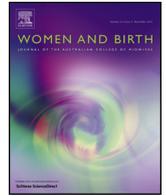




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Clinical guidelines for caring for women with COVID-19 during pregnancy, childbirth and the immediate postpartum period

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ABSTRACT

Background: The spread of the novel coronavirus (COVID-19) was declared a pandemic by the World Health Organization on 11th March 2020. Since then there has been a rapid rise in development of maternal and perinatal health guidelines related to COVID-19. The aim of this project was to develop a database of Australian and international recommendations relating to antenatal, intrapartum and postpartum care of women during the COVID-19 pandemic, in order to identify inconsistencies in clinical guidance.

Methods: We conducted weekly web searches from 30th March to 15th May 2020 to identify recommendations pertaining to the care of women during pregnancy, labour and postpartum period from national or international professional societies, specialist colleges, Ministries of Health, Australian state and territory governments, and international guideline development organisations. Individual recommendations were extracted and classified according to intervention type, time period, and patient population. Findings were reported using descriptive analysis, with areas of consensus and non-consensus identified.

Results: We identified 81 guidelines from 48 different organisations. Generally, there was high consensus across guidelines for specific interventions. However, variable guidance was identified on the use of nitrous oxide during labour, administration of antenatal corticosteroids, neonatal isolation after birth, labour and birth companions, and the use of disease modifying agents for treating COVID-19.

Conclusion: Discrepancies between different guideline development organisations creates challenges for maternity care clinicians during the COVID-19 pandemic. Collating recommendations and keeping up-to-date with the latest guidance can help clinicians provide the best possible care to pregnant women and their babies.

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Statement of significance

Problem or issue

In response to the COVID-19 pandemic, a large number of maternal health guidelines have been rapidly produced. Disagreements between guidelines can create uncertainties for clinicians and health services.

What is already known

COVID-19 was declared a pandemic on 11th March 2020. While there is limited evidence on the effects of COVID-19 on pregnant women and newborns, guideline development organisations have rapidly produced antenatal, intrapartum and postpartum care guidelines to assist clinicians.

What this paper adds

This paper summarises the available maternal healthcare guidelines released since the start of the COVID-19 pandemic and identifies interventions where there is high and low consensus between guideline organisations.

Abbreviations: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; USA, the United States of America; UK, United Kingdom; PPE, personal protective equipment.

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1. Introduction

In December 2019 a pneumonia of unknown cause was detected in Wuhan, China and reported to the World Health Organization [1]. The novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was found to be the causative agent, and the disease subsequently named COVID-19 [2]. The World Health Organization declared the outbreak a pandemic on 11th March 2020. As of 9th July 2020, there have been over 11 million confirmed cases of COVID-19 globally, and over 540,000 deaths [3]. Available data on the effect of COVID-19 on pregnancy, pregnant women, and newborns is limited [4]. Current information suggests pregnant women are not at higher risk of severe illness than the general population [4]. A systematic review identified 33 studies which reported on the outcomes of 385 pregnant women with COVID-19, of whom 368 (95.6%) were considered to have mild disease [5]. Amongst 256 newborns the prevalence of preterm birth was 15.2% and low birth weight was 7.8%. Eight (3.1%) newborns required admission to neonatal intensive care and 3 deaths occurred. The extent to which maternal COVID-19 infection contributed to these perinatal outcomes is unclear.

In the case of COVID-19 – a novel disease where new evidence is emerging daily – up-to-date clinical guidelines are vital in providing clinicians and other stakeholders with recommendations based on the latest available evidence. A considerable volume of guidance relating to care of pregnant women with COVID-19 has been rapidly developed and published. In some instances, clinical recommendations from different organisations are in conflict, which can create confusion for healthcare providers. We aimed to develop a database of national and international guidelines related to the antenatal, intrapartum and postpartum care of women during the COVID-19 pandemic and identify those interventions where there was high and low consensus across recommendations.

