, previous research showed that having a support person present fulfilling these tasks facilitates non-pharmacological pain relief as well as bonding, and improves maternal well-being [29,30,46,47], which clearly highlights the benefits as well as the importance of labour companionship. In its recommendations on "Intrapartum care for a positive childbirth experience", the WHO advocates for a companion of choice for all women throughout labour and childbirth [48] also during the pandemic [49]. Thus, global health agendas do no longer exclusively focus on the reduction of birth complications, yet they have expanded their scope and have started to emphasise the importance of maternal and newborn health and well-being, and that mother and child should also thrive and enjoy their full potential of health [33]. Partners should therefore be allowed access to enable a respectful childbirth experience, yet this opportunity is too often being withheld as our research showed.

This study also revealed shortcomings regarding presence and involvement of family members while the newborn needed special/intensive care, which confirms results of similar studies [14,22,24,33,50]. As we have learned from our findings [18], restrictions were implemented and, besides some exceptions (e.g. in Australia, Canada, France, New Zealand and Sweden), in seven out of 12 countries, partly only the mother was allowed to be present with the newborn. The other parent, however, was less likely to have access with strict access restrictions e.g. in Poland and Ukraine, and siblings as well as other family members were hardly ever allowed in the neonatal intensive care unit in any country. Most importantly, our results showed that there are countries (e.g. Turkey and China) where nobody (not even father or mother) was allowed to be with the hospitalised infant. Thus, extremely strict access measures following a severe separation policy between parents and their vulnerable infant were implemented. Parental-infant bonding, however, can only take place if the parents are present and given the opportunity to care for their newborn [34,51–53]. Not including parents in caring, planning, and participation in decision-making processes pertaining to their newborn, will less likely establish feelings of competency and a healthy parent-child relationship [51]. Research shows that if the parents feel empowered to care for the child, maternal stress and anxiety can be reduced and hospital stays may be shorter [54,55]. Despite this, involving parents and seeing them as primary caregivers also depends on the mind-set of healthcare professionals [16].

Separating family members, and in particular parents from their newborns has severe consequences for the care provision and health outcomes of the vulnerable infant, for example due to limited possibilities for skin-to-skin care and KMC [22,53]. For almost one quarter of the total respondents, skin-to-skin contact with the newborn was not initiated during the time in the hospital, with particular strict measures in Mexico and Turkey, even though the benefits of practices such as KMC are undisputed [16,56–60]. The positive influence on developmental outcomes far outweighs the potential risk of death due to COVID-19 as research highlights [31]. Survival benefits of immediate KMC seem to be higher compared to those of conventional care in an incubator or a radiant warmer, as a recent randomised control trial conducted in low-resource hospital shows [60], making further research also in well-resourced settings necessary. These findings highlight that newborns should not be separated from their parents; our study unfortunately shows that the separation of parents and their newborn is (still) common practice as a minimum during the pandemic.

Even though a large majority of parents felt adequately informed about their newborn, almost 40% of the total respondents were not involved at all in the care of their baby (e.g. nappy changing, feeding, temperature taking) and almost 60% indicated that their partner was not involved in caring for the newborn, leaving them without any practice when the infant was discharged. Strong country-specific differences show that the involvement of the parents was encouraged more in Australia, Canada, France, Italy, New Zealand and Sweden in comparison to China, Poland, Turkey and Ukraine. Moreover, the implemented measures during COVID-19 made parental presence and interaction with the baby more difficult for parents in Mexico, Poland and Turkey than in Australia, France, New Zealand and Sweden. Although we could observe considerable country-specific differences on specific elements of IFCDC, overall, some countries such as New Zealand and Sweden, performed uniformly well, while other countries fell behind. These differences could be partly explained by the government response stringency indexes between August and November 2020 (lowest in New Zealand; highest in China; Supplementary Table S2) [43]. The differences can also be interpreted as a prioritisation of a holistic IFCDC approach in some countries which might have already put a greater focus on this care approach in the pre-pandemic phase compared to others, e.g. China [20]. However, comprehensive data on the national and international implementation of the different aspects of IFCDC is lacking [61] and thus, the results need to be interpreted with caution.

In contrast to parental presence and skin-to-skin contact, breastfeeding does not seem to have been impacted to the same degree. Despite various implemented restrictions, our data did not suggest that the ability to breastfeed or breastfeeding in general was discouraged by nursing staff across the 12 countries. Although about 30% of the parents from Italy and Mexico indicated that breastfeeding was not encouraged at all by nursing staff – against the current WHO recommendation [62] – this did not influence the number of infants being breastfed or provided with mother's own pumped or expressed breastmilk at least in the first weeks after birth (>90%). It has been outlined that globally, breastfeeding has not been prioritised and encouraged during the pandemic, e.g. due to early discharge and limited lactation support, with possible negative implications for its initiation [32,63,64]. Our data, however, implies that breastfeeding, as one element of IFCDC, was somewhat less affected by the restrictions, at least in the hospital. However, this study does not show the long-term trend and potential continuation of breastfeeding, e.g. also in case of early discharge which frequently occurred during the pandemic [21].

Having a newborn requiring special/intensive care is in itself a stressful situation for parents, and even more so during a pandemic. Preterm birth can be associated with a number of adverse maternal psychological outcomes, among others anxiety and psychological distress [65,66]. The COVID-19 pandemic, as an additional contributing factor to emotional distress and with an increased risk for psychiatric illness [67] and postnatal depression [68], makes parents of a preterm, sick or low birthweight infant increasingly vulnerable to developing mental health issues. Our results show that the COVID-19 situation was especially worrisome for parents in Brazil, Canada and Mexico after the birth of their baby. These results do not seem to be related to the cumulative COVID-19 cases or the government response stringency index in the respective countries (Supplementary Table S2). At the same time, parents from Brazil, Canada and Mexico, together with those from Turkey, did not feel well

informed about mental health and support. Early intervention is however important, and mental health support should be offered as early as possible and already during the hospital stay [65]. In an emergency situation, such as the COVID-19 pandemic, the focus on health and early supportive measures should be even more pronounced.

This study has several strengths that merit attention, and contextual factors that need to be outlined. The cross-country approach, data collection in 12 countries and extensive outreach allowed us to acquire valuable and in-depth insights into parents' perspectives and experiences regarding IFCDC during the first year of the COVID-19 pandemic. Pre-testing of the questionnaire reduced methodological inaccuracies and ensured that data was collected in a sensitive way. The findings comprehensively reflect the parent perspective across multiple countries giving insights into country-specific differences which are worthwhile to derive suggestions for improvements on the global and country-specific policy level.

The study has limitations that need to be acknowledged. Due to limited access and outreach possibilities in our network, we were not able to collect a representative set of data in particularly African and Southeast-Asian countries. In many countries in these regions, parent representative organisations do either not exist or do not have a strong lobby, which is in itself an important finding and worthwhile to investigate further. Setting up the study in an online format furthermore bears the risk of selection bias [69], and response rates could not be calculated as information on non-responders, in particular, during the pandemic state is not available. Due to missing demographics on neonates receiving special/intensive care in the different countries, we were unable to assess the representativeness of the sample. We furthermore acknowledge the high c-section rate in the sample, which, however, must be put in context as we study a high-risk population requiring admission of the infant to the NICU or special care unit (inclusion criterium). We are aware that participants completed the survey at different care stages (i.e. during/after hospitalisation) with a potential impact on the parents' perceived experiences. It also needs to be acknowledged that different countries, cultures, settings, income levels, political- and health care systems, as well as the individual countries' contribution to the full sample comprise a potential risk of confounding bias. The reported overall percentages are influenced by the number of responses per country (countries with more responses influence the total more) and could not be weighed in another meaningful way. Thereby, country comparison with overall percentages needs to be interpreted with caution. Moreover, the calculation of confidence intervals has limitations as only one answer option per question was selected for further analysis to aid readability.

The study reflects a point in time and we are unable to compare our findings to pre-pandemic contexts. We acknowledge that strong variation has already existed between and within countries in the field of newborn care, in particular regarding IFCDC implementation [61], which is not exclusively related to the COVID-19 pandemic. Additionally, the respective pandemic situation, geographical, climatic and environmental aspects, as well as containment strategies vary between (and sometimes even within) countries and might have influenced on the one hand, the COVID-19 related policy approach and on the other hand, the results in the respective countries [43,70]. This has to be acknowledged when comparing results between countries and interpreting potential implications of the COVID-19 incidence on IFCDC on a country level.

CONCLUSION

To the best of our knowledge, this is the first multi-country comparison of parents' experiences regarding special/intensive care for newborns during the first year of the COVID-19 pandemic on a country level. The pandemic has challenged healthcare systems leading to disruptions in the care of the most vulnerable groups of patients, namely preterm, sick, and low birthweight infants. Pandemic related restrictions are certainly necessary to prevent and reduce transmission of SARS-CoV-2. However, restrictions in parental presence and the missing possibility for skin-to-skin contact, together with lacking mental health support are global health drawbacks threatening newborn survival, quality of life of survivors and their families, and hinder the achievement of the 2030 Development Agenda. This study provides unique opportunities for public health experts, policy makers, and healthcare professionals

alike to learn from country-specific differences and in-depth insights and consequences from different approaches. It is essential to listen to and acknowledge parents' voices and experiences. Immediate action is necessary, including the reconsideration of implemented restrictions to strengthen an IFCDC approach, both during and in the absence of a global crisis [71,72]. This action requires a set of measures, including a safe and supportive care environment during and after pregnancy, labour and birth, and the implementation of a zero separation and family-inclusive policy in hospitals.