2. Methods

2.1. Literature search and eligibility assessment

We developed a study protocol to guide literature searching and data extraction. We aimed to identify and include any guidance that provided clinical recommendations or normative statements related to the clinical care of women during pregnancy, labour, childbirth or the postpartum period in the context of the COVID-19 pandemic. Guidelines of interest were those developed specifically in response to COVID-19, or where the recommendations pertained to changes to routine care in the context of treating COVID-19. We included guidelines produced either at international, national or Australian state or territory levels. Guidelines produced from reputable guideline development organisations such as national or international professional societies or specialty colleges, Governmental departments or Ministries of Health or international agencies were included. Guidelines published prior to 2020 pertaining to other respiratory illnesses or infections were not eligible.

First, we developed a list of relevant guideline development organisations and searched their institutional websites directly. This was supplemented with structured searches for clinical guidelines via the Trip database, using the 'guideline' filter and search terms pregnancy, childbirth, postpartum (and related terms) and COVID-19 [6]. We also contacted international collaborative networks to identify further eligible resources. For the period of 30th March to 15th May 2020, weekly searches of all identified websites and Trip were conducted to identify new guidelines or updates of existing guidelines. On 17th April 2020, we published a list of included guidelines on the Burnet website [7].

Web visitors were invited to suggest additional guidelines or resources for consideration via an online form.

2.2. Data extraction and management

All identified guidelines were initially screened by one reviewer to assess eligibility. For eligible guidelines, each recommendation pertaining to management of pregnancy, labour, childbirth and the immediate postpartum period for women in the context of the COVID-19 pandemic were extracted. Each guideline was reviewed by two independent reviewers. Individual recommendations were extracted and classified them according to intervention type, period (preconception, antenatal, intrapartum, postpartum, all periods, unspecified) and population (e.g. women, healthcare providers or newborns). Recommendations for women and newborns were classified differently depending on whether they were regarding care of the general population, or specifically those with suspected or confirmed COVID-19. Where one recommendation included the use of two (or more) interventions, it was extracted twice (or more) and classified accordingly. Disagreements between reviewers were resolved through discussion or consultation with a third reviewer. If a guideline was updated, we updated the data extraction accordingly, with superseded or outdated recommendations removed from the database.

While standardised guideline quality assessment tools (such as the AGREE II tool) exist, the majority of guidelines identified in our searches were produced rapidly without the customary documentation of the evidence synthesis and guideline development process. This lack of information makes it difficult to properly (and consistently) assess guideline quality. We therefore decided against a formal quality assessment of individual guidelines. For two guidelines that were not in English (French and Italian) we used a combination of colleagues familiar with these languages plus Google Translate to translate relevant recommendations into English for analysis.

2.3. Data analysis

From the data we identified a list of 91 specific interventions, grouped under 18 intervention types, for which at least one recommendation was available. A full list of this interventions can

Box 1. Priority topics.

-
- Provision of maternal health care during the COVID-19 pandemic
 1. Models of care
 2. Policies on visitors and support persons
 3. Antenatal corticosteroids for preterm birth
 4. Mode of birth
 5. Pain management during labour
 6. Cord clamping
 - Essential newborn care for COVID-19 positive mothers
 7. Skin-to-skin
 8. Rooming in
 9. Breastfeeding
 - Managing COVID-19 in pregnant women
 10. Monitoring COVID-19 progression
 11. Antibiotic treatment
 12. Antivirals and other disease modifying agents
 13. Anticoagulants
 14. Prone ventilation
 15. Intubation
-

Table 1
Organisations and guidelines.