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Contributors
The EFCNI scientific team conceptualised the study and set up the online-survey under the lead of JK and with critical feedback by LZ, SM, and the members of the COVID-19 Zero Separation Collaborative Group. The COVID-19 Zero Separation Collaborative Group substantially supported the recruitment of respondents. CRP and JH were responsible for the statistical analysis, with feedback by JK, AW, and LZ. JK, CRP, and JH drafted the manuscript which was shared with and continuously reviewed by AW, SM, and LZ. JK, JH, CRP, AW, LZ, and SM interpreted and had full access to the data. All authors critically revised and have read and approved the final manuscript.

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Competing interests
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Patient consent for publication
Not required.

Ethics approval
The Ethics Committee of Maastricht UMC+, the Netherlands, has waived the need for ethical approval for this study (MECT 2020-1336).

Data availability statement
Deidentified participant data are available from the corresponding author on reasonable request (S.MaderOffice@efcni.org).

Figures

Figure 1. Distribution of respondents by country and parental presence with newborn per country (A), presence of support persons during pregnancy-related appointments (B), and labour companionship (C)

Figure 2. Country-specific proportions on A. the concern about the COVID-19 situation and B. mental health support

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SUPPLEMENTARY MATERIAL

Supplementary Table S1
Title: Baseline and COVID-19 related characteristics of participants

Supplementary Table S2
Title: Country demographics and COVID-19 related characteristics

Supplementary Table S3
Title: Prenatal care and birth

Supplementary Table S4
Title: Presence with the newborn

Supplementary Table S5
Title: 95% confidence interval of questions related to presence with the newborn and skin-to-skin care

Supplementary Table S6
Title: Information on breastfeeding/nutrition

Supplementary Table S7
Title: Information on health communication

Supplementary Table S8
Title: Information on mental health status

Supplementary Material S9
Title: Survey

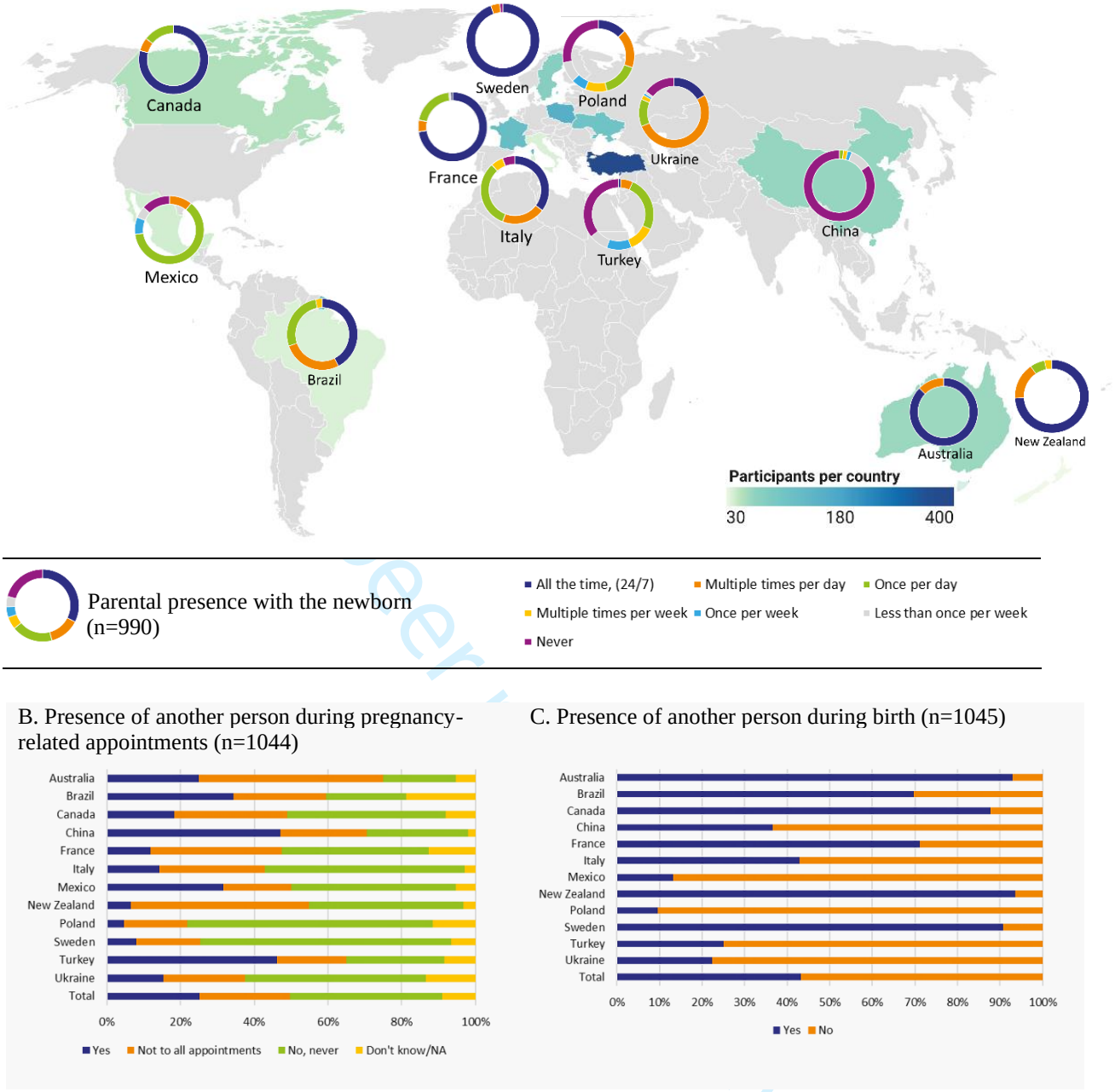

Figure 1. Distribution of respondents by country and parental presence with newborn per country (A), presence of support persons during pregnancy-related appointments (B), and labour companionship (C)

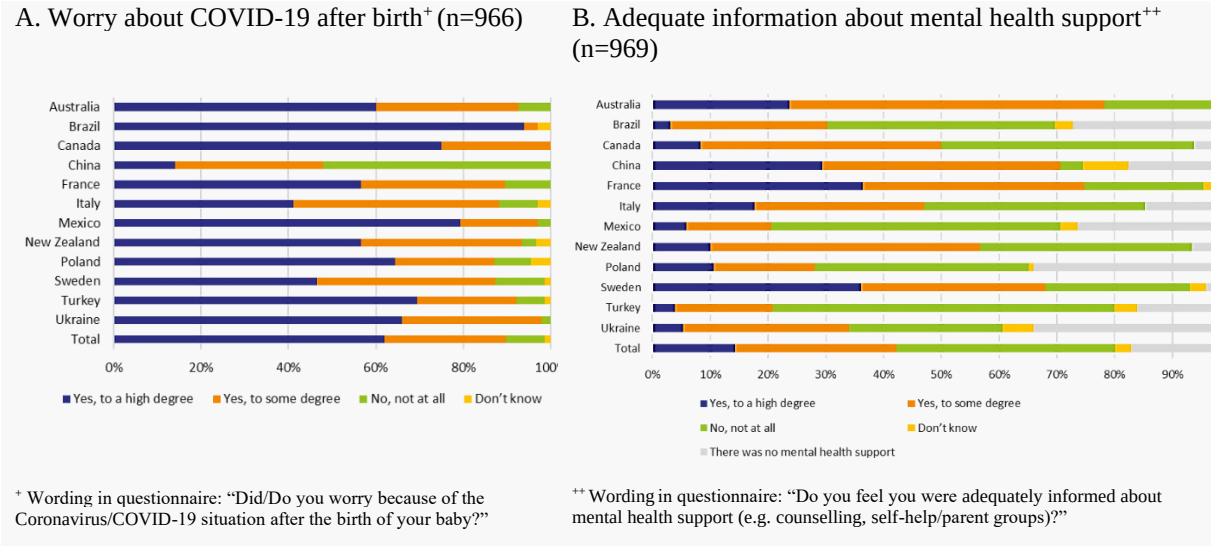

Figure 2. Country-specific proportions on A. the concern about the COVID-19 situation and B. mental health support

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Supplementary Table S1. Baseline and COVID-19 related characteristics of participants