	Number of guidelines	Number of recommendations
Australia		
The Royal Australian and New Zealand College of Obstetrics and Gynaecology (RANZCOG)	6	119
Queensland Clinical Guidelines	2	71
New South Wales Health	2	46
Department of Health (Western Australia)	3	254
Australian Capital Territory Health	2	12
South Australia Health	1	15
Australian and New Zealand College of Anaesthetists (ANZCA)	1	6
Victorian Department of Health and Human Services	1	77
Department of Health Tasmania	2	18
Australasian Diabetes in Pregnancy Society (ADIPS), Australian Diabetes Society (ADS), Australian Diabetes Educators Association (ADEA), Diabetes Australia (DA)	1	17
New Zealand		
Ministry of Health New Zealand	5	89
USA		
Centers for Disease Control and Prevention (CDC)	2	23
The American College of Obstetricians and Gynecologists (ACOG)	4	109
Society for Obstetric Anesthesia and Perinatology (SOAP)	1	17
Society for Obstetric Anesthesia and Perinatology (SOAP); Society for Maternal-Fetal Medicine (SMFM)	1	41
Society for Maternal-Fetal Medicine (SMFM)	2	35
Society for Maternal-Fetal Medicine (SMFM), The American College of Obstetricians and Gynecologists (ACOG), American Academy of Family Physicians (AAFP), American College of Nurse-Midwives (ACNM)	1	2
UK		
Royal College of Obstetricians and Gynaecologists (RCOG)	6	227
Obstetric Anaesthetists' Association (OAA)	1	14
Royal College of Paediatrics and Child Health (RCPCH)	1	28
Ireland		
Institute of Obstetricians and Gynaecologists – Royal College of Physicians of Ireland (RCPI)	1	180
Canada		
The Society of Obstetricians and Gynaecologists of Canada (SOGC)	1	26
Canadian Paediatric Society (CPS)	2	9
India		
Federation of Obstetric and Gynaecological Societies of India (FOGSI)	1	70
The Philippines		
Philippine Obstetrical and Gynecological Society (POGS); Philippine Society of Maternal Fetal Medicine (PSMFM)	1	40
Malaysia		
Ministry of Health	1	12
Sri Lanka		
Ministry of Health and Indigenous Medical Services	2	41
Italy		
Società Italiana di Neonatologia (SIN)	1	21
France		
Collège National des Gynécologues et Obstétriciens Français (CNGOF)	1	33
Spain		
Federation of the Societies of Gynaecology and Obstetrics of the Autonomous Communities of Spain	1	45
Belgium		
Taskforce (ScienSano et al.)	1	9
International		
World Health Organization (WHO)	1	19
The International Society of Ultrasound in Obstetrics and Gynecology (ISUOG)	1	43
International Federation of Gynecology and Obstetrics (FIGO)	5	29
United Nations Population Fund (UNFPA)	3	114
Jhpiego	1	16
Inter-Agency Working Group on Reproductive Health in Crises (IAWG)	1	37

Table 1 (Continued)

	Number of guidelines	Number of recommendations
International Planned Parenthood Federation (IPPF)	1	6
Peer-reviewed journals		
Dashraath et al. (Singapore) [83]	1	25
Chen et al. (China) [81]	1	37
Qi et al. (International) [82]	1	24
Chawla et al. (India) [80]	1	44
Baud et al. (International) [85]	1	9
Schmid et al. (International) [84]	1	5
Favre et al. (International) [86]	1	26
McIntosh (USA) [88]	1	7
Capanna et al. (Italy) [87]	1	46
International Federation of Gynecology and Obstetrics & allied partners	1	91

be found on the Burnet website (www.burnet.edu.au/projects/435). This list was reviewed and discussed by the review team, in consultation with three specialists in obstetrics, gynaecology and midwifery, in order to identify a shortlist of priority topics (Box 1). Priority topics were those considered most important from a clinical care perspective and/or where lower consensus was anticipated. We then prepared a detailed table of all recommendations relating to this shortlist of priority topics. A narrative summary of each priority topic was prepared by the review team based on these findings, in order to qualitatively assess the degree of consensus.

3. Results

As of 15th May 2020, 81 unique guidelines pertaining to pregnancy, labour, childbirth and postpartum care from 48 different organisations were identified (Table 1), all of which are publicly available via the Burnet Institute website [7]. Most of these (55/81) were state or national guidelines from Australia (21 guidelines) [8–28], New Zealand (five guidelines) [29–33] the United States of America (USA) (11 guidelines) [34–44], United Kingdom (UK) (eight guidelines) [45–52], Canada (three guidelines) [53–55], Sri Lanka (two guidelines) [56,57], and one guideline from Ireland [58], Belgium [59], Malaysia [60], the Philippines [61], India [62], Italy [63], France [64] and Spain [65]. There were 14 international guidelines from eight different international organisations or societies [66–79] and nine guidelines from peer-reviewed journals [80,81,82,83,84,85,86,87,88]. Guidelines were issued by state or national governments (21 guidelines), national speciality societies (obstetric, anaesthetic, infectious disease or paediatric; 37 guidelines), international societies (eight guidelines) and United Nations organisations (five guidelines). In total, 71 guidelines were published on websites and ten were published in peer-reviewed journals. All guidelines were published between 2nd March and 13th May. In total, 81 guidelines had 2205 recommendations for interventions regarding pregnancy, childbirth and postpartum care (though some recommendations were counted twice, where they pertained to two different interventions). The number of recommendations per guideline ranged from two [42] to 180 [58].