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Age of respondent (years)													
	n = 1146	**n = 58**	**n = 38**	**n = 52**	**n = 60**	**n = 125**	**n = 38**	**n = 40**	**n = 31**	**n = 160**	**n = 78**	**n = 357**	**n = 109**
<20	5 (0%)	1 (2%)	0 (0%)	0 (0%)	1 (2%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)
20-29	468 (41%)	14 (24%)	15 (39%)	15 (29%)	16 (27%)	40 (32%)	2 (5%)	18 (45%)	15 (48%)	70 (44%)	24 (31%)	205 (57%)	34 (31%)
30-39	608 (53%)	39 (67%)	20 (53%)	30 (58%)	38 (63%)	78 (62%)	30 (79%)	18 (45%)	15 (48%)	84 (53%)	46 (59%)	136 (38%)	74 (68%)
>40	65 (6%)	4 (7%)	3 (8%)	7 (13%)	5 (8%)	6 (5%)	6 (16%)	3 (8%)	1 (3%)	6 (4%)	8 (10%)	15 (4%)	1 (1%)
Gestational age at birth (weeks)													
	n = 1107	**n = 58**	**n = 37**	**n = 49**	**n = 53**	**n = 123**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 106**
Early preterm: <28	270 (24%)	22 (38%)	9 (24%)	15 (31%)	18 (34%)	40 (33%)	9 (25%)	4 (10%)	6 (19%)	40 (26%)	23 (31%)	67 (19%)	17 (16%)
Very preterm: 28–<32	389 (35%)	10 (17%)	16 (43%)	14 (29%)	29 (55%)	36 (29%)	10 (28%)	20 (49%)	7 (23%)	48 (31%)	27 (36%)	140 (41%)	32 (30%)
Moderate to late preterm: 32–<37	412 (37%)	20 (34%)	12 (32%)	20 (41%)	6 (11%)	43 (35%)	15 (42%)	15 (37%)	15 (48%)	64 (42%)	19 (25%)	131 (38%)	52 (49%)
Term: 37–42	36 (3%)	6 (10%)	0 (0%)	0 (0%)	0 (0%)	4 (3%)	2 (6%)	2 (5%)	3 (10%)	2 (1%)	6 (8%)	6 (2%)	5 (5%)
Multiple pregnancy													
	n = 1112	**n = 58**	**n = 37**	**n = 49**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 109**
Yes	180 (16%)	12 (21%)	7 (19%)	6 (12%)	18 (33%)	14 (11%)	5 (14%)	4 (10%)	3 (10%)	14 (9%)	16 (21%)	65 (19%)	16 (15%)
No	932 (84%)	46 (79%)	30 (81%)	43 (88%)	36 (67%)	110 (89%)	31 (86%)	37 (90%)	28 (90%)	140 (91%)	59 (79%)	279 (81%)	93 (85%)
Birth mode													
	n = 1111	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 30**	**n = 153**	**n = 75**	**n = 344**	**n = 109**
Vaginal birth	301 (27%)	18 (31%)	6 (16%)	22 (44%)	24 (44%)	62 (50%)	14 (39%)	6 (15%)	6 (20%)	42 (27%)	28 (37%)	38 (11%)	35 (32%)
C-section	804 (72%)	39 (67%)	31 (84%)	28 (56%)	29 (54%)	62 (50%)	21 (58%)	35 (85%)	24 (80%)	111 (73%)	47 (63%)	304 (88%)	73 (67%)
Both (e.g. in case of multiple pregnancy)	6 (1%)	1 (2%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)	1 (1%)
Birth weight of the baby (grams)													
	n = 1110	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 342**	**n = 108**
<1000	290 (26%)	20 (34%)	10 (27%)	18 (36%)	15 (28%)	45 (36%)	14 (39%)	6 (15%)	8 (26%)	35 (23%)	27 (36%)	78 (23%)	14 (13%)
1000-1500	373 (34%)	14 (24%)	15 (41%)	11 (22%)	28 (52%)	28 (23%)	5 (14%)	18 (44%)	7 (23%)	57 (37%)	18 (24%)	130 (38%)	42 (39%)
>1500-2500	374 (34%)	16 (28%)	12 (32%)	15 (30%)	10 (19%)	45 (36%)	16 (44%)	13 (32%)	10 (32%)	53 (34%)	19 (25%)	120 (35%)	45 (42%)
>2500	71 (6%)	8 (14%)	0 (0%)	6 (12%)	1 (2%)	6 (5%)	1 (3%)	4 (10%)	6 (19%)	9 (6%)	10 (13%)	14 (4%)	6 (6%)
Don't know the birth weight	2 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1 (1%)
Duration of special/intensive care (weeks)													
	n = 1112	**n = 58**	**n = 37**	**n = 50**	**n = 54**	**n = 124**	**n = 36**	**n = 41**	**n = 31**	**n = 154**	**n = 75**	**n = 344**	**n = 108**
<1	81 (7%)	3 (5%)	0 (0%)	5 (10%)	5 (9%)	4 (3%)	4 (11%)	3 (7%)	1 (3%)	10 (6%)	4 (5%)	13 (4%)	29 (27%)
1-3	251 (23%)	10 (17%)	5 (14%)	11 (22%)	17 (31%)	24 (19%)	11 (31%)	7 (17%)	3 (10%)	29 (19%)	20 (27%)	73 (21%)	41 (38%)
>3-5	277 (25%)	12 (21%)	10 (27%)	2 (4%)	17 (31%)	61 (49%)	3 (8%)	10 (24%)	9 (29%)	43 (28%)	13 (17%)	83 (24%)	14 (13%)
>5	503 (45%)	33 (57%)	22 (59%)	32 (64%)	15 (28%)	35 (28%)	18 (50%)	21 (51%)	18 (58%)	72 (47%)	38 (51%)	175 (51%)	24 (22%)

Supplementary Table S1. Baseline and COVID-19 related characteristics of participants *(continued)*

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Different countries and regions have been addressing the threat of Coronavirus/COVID-19 in different ways. Which of the following best describes the situation in your country/region around the time of your baby's birth?													
	n = 1071	**n = 58**	**n = 33**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 41**	**n = 30**	**n = 151**	**n = 75**	**n = 322**	**n = 107**
No major concern	49 (5%)	0 (0%)	3 (9%)	4 (8%)	14 (27%)	6 (5%)	1 (3%)	2 (5%)	0 (0%)	1 (1%)	1 (1%)	14 (4%)	3 (3%)
Precautions	137 (13%)	6 (10%)	2 (6%)	4 (8%)	30 (58%)	12 (10%)	2 (6%)	5 (12%)	5 (17%)	12 (8%)	5 (7%)	44 (14%)	10 (9%)
Social distancing	325 (30%)	17 (29%)	8 (24%)	14 (29%)	7 (13%)	38 (32%)	9 (26%)	7 (17%)	6 (20%)	48 (32%)	69 (92%)	80 (25%)	22 (21%)
Lockdown	438 (41%)	31 (53%)	16 (48%)	26 (53%)	1 (2%)	16 (14%)	16 (46%)	27 (66%)	18 (60%)	73 (48%)	0 (0%)	147 (46%)	67 (63%)
Quarantine	122 (11%)	4 (7%)	4 (12%)	1 (2%)	0 (0%)	46 (39%)	7 (20%)	0 (0%)	1 (3%)	17 (11%)	0 (0%)	37 (11%)	5 (5%)
Have you tested positive for Coronavirus/COVID-19?													
	n = 1084	**n = 58**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 35**	**n = 41**	**n = 31**	**n = 150**	**n = 75**	**n = 326**	**n = 109**
Yes	27 (2%)	1 (2%)	1 (3%)	0 (0%)	0 (0%)	1 (1%)	1 (3%)	5 (12%)	0 (0%)	1 (1%)	4 (5%)	8 (2%)	5 (5%)
No	1057 (98%)	57 (98%)	34 (97%)	50 (100%)	53 (100%)	120 (99%)	34 (97%)	36 (88%)	31 (100%)	149 (99%)	71 (95%)	318 (98%)	104 (95%)
Has your partner tested positive for Coronavirus/COVID-19?													
	n = 1086	**n = 57**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 36**	**n = 41**	**n = 31**	**n = 152**	**n = 75**	**n = 326**	**n = 109**
Yes	25 (2%)	1 (2%)	2 (6%)	0 (0%)	0 (0%)	1 (1%)	1 (3%)	5 (12%)	0 (0%)	0 (0%)	1 (1%)	8 (2%)	6 (6%)
No	1039 (96%)	56 (98%)	27 (77%)	50 (100%)	53 (100%)	117 (97%)	35 (97%)	36 (88%)	31 (100%)	147 (97%)	74 (99%)	312 (96%)	101 (93%)
Don't know	22 (2%)	0 (0%)	6 (17%)	0 (0%)	0 (0%)	3 (2%)	0 (0%)	0 (0%)	0 (0%)	5 (3%)	0 (0%)	6 (2%)	2 (2%)
Has your baby tested positive for Coronavirus/COVID-19?													
	n = 1087	**n = 58**	**n = 35**	**n = 50**	**n = 53**	**n = 121**	**n = 36**	**n = 41**	**n = 31**	**n = 152**	**n = 75**	**n = 326**	**n = 109**
Yes	5 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	1 (1%)
No	1035 (95%)	57 (98%)	31 (89%)	50 (100%)	50 (94%)	113 (93%)	35 (97%)	39 (95%)	31 (100%)	145 (95%)	74 (99%)	303 (93%)	107 (98%)
Don't know	47 (4%)	0 (0%)	4 (11%)	0 (0%)	3 (6%)	8 (7%)	0 (0%)	1 (2%)	0 (0%)	7 (5%)	1 (1%)	22 (7%)	1 (1%)

Supplementary Table S2. Country demographics and COVID-19 related characteristics

Country	**GDP per capita** [1]	**Preterm birth rate (%)** [2]	**Female educational attainment at least completed upper secondary (%) (cumulative)** [3]	**Maternal mortality per 100,000 live births** [4]	**Under-5 mortality rate per 1,000 live births** [5]	**% of population using safely managed sanitation services** [6]	**Cumulative COVID-19 cases per 1 million population as of 29 November 2020** [7]	**Average government response stringency index between 1 August and 29 November 2020** [8]
Australia	51,812.2	8.6	79.1 (2020)	6	4	74	1,094	66.21
Brazil	6,796.8	11.18	49.5 (2018)	60	14	49	29,349	65.28
Canada	43,258.2	8.15	84.9 (2016)	10	5	84	9,514	68.98
China	10,500.4	6.94	19.2 (2010)	29	8	70	63	80.09
France	39,030.4	8.42	70.0 (2019)	8	5	79	33,242	60.65
Italy	31,676.2	7.79	51.8 (2020)	2	3	96	25,876	73.61
Mexico	8,346.7	7.04	37.7 (2020)	33	14	57	8,459	71.30
New Zealand	41,477.9	7.47	74.6 (2020)	9	5	82	352	22.22
Poland	15,656.2	7.25	85.9 (2020)	2	4	91	25,725	57.41
Sweden	52,259.3	6.31	77.2 (2019)	4	3	95	24,074	62.04
Turkey	8,538.2	12.41	36.0 (2019)	17	10	78	5,785	54.40
Ukraine	3,726.9	8.72	71.1 (2001)	19	8	72	16,525	55.09

Note: Average government response stringency index is a score from 0 (no restrictions) to 100 (maximal restrictions) related to the severity of restrictions in the country [8]

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Supplementary Table S3. Prenatal care and birth

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
How was the timing of pregnancy-related appointments affected, if at all, by Coronavirus/Covid-19?													
	n = 1045	**n = 56**	**n = 33**	**n = 48**	**n = 51**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 147**	**n = 75**	**n = 308**	**n = 105**
It was done as usual	117 (11%)	7 (13%)	3 (9%)	7 (15%)	1 (2%)	8 (7%)	4 (11%)	4 (11%)	2 (6%)	12 (8%)	24 (32%)	40 (13%)	5 (5%)
No appointments took place	510 (49%)	23 (41%)	21 (64%)	22 (46%)	49 (96%)	70 (59%)	20 (57%)	10 (26%)	3 (10%)	75 (51%)	30 (40%)	147 (48%)	40 (38%)
Fewer appointments took place	47 (4%)	0 (0%)	2 (6%)	1 (2%)	0 (0%)	10 (8%)	1 (3%)	4 (11%)	2 (6%)	9 (6%)	3 (4%)	8 (3%)	7 (7%)
Other	371 (36%)	26 (46%)	7 (21%)	18 (38%)	1 (2%)	30 (25%)	10 (29%)	20 (53%)	24 (77%)	51 (35%)	18 (24%)	113 (37%)	53 (50%)
If you were permitted to have another person present with you during birth, for how long was this person permitted to stay with you?													
	n = 481	**n = 51**	**n = 24**	**n = 44**	**n = 20**	**n = 85**	**n = 18**	**n = 6**	**n = 29**	**n = 14**	**n = 71**	**n = 96**	**n = 23**
For the entire labour	367 (76%)	46 (90%)	23 (96%)	38 (86%)	17 (85%)	67 (79%)	7 (39%)	1 (17%)	25 (86%)	9 (64%)	59 (83%)	60 (63%)	15 (65%)
For a part of it	114 (24%)	5 (10%)	1 (4%)	6 (14%)	3 (15%)	18 (21%)	11 (61%)	5 (83%)	4 (14%)	5 (36%)	12 (17%)	36 (38%)	8 (35%)

Supplementary Table S4. Presence with the newborn

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Were you permitted to touch your baby in the incubator or bed?													
	n = 1047	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 147**	**n = 75**	**n = 308**	**n = 105**
Yes	754 (72%)	55 (98%)	33 (100%)	49 (100%)	4 (8%)	116 (98%)	32 (91%)	31 (82%)	31 (100%)	119 (81%)	74 (99%)	124 (40%)	86 (82%)
No	293 (28%)	1 (2%)	0 (0%)	0 (0%)	48 (92%)	2 (2%)	3 (9%)	7 (18%)	0 (0%)	28 (19%)	1 (1%)	184 (60%)	19 (18%)
How often were you permitted to touch your baby in the incubator or bed?													
	n = 1046	**n = 56**	**n = 34**	**n = 49**	**n = 52**	**n = 118**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 74**	**n = 308**	**n = 105**
As often as I wanted	491 (47%)	46 (82%)	29 (85%)	42 (86%)	0 (0%)	110 (93%)	20 (57%)	5 (13%)	31 (100%)	54 (37%)	72 (97%)	20 (6%)	62 (59%)
At least once per day	174 (17%)	9 (16%)	5 (15%)	7 (14%)	2 (4%)	6 (5%)	11 (31%)	20 (53%)	0 (0%)	33 (23%)	2 (3%)	57 (19%)	22 (21%)
At least once per week	43 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (8%)	0 (0%)	15 (10%)	0 (0%)	24 (8%)	0 (0%)
Less than once per week	73 (7%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)	0 (0%)	2 (6%)	3 (8%)	0 (0%)	22 (15%)	0 (0%)	37 (12%)	7 (7%)
Not so far	265 (25%)	0 (0%)	0 (0%)	0 (0%)	48 (92%)	2 (2%)	2 (6%)	7 (18%)	0 (0%)	22 (15%)	0 (0%)	170 (55%)	14 (13%)
Were sleeping facilities provided so you could stay with the baby (24/7)?													
	n = 984	**n = 55**	**n = 33**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 129**	**n = 74**	**n = 286**	**n = 96**
Yes, sleeping facilities were provided next to my baby in the unit	179 (18%)	5 (9%)	4 (12%)	15 (31%)	5 (10%)	49 (45%)	4 (12%)	0 (0%)	1 (3%)	18 (14%)	41 (55%)	11 (4%)	26 (27%)
Yes, sleeping facilities were provided outside the unit (e.g. in an apartment house nearby, in another unit)	125 (13%)	5 (9%)	0 (0%)	6 (13%)	2 (4%)	8 (7%)	9 (26%)	0 (0%)	4 (13%)	18 (14%)	30 (41%)	11 (4%)	32 (33%)
No, sleeping facilities were not provided	680 (69%)	45 (82%)	29 (88%)	27 (56%)	44 (86%)	53 (48%)	21 (62%)	37 (100%)	26 (84%)	93 (72%)	3 (4%)	264 (92%)	38 (40%)
Which alternatives to being present were provided with your baby receiving special/intensive care? (multiple answers possible)													
	n = 982	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 109**	**n = 34**	**n = 37**	**n = 29**	**n = 130**	**n = 72**	**n = 287**	**n = 96**
Sum of multiple answers	**1122 (114%)**	**57 (104%)**	**39 (115%)**	**63 (131%)**	**59 (116%)**	**123 (113%)**	**35 (103%)**	**38 (103%)**	**30 (103%)**	**155 (119%)**	**100 (139%)**	**318 (111%)**	**105 (109%)**
Photos	309 (32%)	6 (11%)	12 (35%)	12 (25%)	14 (27%)	28 (26%)	10 (29%)	5 (14%)	4 (14%)	69 (53%)	22 (31%)	114 (40%)	13 (14%)
Livestream	42 (4%)	6 (11%)	1 (3%)	5 (10%)	4 (8%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	16 (12%)	6 (8%)	0 (0%)	2 (2%)
Recorded video	74 (8%)	0 (0%)	2 (6%)	6 (13%)	3 (6%)	3 (3%)	1 (3%)	0 (0%)	0 (0%)	16 (12%)	12 (17%)	24 (8%)	7 (7%)
Video calls	52 (5%)	2 (4%)	2 (6%)	9 (19%)	1 (2%)	6 (6%)	1 (3%)	1 (3%)	5 (17%)	5 (4%)	14 (19%)	5 (2%)	1 (1%)
None	542 (55%)	39 (71%)	19 (56%)	23 (48%)	26 (51%)	64 (59%)	20 (59%)	29 (78%)	20 (69%)	35 (27%)	30 (42%)	159 (55%)	78 (81%)
Other	103 (11%)	4 (7%)	3 (9%)	8 (17%)	11 (22%)	21 (19%)	3 (9%)	2 (5%)	1 (3%)	14 (11%)	16 (22%)	16 (6%)	4 (4%)

Supplementary Table S5. 95% confidence interval of questions related to presence with the newborn and skin-to-skin care