4. Provision of maternal healthcare during the COVID-19 pandemic

4.1. Models of care

There were 239 recommendations from 43 guidelines (originating from 29 organisations) regarding models of care for all

women during the COVID-19 pandemic. These included recommendations pertaining to attending or postponing appointments (63 recommendations), face-to-face visits (57 recommendations), and the use of telehealth (88 recommendations). There was general consensus that face-to-face visits should be minimised in favour of telehealth and home visits where possible. Several guidelines recommended the number of face-to-face visits be reduced, such as by grouping components of care together [4,10,30,31,37,46,49,66,71,75], and both antenatal and postnatal care should be redirected to telehealth or home visits where possible [4,10,16,17,21,23,25,30,31,37,41,45,48,58,61,66,71,75,76].

Additionally, there was consensus that women who are well should attend appointments which require a face-to-face visit and should not be deterred from presenting to hospital if concerned about their pregnancy [23,45,46,48,58,78]. One guideline from Sri Lanka [56] suggested that routine antenatal and postnatal care should only be conducted for specific groups of women and newborns with complications. Some guidelines stated the time taken for these appointments and for physical examination should be limited to minimise the risk of infection transmission [4,17,23–25,30,31,66]. There was general consensus that face-to-face visits should be delayed for women in self-isolation or with respiratory symptoms [13,17,21,23,31,37,45,48,53,58,61,66,74,75] and that screening should occur prior to all visits to identify women who are unwell [17,23,37,38,46,75].

4.2. Policies on visitors and support persons during antenatal visits and childbirth

There were 87 recommendations across 40 guidelines (from 28 organisations) regarding the presence of a support person and birth and appointments for all pregnant women, and infection control policies for these visitors. There was general consensus that the number of visitors for women in hospital should be restricted, with some guidelines suggesting a limit of one visitor per day [4,8,10,13,16,17,19–21,23–25,30,34,40,45,56,65,66,71,81]. Four guidelines – Western Australia [18], India [62], Italy (Capanna et al. [87]) and the USA [35] – suggested that women with suspected or confirmed COVID-19 should not be allowed visitors.

Other recommendations for minimising the risk of infection transmission included preventing young children from visiting their mothers in hospital [10,20,66], encouraging women to have one regular support person rather than rotating through numerous visitors [13,23], and enforcing regular hand hygiene and appropriate Personal Protective Equipment (PPE) for all visitors and patients [10,17,23,40,45,65,66,80].

There was no consensus between guidelines regarding birth companions. Eight guidelines indicated that women – irrespective

of COVID-19 status – should be allowed and encouraged to have a companion present, provided the companion is asymptomatic [13,18,45,50,58,62,66]. However, three guidelines from Sri Lanka [57], Italy (Capanna et al. [87]) and FIGO and allied partners [75] advised that no birth partners should be allowed for women with suspected or confirmed COVID-19. There was consensus that individuals who are symptomatic or confirmed to have COVID-19 should not be allowed to visit a hospital [4,10,13,23,54,66,80] and that all support persons should be screened prior to presenting to a facility [34,40,45,66,80]. Regarding appointments, some guidelines stated it is preferable that women attend alone, however if necessary for support or care then a maximum of one visitor may be allowed [18,25,47,48,61,66].

4.3. Antenatal corticosteroids for preterm birth

There were 29 guidelines from 27 organisations which provided 37 recommendations regarding the use of antenatal corticosteroids (both betamethasone and dexamethasone) for preterm birth in women with COVID-19 infection. There was disagreement between guidelines as to whether corticosteroids should be given when usually recommended. While some guidelines recommended that steroids should be given where usually indicated [8,13,23,45,52,53,57,65,66,81], others suggested there should be more careful assessment of the balance between maternal risks and neonatal benefit, and that it should be discussed with maternal-fetal, neonatal and infectious disease specialists in light of evidence suggesting harm to the patient with severe COVID-19 [35,61,62,64,73–75,77,83,85,87,88]. Three guidelines from Western Australia [17], Queensland [13] and Ireland [58] recommended that while COVID-19 infection itself is not an indication to alter the provision of antenatal corticosteroids, in those with moderate to severe disease the administration of antenatal corticosteroids should be discussed with specialists in light of the maternal risks. Two guidelines from the USA [37,44] suggested that antenatal corticosteroids could be given up until 34 weeks' gestation, as at later gestations the benefits may not outweigh the potential risks to a COVID-19 positive patient with moderate to severe disease.

4.4. Mode of birth

There were 115 recommendations from 38 guidelines (32 organisations) regarding the mode of birth for women with COVID-19. The majority of these were regarding the decision between a caesarean or vaginal birth (53 recommendations). Others pertained to instrumental birth, induction of labour, the timing of birth and guidelines for performing a caesarean section such as PPE and the number of theatre staff.

There was general consensus that the mode of birth should not be influenced by maternal COVID-19, unless urgent birth is required due to the mother's respiratory condition [4,8,10,13,17,21,23,37,44,45,57–59,61,62,64,73–81]. In the case of rapid maternal deterioration, guidelines advise an individual assessment and treatment of the patient [17,45,87] and caesarean section may be required [10,75,83,86]. Alternatively, if the woman delivers vaginally and is short of breath, some guidelines suggest instrumental birth may be required to shorten the length of the second stage of labour [8,74,75,86]. However, two guidelines suggested that there may be a greater need for caesarean section in COVID-19 positive women – Qi et al. [82] suggested that the threshold for a caesarean should be lower. A Malaysian guideline [60] suggested that infected women should be offered caesarean section until there is further information on the safety of vaginal birth, however this guideline had not been updated since 24 March 2020.

There was general consensus that maternal COVID-19 infection alone is not a reason to expedite birth [13,44,58,65,74,75,81,82],

however delaying elective caesarean section and induction of labour could be considered [8,53,61]. Despite suggesting that COVID-19 infection alone is not a reason to expedite birth, Qi et al. [82] recommended that if COVID-19 infection is not improved by treatment, early birth should be considered even in absence of obstetric indications (no justification was provided for this).

4.5. Pain management

There were 26 guidelines from 23 different organisations which offered 80 recommendations regarding labour analgesia for all women including regional and general anaesthesia (45 recommendations), water immersion/birthing pools (10 recommendations) and nitrous oxide (23 recommendations).

There was disagreement between guidelines as to whether to use nitrous oxide. Several guidelines suggested that given the insufficient information as to whether or not nitrous oxide is an aerosol generating procedure it should be avoided in women with suspected or confirmed COVID-19 [4,12,13,17,22,33,60]. Others suggested that nitrous oxide was safe to give all pregnant women, provided it was used with a single-patient microbiological filter [10,23,45,51,58]. One guideline from the UK indicated that nitrous oxide use was not an aerosol-generating procedure, however it did not provide a recommendation as to its safety in COVID-19-positive women [52]. Other guidelines from the USA indicated that its use and potential suspension should be discussed within individual labour and delivery units [34,35,37], or that it may be a source of cross-infection, and that it is important staff are aware of the appropriate decontamination guidelines [83].

There was consensus that regional anaesthesia should continue to be used normally [4,8,12,22,34,45,51,62]. Although both regional and general anaesthesia may be considered [74,75,81,82], regional anaesthesia is preferred to general anaesthesia, unless it is unavoidable [22,51,57,58,60,75]. Several guidelines indicated that early epidural anaesthesia in labour should be considered to minimise need for general anaesthesia [12,13,17,23,35,45,51,58], and also as an alternative to nitrous oxide in women who are COVID-19 positive [12]. Three guidelines indicated that in women with COVID-19 the platelet count should be checked prior to spinal/epidural, considering that thrombocytopenia is a common finding in people with COVID-19 [22,51,58]. When general anaesthesia is used, guidelines recommend it should be done under negative pressure [45], by experienced anaesthetists with adequate PPE [57,58].