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you know if the Coronavirus/COVID-19 situation affected the facility policy around your ability to be present with the baby receiving special/intensive care?													
	n = 991	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 73**	**n = 288**	**n = 96**
Restrictions were implemented	0.80; 0.85	0.69; 0.91	0.77; 0.99	0.81; 0.98	0.57; 0.82	0.79; 0.92	0.66; 0.93	0.83; 1.01	0.67; 0.95	0.84; 0.95	0.49; 0.71	0.79; 0.88	0.75; 0.90
Could more than one person be present with the baby at the same time?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 130**	**n = 74**	**n = 288**	**n = 96**
Yes	0.30; 0.36	0.43; 0.69	0.12; 0.41	0.27; 0.55	0.38; 0.66	0.55; 0.73	-0.02; 0.14	-0.02; 0.13	0.34; 0.69	0.01; 0.07	0.75; 0.92	0.18; 0.28	0.09; 0.24
How long were you allowed to see your baby per visit?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 109**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 73**	**n = 288**	**n = 96**
Not at all	0.18; 0.23	n.a.	-0.03; 0.09	n.a.	0.77; 0.96	-0.01; 0.03	-0.02; 0.14	0.01; 0.21	n.a.	0.18; 0.33	-0.01; 0.04	0.28; 0.39	0.08; 0.22
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be present with your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 48**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 288**	**n = 96**
Yes	0.71; 0.76	0.47; 0.73	0.36; 0.70	0.65; 0.89	0.65; 0.88	0.46; 0.65	0.39; 0.73	0.87; 1.02	0.48; 0.81	0.79; 0.91	0.1; 0.28	0.88; 0.95	0.7; 0.86
Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be interactive with your baby (e.g. skin-to-skin contact or being involved in the care of your baby)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 132**	**n = 74**	**n = 286**	**n = 96**
Yes	0.61; 0.67	0.12; 0.35	0.27; 0.61	0.41; 0.69	0.63; 0.86	0.28; 0.46	0.45; 0.78	0.92; 1.03	0.13; 0.45	0.74; 0.87	0.05; 0.20	0.90; 0.96	0.45; 0.65
When was skin-to-skin contact with your baby and one of the parents initiated (e.g. holding the baby on the chest, kangaroo mother care)?													
	n = 1044	**n = 56**	**n = 33**	**n = 49**	**n = 52**	**n = 117**	**n = 35**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
Not during the time in the hospital if discharged	0.21; 0.26	n.a.	-0.03; 0.09	n.a.	-0.01; 0.09	-0.01; 0.03	0.07; 0.33	0.31; 0.63	n.a.	0.25; 0.40	n.a.	0.43; 0.55	0.08; 0.22
How often were you permitted to have skin-to-skin contact (kangaroo mother care) with your baby?													
	n = 1043	**n = 56**	**n = 32**	**n = 49**	**n = 52**	**n = 118**	**n = 34**	**n = 38**	**n = 31**	**n = 146**	**n = 75**	**n = 308**	**n = 104**
As often as I wanted	0.26; 0.32	0.20; 0.44	0.27; 0.61	0.37; 0.65	n.a.	0.77; 0.91	0.09; 0.38	n.a.	0.34; 0.69	0.04; 0.13	0.76; 0.92	0.01; 0.06	0.25; 0.44
Did medical/nursing staff involve you in the care of your baby (e.g. nappy changing, feeding, temperature taking)?													
	n = 989	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 287**	**n = 96**
No, not at all	0.34; 0.40	-0.02; 0.05	0.12; 0.41	n.a.	0.67; 0.90	-0.01; 0.03	-0.02; 0.14	0.38; 0.70	n.a.	0.32; 0.49	n.a.	0.68; 0.79	0.19; 0.37
Did medical/nursing staff involve your partner in the care of your baby?													
	n = 990	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 37**	**n = 31**	**n = 131**	**n = 74**	**n = 288**	**n = 96**
No, not at all	0.54; 0.60	-0.02; 0.05	0.39; 0.73	0.03; 0.21	0.65; 0.88	0.01; 0.10	0.05; 0.30	0.49; 0.80	0.03; 0.29	0.81; 0.93	0.00; 0.09	0.88; 0.95	0.77; 0.92

Supplementary Table S6. Information on breastfeeding/nutrition

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Was initiation of breastfeeding encouraged by medical/nursing staff?													
	n = 1024	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 140**	**n = 75**	**n = 299**	**n = 103**
Yes, highly encouraged	515 (50%)	48 (87%)	23 (68%)	30 (61%)	50 (98%)	78 (68%)	13 (38%)	20 (53%)	23 (74%)	52 (37%)	35 (47%)	95 (32%)	48 (47%)
Yes, somewhat encouraged	265 (26%)	5 (9%)	6 (18%)	12 (24%)	0 (0%)	24 (21%)	9 (26%)	15 (39%)	5 (16%)	41 (29%)	31 (41%)	82 (27%)	35 (34%)
No, not encouraged at all	189 (18%)	1 (2%)	4 (12%)	5 (10%)	0 (0%)	10 (9%)	11 (32%)	3 (8%)	0 (0%)	39 (28%)	9 (12%)	89 (30%)	18 (17%)
Don't know	55 (5%)	1 (2%)	1 (3%)	2 (4%)	1 (2%)	3 (3%)	1 (3%)	0 (0%)	3 (10%)	8 (6%)	0 (0%)	33 (11%)	2 (2%)
Was your baby breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth?													
	n = 1023	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 114**	**n = 34**	**n = 38**	**n = 30**	**n = 141**	**n = 75**	**n = 299**	**n = 103**
Yes, exclusively	506 (49%)	38 (69%)	14 (41%)	25 (51%)	31 (61%)	53 (46%)	15 (44%)	9 (24%)	22 (73%)	67 (48%)	24 (32%)	178 (60%)	30 (29%)
Yes, partly	436 (43%)	16 (29%)	17 (50%)	22 (45%)	18 (35%)	46 (40%)	16 (47%)	24 (63%)	7 (23%)	54 (38%)	45 (60%)	116 (39%)	55 (53%)
No, not at all	76 (7%)	1 (2%)	3 (9%)	1 (2%)	2 (4%)	14 (12%)	3 (9%)	5 (13%)	1 (3%)	18 (13%)	6 (8%)	4 (1%)	18 (17%)
Don't know	5 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)	0 (0%)	1 (0%)	0 (0%)
When did the initiation of breastfeeding or provision of mother's own pumped/expressed breastmilk take place?													
	n = 1026	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 75**	**n = 300**	**n = 103**
Not applicable; baby was not breastfed	56 (5%)	1 (2%)	2 (6%)	0 (0%)	2 (4%)	12 (10%)	2 (6%)	4 (11%)	0 (0%)	19 (13%)	3 (4%)	1 (0%)	10 (10%)
On the first day	348 (34%)	29 (53%)	5 (15%)	28 (57%)	8 (16%)	60 (52%)	10 (29%)	1 (3%)	17 (55%)	39 (28%)	23 (31%)	112 (37%)	16 (16%)
After the first day but during the first week	409 (40%)	21 (38%)	18 (53%)	18 (37%)	34 (67%)	10 (9%)	14 (41%)	13 (34%)	9 (29%)	64 (45%)	41 (55%)	125 (42%)	42 (41%)
After the first week	172 (17%)	4 (7%)	9 (26%)	2 (4%)	4 (8%)	26 (23%)	7 (21%)	19 (50%)	4 (13%)	13 (9%)	7 (9%)	45 (15%)	32 (31%)
Don't know	41 (4%)	0 (0%)	0 (0%)	1 (2%)	3 (6%)	7 (6%)	1 (3%)	1 (3%)	1 (3%)	6 (4%)	1 (1%)	17 (6%)	3 (3%)
Were you allowed to bring expressed milk from home to the unit?													
	n = 1024	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 74**	**n = 299**	**n = 103**
Not applicable; baby was not breastfed	41 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	12 (10%)	1 (3%)	2 (5%)	1 (3%)	7 (5%)	4 (5%)	3 (1%)	10 (10%)
Yes	782 (76%)	52 (95%)	8 (24%)	46 (94%)	51 (100%)	79 (69%)	30 (88%)	26 (68%)	25 (81%)	99 (70%)	46 (62%)	282 (94%)	38 (37%)
No, the milk had to be expressed at the hospital	121 (12%)	1 (2%)	24 (71%)	1 (2%)	0 (0%)	16 (14%)	3 (9%)	8 (21%)	2 (6%)	11 (8%)	15 (20%)	7 (2%)	33 (32%)
No, other	80 (8%)	1 (2%)	2 (6%)	2 (4%)	0 (0%)	8 (7%)	0 (0%)	2 (5%)	3 (10%)	24 (17%)	9 (12%)	7 (2%)	22 (21%)
How was your baby fed? (multiple answers possible)													
	n = 1027	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 115**	**n = 34**	**n = 38**	**n = 31**	**n = 141**	**n = 75**	**n = 300**	**n = 103**
Sum of multiple answers	**1505 (147%)**	**83 (151%)**	**57 (168%)**	**91 (186%)**	**79 (152%)**	**192 (167%)**	**57 (168%)**	**59 (155%)**	**39 (126%)**	**214 (152%)**	**122 (163%)**	**366 (122%)**	**146 (142%)**
With breastmilk (breastfeeding or pumped milk)	912 (89%)	54 (98%)	30 (88%)	48 (98%)	50 (96%)	97 (84%)	30 (88%)	32 (84%)	30 (97%)	123 (87%)	60 (80%)	286 (95%)	72 (70%)
With donor milk	229 (22%)	14 (25%)	6 (18%)	29 (59%)	14 (27%)	51 (44%)	11 (32%)	2 (5%)	4 (13%)	38 (27%)	44 (59%)	4 (1%)	12 (12%)
With formula milk	352 (34%)	15 (27%)	20 (59%)	14 (29%)	15 (29%)	44 (38%)	15 (44%)	25 (66%)	5 (16%)	53 (38%)	18 (24%)	68 (23%)	60 (58%)
Don't know	12 (1%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (3%)	2 (2%)

Supplementary Table S7. Information on health communication

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you feel you received or are receiving adequate general health information about your baby during the hospital stay?													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 51**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Yes, to a high degree	451 (46%)	36 (65%)	18 (53%)	29 (59%)	20 (39%)	62 (56%)	18 (53%)	13 (37%)	20 (67%)	50 (38%)	57 (77%)	96 (34%)	32 (34%)
Yes, to some degree	424 (43%)	15 (27%)	14 (41%)	18 (37%)	23 (45%)	37 (34%)	15 (44%)	16 (46%)	9 (30%)	60 (45%)	14 (19%)	156 (55%)	47 (49%)
No, not at all	83 (8%)	4 (7%)	1 (3%)	2 (4%)	2 (4%)	9 (8%)	1 (3%)	5 (14%)	1 (3%)	21 (16%)	3 (4%)	24 (8%)	10 (11%)
Don't know	9 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (1%)	4 (4%)
I didn't receive any information	15 (2%)	0 (0%)	1 (3%)	0 (0%)	5 (10%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	1 (1%)	0 (0%)	4 (1%)	2 (2%)
How did you receive health information about your baby during the time your baby received or is receiving special/intensive care? (multiple answers possible)													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 282**	**n = 95**
Sum of multiple answers	**1392 (142%)**	**96 (175%)**	**40 (118%)**	**96 (196%)**	**78 (150%)**	**166 (151%)**	**47 (138%)**	**40 (114%)**	**54 (180%)**	**180 (136%)**	**111 (150%)**	**359 (127%)**	**125 (132%)**
Meetings with medical/nursing staff (face to face)	743 (76%)	50 (91%)	34 (100%)	46 (94%)	24 (46%)	96 (87%)	31 (91%)	28 (80%)	28 (93%)	79 (60%)	74 (100%)	164 (58%)	89 (94%)
Meetings with medical/nursing staff (video conference)	28 (3%)	2 (4%)	0 (0%)	8 (16%)	2 (4%)	4 (4%)	1 (3%)	0 (0%)	2 (7%)	1 (1%)	4 (5%)	4 (1%)	0 (0%)
Phone calls	491 (50%)	28 (51%)	5 (15%)	28 (57%)	48 (92%)	51 (46%)	8 (24%)	7 (20%)	11 (37%)	88 (67%)	12 (16%)	178 (63%)	27 (28%)
E-Mails	8 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)	0 (0%)	0 (0%)	4 (3%)	0 (0%)	1 (0%)	1 (1%)
Letters	2 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Information material (e.g. brochure, website)	84 (9%)	13 (24%)	0 (0%)	11 (22%)	3 (6%)	9 (8%)	3 (9%)	2 (6%)	10 (33%)	5 (4%)	21 (28%)	2 (1%)	5 (5%)
I didn't receive information	10 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	2 (6%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	4 (1%)	2 (2%)
Other	26 (3%)	3 (5%)	1 (3%)	3 (6%)	1 (2%)	3 (3%)	2 (6%)	3 (9%)	1 (3%)	2 (2%)	0 (0%)	6 (2%)	1 (1%)
How often did you receive information about your baby during the time your baby received or is receiving special/intensive care?													
	n = 983	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Multiple times per day	261 (27%)	30 (55%)	5 (15%)	23 (47%)	1 (2%)	59 (54%)	9 (26%)	5 (14%)	15 (50%)	22 (17%)	42 (57%)	28 (10%)	22 (23%)
Once per day	494 (50%)	19 (35%)	27 (79%)	21 (43%)	2 (4%)	40 (36%)	15 (44%)	27 (77%)	10 (33%)	72 (55%)	22 (30%)	176 (62%)	63 (66%)
Multiple times per week	168 (17%)	4 (7%)	2 (6%)	2 (4%)	32 (62%)	6 (5%)	7 (21%)	2 (6%)	3 (10%)	34 (26%)	9 (12%)	59 (21%)	8 (8%)
Once per week	33 (3%)	1 (2%)	0 (0%)	0 (0%)	9 (17%)	2 (2%)	2 (6%)	0 (0%)	1 (3%)	2 (2%)	0 (0%)	15 (5%)	1 (1%)
Less than once per week	13 (1%)	1 (2%)	0 (0%)	1 (2%)	3 (6%)	2 (2%)	1 (3%)	1 (3%)	0 (0%)	1 (1%)	0 (0%)	2 (1%)	1 (1%)
Never	8 (1%)	0 (0%)	0 (0%)	1 (2%)	2 (4%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	1 (1%)	2 (1%)	0 (0%)
Don't know	6 (1%)	0 (0%)	0 (0%)	1 (2%)	3 (6%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)

Supplementary Table S7. Information on health communication *(continued)*

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Do you feel you received or are receiving adequate information about how to protect yourself and your baby from Coronavirus/COVID-19 transmission while your baby received or is receiving special/intensive care?													
	n = 983	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 283**	**n = 95**
Yes, to a high degree	321 (33%)	22 (40%)	12 (35%)	13 (27%)	26 (50%)	43 (39%)	21 (62%)	12 (34%)	11 (37%)	30 (23%)	31 (42%)	73 (26%)	27 (28%)
Yes, to some degree	334 (34%)	23 (42%)	14 (41%)	22 (45%)	15 (29%)	38 (35%)	8 (24%)	15 (43%)	12 (40%)	37 (28%)	23 (31%)	92 (33%)	35 (37%)
No, not at all	187 (19%)	3 (5%)	4 (12%)	11 (22%)	2 (4%)	18 (16%)	3 (9%)	5 (14%)	3 (10%)	29 (22%)	14 (19%)	80 (28%)	15 (16%)
Don't know	49 (5%)	2 (4%)	0 (0%)	1 (2%)	5 (10%)	2 (2%)	1 (3%)	2 (6%)	0 (0%)	15 (11%)	5 (7%)	9 (3%)	7 (7%)
I didn't receive any information	92 (9%)	5 (9%)	4 (12%)	2 (4%)	4 (8%)	9 (8%)	1 (3%)	1 (3%)	4 (13%)	21 (16%)	1 (1%)	29 (10%)	11 (12%)
Do you feel you received adequate information about Coronavirus/COVID-19 when discharged from the hospital?													
	n = 982	**n = 55**	**n = 34**	**n = 49**	**n = 52**	**n = 110**	**n = 34**	**n = 35**	**n = 30**	**n = 132**	**n = 74**	**n = 282**	**n = 95**
Yes, to a high degree	204 (21%)	14 (25%)	6 (18%)	5 (10%)	20 (38%)	29 (26%)	14 (41%)	6 (17%)	2 (7%)	22 (17%)	18 (24%)	51 (18%)	17 (18%)
Yes, to some degree	224 (23%)	16 (29%)	14 (41%)	19 (39%)	15 (29%)	21 (19%)	10 (29%)	9 (26%)	8 (27%)	15 (11%)	16 (22%)	62 (22%)	19 (20%)
No, not at all	217 (22%)	7 (13%)	5 (15%)	12 (24%)	1 (2%)	29 (26%)	6 (18%)	10 (29%)	7 (23%)	20 (15%)	20 (27%)	77 (27%)	23 (24%)
Don't know	35 (4%)	1 (2%)	0 (0%)	0 (0%)	3 (6%)	3 (3%)	0 (0%)	2 (6%)	0 (0%)	8 (6%)	2 (3%)	8 (3%)	8 (8%)
I didn't receive any information	157 (16%)	10 (18%)	4 (12%)	6 (12%)	2 (4%)	15 (14%)	2 (6%)	4 (11%)	5 (17%)	50 (38%)	8 (11%)	34 (12%)	17 (18%)
No discharge yet	145 (15%)	7 (13%)	5 (15%)	7 (14%)	11 (21%)	13 (12%)	2 (6%)	4 (11%)	8 (27%)	17 (13%)	10 (14%)	50 (18%)	11 (12%)