There was general consensus that birthing pools (i.e. giving birth while immersed in water) should be avoided in women with COVID-19 due to the risk of infection to the newborn and healthcare workers [13,17,23,45,58,74,75]. However, RANZCOG [4,12] has indicated that water immersion may continue to be used in the normal manner. It is unclear as to whether this recommendation also includes women who are COVID-19 positive.

4.6. Delayed umbilical cord clamping

There were 20 guidelines from 18 organisations which gave 23 recommendations regarding cord clamping. There was no consensus between guidelines surrounding whether delayed cord clamping is appropriate in women with COVID-19. While many guidelines suggest that delayed cord clamping safe to continue given the lack of evidence to suggest otherwise [8,12,13,17,23,37,45,52,53,85], others recommended it may be best avoided [58,65,74,75,80,81,83,87]. One guideline from Ireland [58] suggested that delayed cord clamping might be appropriate for preterm neonates less than 32 weeks' gestation, but should not be routinely done for babies born at a later gestation. Favre et al. [86] suggested that for women with septic shock, acute organ failure or

fetal distress, there should be early clamping of the umbilical cord. However, Schmid et al. [84] suggested this recommendation was harmful when applied to the general population, stating that vertical transmission of SARS-CoV-2 is uncommon.

5. Essential newborn care for babies born to women with COVID-19

5.1. Skin-to-skin contact for the newborn

There were 21 recommendations in 17 guidelines (from 16 organisations) regarding skin-to-skin contact between mothers and newborns after birth. There was consensus that skin-to-skin should continue regardless of maternal COVID-19 infection, provided appropriate PPE is worn [12,15,17,23,31,52–54,66,73,76]. However, guidelines from Spain [65], Singapore (Dashraath et al. [83]), Ireland [58], India (Chawla et al. [80]) and Italy (Capanna et al. [87]) recommended that early skin-to-skin contact be avoided in mothers with COVID-19, although they did not provide evidence that skin-to-skin transmission of COVID-19 occurs.

5.2. Rooming in for mother and baby

In total, 32 guidelines (27 organisations) gave 67 recommendations on this topic. There was lower consensus regarding whether or not, in the presence of maternal COVID-19, rooming in should be used. Most indicated that the newborn should not be separated from the mother, regardless of maternal COVID-19 status, unless in the case of severe maternal or newborn illness [8,10,13,15,17,23,45,53,54,58,63,66,74,75,78]. However, some guidelines from the USA, as well as China (Chen et al.) and Favre et al. recommended separation to prevent maternal-infant transmission [34,35,81,86]. Others from the USA, FIGO and Baud et al. suggested separation should be considered on a case-by-case basis, with full involvement of the mother [38,40,41,71,85]. One guideline from India (Chawla et al. [80]) suggested that rooming-in be undertaken for stable neonates, but if there are available resources for isolation then separation should be favoured. It was suggested that in the event of rooming-in, when a mother has COVID-19, measures should be taken to reduce transmission, for example using PPE or a curtain between mother and newborn and attention to strict hand hygiene measures [35,40,58,71,74,75].

5.3. Breastfeeding

In total, 52 guidelines from 41 different organisations had 121 recommendations related to breastfeeding. There was consensus that breastfeeding is safe and important to continue, regardless of the woman's COVID-19 status, and if a woman was well enough to breastfeed she should be encouraged to do so [8,10,12–15,17,19,21,23,29,31,41,45,53,54,56,58,62–64,66,67,71,73,76,78–80]. However, three guidelines from Malaysia [60], China (Chen et al. [81]) and Favre et al. [86] advised against direct breastfeeding in mothers with COVID-19, however no evidence was provided to support these recommendations.

Several guidelines indicated that while there is currently no evidence that the virus can be transmitted through breastmilk, there is a risk of transmission from mother to baby during breastfeeding via respiratory droplets. Guidelines consequently emphasised the need for mothers with suspected or confirmed COVID-19 to wear a face mask and to practice hand hygiene while breastfeeding [8,9,16,17, 23,29,31,35,38,40,41,45,46,53,54,56,58,59,62,63,66,67,71,73–75, 79–81,83,85].

Additionally, there was consensus that if women are not well enough to breastfeed, or if temporary separation is undertaken

due to maternal COVID-19 infection, they should still be encouraged to express milk which can safely be provided to their newborn [10,15,17,23,29,39,54,58,62,63,66,67,71,73–76,80]. One guideline from the UK [52] suggested that given the overwhelming benefits of breast milk to the infant, unwell COVID-19 positive women who are required to withhold breastfeeding are encouraged to express their breastmilk and discard it in order to maintain lactation until she is no longer infectious.

6. Managing pregnant women with COVID-19 disease

6.1. Monitoring COVID-19 progression

There were 28 guidelines (from 26 different organisations) which gave 93 recommendations regarding caring for pregnant women with COVID-19. These pertained to hospital admission (22 recommendations), fluid balance monitoring (21 recommendations) and target oxygen saturation (29 recommendations). There was consensus that pregnant women who had COVID-19 infection with moderate or severe disease or respiratory complications or compromise should be admitted to hospital for management [43,44,64,71,86]. Two guidelines specified that criteria should be in place for transferring women to a centre with Intensive Care Unit facilities [62,86] and one guideline indicated there should be a lower threshold for transferring vulnerable groups of patients to such facilities [10].

There was general consensus that given the association of fluid overload and Acute Respiratory Distress Syndrome, women with moderate and severe disease require close fluid balance monitoring [8,13,17,45,58,66,75]. Several noted critically ill pregnant patients without shock should be managed with conservative fluid management [74,81]. Additionally, there was consensus that oxygen saturations should be monitored closely [17,45,74,75,80,81] and hypoxia should be avoided, with the aim of maintaining target oxygen saturation >92% [8,13,44,45,57,58,74,75,80,81]. However, there was some variation on the actual target level of oxygen saturation (>92–95%). One guideline from the USA specified that while the recommended target oxygen saturation for nonpregnant women with COVID-19 is >92%, for pregnant women oxygen saturation should aim for >95% [44].

6.2. Antibiotics for treating women with COVID-19

There were 27 recommendations in 15 guidelines from 15 different organisations regarding antibiotic use. There was general consensus that antibiotics should only be commenced in women with COVID-19 if there was evidence of secondary bacterial infection [17,53,58,61,62,65,74,75,81,89], and that antibiotic therapy should be discussed with infectious diseases specialists [13,17,64,74,75]. However, three guidelines from India [62,80] and the Philippines [61] suggested that azithromycin could be used for the specific treatment of COVID-19, however there is no evidence to support these recommendations.

6.3. Antivirals and other disease modifying treatments for women with COVID-19

Eleven guidelines (11 organisations) made 27 recommendations regarding antiviral and other disease modifying treatments for COVID-19. Some guidelines specified that the use of antivirals in a pregnant woman with COVID-19 must be done in consultation with a virologist prior to initiating therapy and on a case-by-case basis [65,74,75]. Others gave suggestions regarding possible dosing regimens for hydroxychloroquine [58,59,62,80,83],

lopinavir and ritonavir [58,59,80,81], remdesivir [58,59], oseltamivir [62] and the immunosuppressive agent tocilizumab [58].

6.4. Anticoagulants for women with COVID-19

Six guidelines (five organisations) provided 17 recommendations regarding anticoagulation for COVID-19 positive pregnant patients. Most recommended that both antenatal and postnatal venous thromboembolism prophylaxis be considered for pregnant women with COVID-19 irrespective of disease severity [13,45,58,75], while two recommended that all COVID-19-positive women be discharged home postnatally with prophylactic low molecular weight heparin [45,58]. Others recommended venous thromboembolism prophylaxis needs to be considered on a case-by-case basis [44,58].

6.5. Prone ventilation

We identified four recommendations from four guidelines regarding prone ventilation in pregnant women. Two indicated that while prone ventilation is strongly recommended in adults with severe Acute Respiratory Distress Syndrome, there is little evidence on prone position in pregnant women, and in this case the lateral decubitus position may be more beneficial [62,73]. One suggested that prone positioning may not be feasible in pregnancy but should be considered in early (pre-viable) gestations [58], however another stated prone positioning was indeed feasible in pregnancy and could be used in addition to the lateral decubitus position [44].