Supplementary Table S8. Information on mental health status

	Total	Australia	Brazil	Canada	China	France	Italy	Mexico	New Zealand	Poland	Sweden	Turkey	Ukraine
Did you worry because of the Coronavirus/COVID-19 situation during pregnancy?													
	n = 966	**n = 55**	**n = 33**	**n = 48**	**n = 50**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 132**	**n = 71**	**n = 278**	**n = 94**
Yes, to a high degree	459 (48%)	25 (45%)	17 (52%)	20 (42%)	9 (18%)	35 (33%)	13 (38%)	24 (71%)	11 (37%)	66 (50%)	25 (35%)	157 (56%)	57 (61%)
Yes, to some degree	304 (31%)	19 (35%)	7 (21%)	19 (40%)	17 (34%)	44 (41%)	17 (50%)	6 (18%)	15 (50%)	39 (30%)	27 (38%)	66 (24%)	28 (30%)
No, not at all	100 (10%)	5 (9%)	0 (0%)	5 (10%)	20 (40%)	11 (10%)	1 (3%)	1 (3%)	3 (10%)	11 (8%)	14 (20%)	23 (8%)	6 (6%)
Don't know	12 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3%)	1 (3%)	0 (0%)	0 (0%)	5 (4%)	0 (0%)	3 (1%)	0 (0%)
Coronavirus/ COVID-19 was not an issue then	91 (9%)	6 (11%)	9 (27%)	4 (8%)	4 (8%)	14 (13%)	2 (6%)	3 (9%)	1 (3%)	11 (8%)	5 (7%)	29 (10%)	3 (3%)
Did (or do) you struggle to be present with your baby who received or is receiving special care due to other obligations you have (e.g. for other children, family member/s)?													
	n = 966	**n = 55**	**n = 33**	**n = 48**	**n = 51**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 131**	**n = 72**	**n = 278**	**n = 93**
Yes, to a high degree	207 (21%)	13 (24%)	5 (15%)	12 (25%)	7 (14%)	16 (15%)	2 (6%)	13 (38%)	4 (13%)	21 (16%)	24 (33%)	70 (25%)	20 (22%)
Yes, to some degree	261 (27%)	12 (22%)	8 (24%)	15 (31%)	12 (24%)	28 (26%)	7 (21%)	7 (21%)	12 (40%)	22 (17%)	27 (38%)	81 (29%)	30 (32%)
No, not at all	440 (46%)	30 (55%)	20 (61%)	21 (44%)	27 (53%)	62 (58%)	25 (74%)	13 (38%)	14 (47%)	66 (50%)	19 (26%)	108 (39%)	35 (38%)
Don't know	58 (6%)	0 (0%)	0 (0%)	0 (0%)	5 (10%)	1 (1%)	0 (0%)	1 (3%)	0 (0%)	22 (17%)	2 (3%)	19 (7%)	8 (9%)
What kind of support was offered? (multiple answers possible)													
	n = 967	**n = 55**	**n = 32**	**n = 48**	**n = 51**	**n = 107**	**n = 34**	**n = 34**	**n = 30**	**n = 132**	**n = 72**	**n = 278**	**n = 94**
Sum of multiple answers	**1239 (128%)**	**94 (171%)**	**36 (113%)**	**80 (167%)**	**84 (165%)**	**150 (140%)**	**41 (121%)**	**38 (112%)**	**41 (137%)**	**149 (113%)**	**97 (135%)**	**313 (113%)**	**116 (123%)**
Psychological counselling	280 (29%)	18 (33%)	11 (34%)	10 (21%)	9 (18%)	87 (81%)	15 (44%)	5 (15%)	6 (20%)	46 (35%)	29 (40%)	26 (9%)	18 (19%)
Self-help groups	30 (3%)	2 (4%)	0 (0%)	4 (8%)	3 (6%)	3 (3%)	2 (6%)	1 (3%)	1 (3%)	4 (3%)	1 (1%)	7 (3%)	2 (2%)
Parent groups	133 (14%)	18 (33%)	2 (6%)	15 (31%)	26 (51%)	8 (7%)	3 (9%)	2 (6%)	5 (17%)	12 (9%)	5 (7%)	17 (6%)	20 (21%)
Peer-to-peer support	101 (10%)	4 (7%)	0 (0%)	9 (19%)	23 (45%)	0 (0%)	2 (6%)	2 (6%)	3 (10%)	11 (8%)	1 (1%)	30 (11%)	16 (17%)
Social worker	182 (19%)	42 (76%)	2 (6%)	27 (56%)	7 (14%)	33 (31%)	1 (3%)	5 (15%)	16 (53%)	0 (0%)	44 (61%)	4 (1%)	1 (1%)
None	462 (48%)	9 (16%)	21 (66%)	11 (23%)	9 (18%)	13 (12%)	17 (50%)	21 (62%)	8 (27%)	72 (55%)	11 (15%)	213 (77%)	57 (61%)
Don't know	33 (3%)	1 (2%)	0 (0%)	1 (2%)	6 (12%)	2 (2%)	0 (0%)	2 (6%)	1 (3%)	3 (2%)	2 (3%)	14 (5%)	1 (1%)
Other	18 (2%)	0 (0%)	0 (0%)	3 (6%)	1 (2%)	4 (4%)	1 (3%)	0 (0%)	1 (3%)	1 (1%)	4 (6%)	2 (1%)	1 (1%)

Supplementary Material S9. Survey

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

The Coronavirus/COVID-19 pandemic creates exceptional challenges, especially for the care of the most vulnerable groups of patients – such as sick and preterm born children. With this survey, we aim to explore parents' experiences related to these challenges as they play a crucial role in the care of their babies – not only at home but also in the hospital setting.

We therefore kindly ask you as parents of sick and preterm infants who were born during this Coronavirus/COVID-19 pandemic to participate in this survey. Please be aware that some of the questions might cause distressing reactions considering your personal situation and experience. You may of course stop your participation at any time. Completing the survey will take approx. 15 minutes.

Ethics and data use: EFCNI handles your data lawfully and confidentially, in accordance with the General Data Protection Regulation (GDPR). No person-related data will be stored or published. Your data will be evaluated anonymously, it will not be stored or passed on to third parties and will not be used for any other purpose than the one mentioned above. Surveymonkey, the tool used for this survey, grants compliance with the GDPR and the Privacy Shield. In accordance with the GDPR, you have the right to information, the right to delete your data and can withdraw this declaration of consent at any time. The Ethics Committee of Maastricht UMC+ officially waived the need for ethics approval.

This survey is carried out by the Scientific Affairs Department of the European Foundation for the Care of Newborn Infants (EFCNI) (www.efcni.org) in collaboration with representatives of parent organisations, COINN (Council of International Neonatal Nurses), ESPR (European Society for Paediatric Research), NIDCAP (Newborn Individualized Developmental Care and Assessment Program), and UENPS (Union of European Neonatal & Perinatal Societies).

If you have any questions, comments or concerns regarding the study please contact: research@efcni.org

Thank you for your participation and support!

European Foundation for the Care of Newborn Infants (EFCNI)
and Global Alliance for Newborn Care (GLANCE)

* 1. I confirm to have read and understood the information provided above and consent to the use of my de-identified data.

- ○ Agree and continue
- ○ Do not agree and end survey

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Background information

* 2. How are you related to the newborn baby?

- ○ Mother
- ○ Father
- ○ Other
- ○ Other parent (please specify)

* 3. Was your baby born on 1st of Dec 2019 or after?

- ○ Yes
- ○ No

* 4. Did your baby receive special/intensive care after birth (exceeding regular care for healthy babies, e.g. oxygen therapy, incubator, intravenous infusions)?

- ○ Yes
- ○ No

5. Which country do you currently live in?

6. What is your age?

- ○ Younger than 20
- ○ Between 20 and 24
- ○ Between 25 and 29
- ○ Between 30 and 34
- ○ Between 35 and 39
- ○ Between 40 and 44
- ○ Older than 44

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

7. When was your baby born?

Date

Date

DD/MM/YYYY

8. What week of pregnancy was your baby born at (gestational age)?

9. Was this a multiple pregnancy?

- Yes (Please note: when answering the following questions refer to the first-born baby of the pregnancy)
- No

10. How was your baby born?

- Vaginal birth
- C-section
- Both (e.g. in case of multiple pregnancy)

11. What was the birth weight of your baby?

- Under 1000 g (2,2 lbs)
- Between 1000 g (2,2 lbs) and 1500 g (3,3 lbs)
- More than 1500 g (3,3 lbs) and up to 2500 g (5,5 lbs)
- More than 2500 g (5,5 lbs)
- Don't know the birth weight

12. Does your baby still receive special/intensive care today?

- Yes
- No

13. How long did your baby receive special/intensive care (or until today if your baby is still receiving it)?

- Under 1 week
- Between 1 to 3 weeks
- More than 3 and up to 5 weeks
- More than 5 weeks

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Coronavirus/COVID-19

14. Different countries and regions have been addressing the threat of Coronavirus/COVID-19 in different ways. Which of the following best describes the situation in your country/region around the time of your baby's birth?

- ○ There was no major concern about Coronavirus/COVID-19 in the country/region in which I live.
- ○ People were advised to take precautions (e.g. hand washing) but day-to-day life continued as usual.
- ○ Social distancing was strongly encouraged (e.g. keeping a distance, avoiding public gatherings) but no lockdowns were in place.
- ○ Lockdown had been implemented (e.g. advised to stay home except for essential activities; schools, restaurants and non-essential businesses were closed).
- ○ Quarantine was implemented and/or people were fined for leaving their homes without authorization.
- ○ Other (please elaborate):

15. Have you tested positive for Coronavirus/COVID-19?

- ○ Yes
- ○ No
- ○ No, but suspected case (based on symptoms)

16. Has your partner tested positive for Coronavirus/COVID-19?

- ○ Yes
- ○ No
- ○ No, but suspected case (based on symptoms)
- ○ Don't know

17. Has your baby tested positive for Coronavirus/COVID-19?

- ○ Yes
- ○ No
- ○ Don't know

18. Did you have contact with a person who tested positive for Coronavirus/COVID-19 during the 2 weeks prior to your baby's birth?

- Yes
- No
- No, but suspected case (based on symptoms)
- Don't know

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Before and after birth

19. How was the timing of pregnancy-related appointments affected, if at all, by Coronavirus/Covid-19?

- ◯ It was done as usual.
- ◯ No appointments took place.
- ◯ Fewer appointments took place.
- ◯ Other (please explain):

20. Was another person permitted to accompany you to pregnancy-related appointments during the Coronavirus/COVID-19 phase?

- ◯ Yes
- ◯ Not to all appointments
- ◯ No, never
- ◯ Don't know
- ◯ Not applicable (e.g. no appointments took place)

21. Were you permitted to have another person present with you during birth (e.g. partner)?

- ◯ Yes
- ◯ No

22. For how long was this person permitted to stay with you?

- ◯ Not applicable; no other person was permitted to be present
- ◯ For the entire labour
- ◯ For a part of it (please elaborate):

23. When was skin-to-skin contact with your baby and one of the parents initiated (e.g. holding the baby on the chest, kangaroo mother care)?

- Immediately after birth
- On the first day
- After the first day but during the first week
- After the first week
- Not so far (If you are still in the hospital with your baby)
- Not during the time in the hospital (if you are already at home with your baby)

24. How often were you permitted to have skin-to-skin contact (kangaroo mother care) with your baby?

- As often as I wanted
- At least once per day
- At least once per week
- Less than once per week
- Not so far

25. Were you permitted to touch your baby in the incubator or bed?

- Yes
- No

26. How often were you permitted to touch your baby in the incubator or bed?

- As often as I wanted
- At least once per day
- At least once per week
- Less than once per week
- Not so far

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Breastfeeding/nutrition

27. Was initiation of breastfeeding encouraged by medical/nursing staff?

- ○ Yes, highly encouraged
- ○ Yes, somewhat encouraged
- ○ No, not encouraged at all
- ○ Don't know

28. Was your baby breastfed or provided with mother's own pumped/expressed breastmilk in the first weeks after birth?

- ○ Yes, exclusively
- ○ Yes, partly
- ○ No, not at all
- ○ Don't know

29. When did the initiation of breastfeeding or provision of mother's own pumped/expressed breastmilk take place?

- ○ Not applicable; baby was not breastfed
- ○ On the first day
- ○ After the first day but during the first week
- ○ After the first week
- ○ Don't know

30. Were you allowed to bring expressed milk from home to the unit?

- ○ Not applicable; baby was not breastfed
- ○ Yes
- ○ No, the milk had to be expressed at the hospital
- ○ No, other

31. How was your baby fed? *(multiple answers possible)*

- ☐ With breastmilk (breastfeeding or pumped milk)
- ☐ With donor milk
- ☐ With formula milk
- ☐ Don't know

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Presence with the baby receiving special/intensive care

32. Do you know if the Coronavirus/COVID-19 situation affected the facility policy around your ability to be present with the baby receiving special/intensive care?

- ◯ There were no changes
- ◯ Restrictions were implemented
- ◯ I don't know if there were changes

33. Who was allowed to be present with your baby receiving special/intensive care? *(multiple answers possible)*

- ☐ Mother
- ☐ Father/partner
- ☐ Sibling/s
- ☐ Other family members
- ☐ Friends
- ☐ No one
- ☐ I don't know

34. Could more than one person be present with the baby at the same time?

- ◯ No
- ◯ Don't know
- ◯ Yes, both parents
- ◯ Yes, other (please explain):

35. How often were you allowed to see your baby receiving special/intensive care?

- ◯ All the time, (24/7)
- ◯ Multiple times per day
- ◯ Once per day
- ◯ Multiple times per week
- ◯ Once per week
- ◯ Less than once per week
- ◯ Never

36. How long were you allowed to see your baby per visit?

- ○ Up to 15 minutes
- ○ More than 15 minutes, up to one hour
- ○ More than one hour, up to three hours
- ○ More than three hours, but not unlimited
- ○ Unlimited
- ○ Not at all

37. Were sleeping facilities provided so you could stay with the baby (24/7)?

- ○ Yes, sleeping facilities were provided next to my baby in the unit
- ○ Yes, sleeping facilities were provided outside the unit (e.g. in an apartment house nearby, in another unit)
- ○ No, sleeping facilities were not provided

38. Which alternatives to being present were provided with your baby receiving special/intensive care? *(multiple answers possible)*

- ☐ Photos
- ☐ Livestream
- ☐ Recorded video
- ☐ Video calls
- ☐ None
- ☐ Other, please specify:

39. Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be **present** with your baby?

- ○ Yes, much more difficult
- ○ Yes, somewhat more difficult
- ○ No, not more difficult
- ○ No, there were no restrictive measures in place
- ○ Don't know

40. Do you feel that the measures that were implemented due to Coronavirus/COVID-19 (e.g. restrictions by hospital management) made it more difficult for you to be **interactive** with your baby (e.g. skin-to-skin contact or being involved in the care of your baby)?

- Yes, much more difficult
- Yes, somewhat more difficult
- No, not more difficult
- No, there were no restrictive measures in place
- Don't know

41. Did medical/nursing staff involve you in the care of your baby (e.g. nappy changing, feeding, temperature taking)?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know

42. Did medical/nursing staff involve your partner in the care of your baby?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- I don't have a partner

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Communication

43. Do you feel you received or are receiving adequate general health information about your baby during the hospital stay?

- ◯ Yes, to a high degree
- ◯ Yes, to some degree
- ◯ No, not at all
- ◯ Don't know
- ◯ I didn't receive any information

44. How did you receive health information about your baby during the time your baby received or is receiving special/intensive care? *(multiple answers possible)*

- ☐ Meetings with medical/nursing staff (face to face)
- ☐ Meetings with medical/nursing staff (video conference)
- ☐ Phone calls
- ☐ E-Mails
- ☐ Letters
- ☐ Information material (e.g. brochure, website)
- ☐ I didn't receive information
- ☐ Other, please specify:

45. How often did you receive information about your baby during the time your baby received or is receiving special/intensive care?

- ◯ Multiple times per day
- ◯ Once per day
- ◯ Multiple times per week
- ◯ Once per week
- ◯ Less than once per week
- ◯ Never
- ◯ Don't know

46. Do you feel you received or are receiving adequate information about how to protect yourself and your baby from Coronavirus/COVID-19 transmission while your baby received or is receiving special/intensive care?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- I didn't receive any information

47. Do you feel you received adequate information about Coronavirus/COVID-19 when discharged from the hospital?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- I didn't receive any information
- No discharge yet

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Mental health and support

48. Did you worry because of the Coronavirus/COVID-19 situation during pregnancy?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- Coronavirus/COVID-19 was not an issue then.

49. Did/do you worry because of the Coronavirus/COVID-19 situation after the birth of your baby?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know

50. Did (or do) you struggle to be present with your baby who received or is receiving special care due to other obligations you have (e.g. for other children, family member/s)?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know

51. Do you feel you were adequately informed about mental health support (e.g. counselling, self-help/parent groups)?

- Yes, to a high degree
- Yes, to some degree
- No, not at all
- Don't know
- There was no mental health support

52. What kind of support was offered? *(multiple answers possible)*

- [ ] Psychological counselling
- [ ] Self-help groups
- [ ] Parent groups
- [ ] Peer-to-peer support
- [ ] Social worker
- [ ] None
- [ ] Don't know
- [ ] Other, please specify:

53. Do you have anything additional to share relating to the impact of Coronavirus/COVID-19 on special/intensive care for babies?

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Thank you very much for your interest in our study. The aim of this survey is to explore parents' experiences related to the challenges caused by the Coronavirus/COVID-19 pandemic regarding the care of sick and preterm born children receiving special/intensive care. In case you have questions or comments feel free to contact us: research@efcni.org

Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective

Thank you very much for your interest and for taking part in our survey "Impact of Coronavirus/COVID-19 on special/intensive care for newborns – a parents' perspective". In case you have any questions or would like to contact us in the future, please send an email to: research@efcni.org.

European Foundation for the Care of Newborn Infants (EFCNI): www.efcni.org

Global Alliance for Newborn Care (GLANCE): www.glance-network.org

STROBE statement - checklist of items that should be included in reports of observational/population/cohort studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	4-5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	5
		(*e*) Describe any sensitivity analyses	n/a

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	6
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	n/a
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	7-12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-12
		(*b*) Report category boundaries when continuous variables were categorized	n/a
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7-12
Discussion			
Key results	18	Summarise key results with reference to study objectives	12-14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.