6.6. Intubation

There was limited guidance regarding the use of intubation in pregnant women (five recommendations from three guidelines). It was suggested that the timing of intubation should be individualised [44], with another guideline recommending early intubation for pregnant women whose respiratory function deteriorates [65]. Another guideline stated pregnant women were at risk of aspiration requiring early intubation [58].

One guideline suggested that in pregnant women, mechanical ventilation may not be sufficient for severe respiratory failure and extracorporeal membrane oxygenation may have a role [65]. Two other recommendations also referred to the use of extracorporeal membrane oxygenation – One guideline from the USA advised its use be discussed if expedited birth was being considered for severe hypoxaemia [44], and another from China (Chen et al.) recommended its use be limited during pregnancy with less invasive measures used beforehand [81].

7. Discussion

7.1. Key findings

We identified a large and growing volume of maternal and perinatal health guidelines related to COVID-19 over a six-week period. We identified limited consensus amongst guideline development organisations regarding key maternal and newborn health interventions, including nitrous oxide during labour, policies on birth companions, rooming-in, antenatal corticosteroids, anticoagulants and the use of antivirals and other disease modifying agents. Available guidelines were produced rapidly in the context of the COVID-19 pandemic, generally in the absence of direct evidence. Given the frequency of updates, it is difficult for clinicians and services to stay up-to-date with the most recent guidance.

7.2. Strengths and limitations

Our review has included a large number of guidelines from a range of different organisations worldwide. Through weekly checks, we closely monitored updates to pre-existing recommendations and guidelines and were able to identify key areas of disagreement. A limitation to this review is the pace at which guidance is being updated, given the emergence of new information and evidence regarding COVID-19 and its impacts on women and newborns. Many guidelines were regularly updated, and in several instances, recommendations were significantly changed or removed entirely. This makes it difficult for clinicians and health services to stay up-to-date with best practice.

Additionally, we were limited in our ability to translate guidelines and there were few guidelines reviewed in languages other than English.

7.3. Interpretation and implications

Two recent publications by Cochrane Pregnancy and Childbirth [90] and Narang et al. [91] considered a range of maternal and perinatal health guidelines related to the COVID-19 pandemic. The Cochrane report, which focused on guidelines in a subset of countries with more than 10,000 cases of COVID-19 on 19th April, similarly found a lack of consensus in the use of antenatal steroids, the use of nitrous oxide, policies on birth companions and rooming-in, as well as skin-to-skin contact and breastfeeding – two interventions for which our review found more general consensus. Narang et al. considered 15 papers from 10 professional societies available on 20th April 2020 and reported inconsistencies in guidelines regarding the provision of antenatal corticosteroids. These differences can largely be attributed to scope (our review considered a wider range of countries and guidelines) and time period of interest (considering guidelines are being produced and updated rapidly, however they similarly indicate the presence of conflicts in clinical guidance internationally). The limited consensus we identified for some recommendations – such as anticoagulation, nitrous oxide and birth companions – identify where further research would assist clinicians in their practice in COVID-affected settings.

Our review represents a snapshot in time of the current guidelines and recommendations available up until 15th May 2020 and we acknowledge that some recommendations may have been updated or altered. These changes may reflect new evidence on the benefits and possible harms of using some interventions in the context of COVID-19. While it is important for guidelines to be updated rapidly in response to new evidence, this creates further challenges for clinicians in staying up-to-date. In the past few years, “living guidelines” have emerged as a model for ensuring recommendations remain up-to-date in light of new evidence [92]. In the living guidelines approach, literature is monitored on an ongoing basis, with systematic reviews, evidence profiles and recommendations updated in response to changes in the underlying evidence. Living guideline approaches have been applied in guidelines for maternal and perinatal health, stroke and diabetes [93–95]. In March 2020, the National COVID-19 Clinical Evidence Taskforce (<https://covid19evidence.net.au/>) was established in Australia to provide healthcare professionals with living guidelines on the clinical care of people with COVID-19. This review was conducted as part of the preparatory activities to support the Pregnancy and Perinatal Care Panel of the Taskforce, which first convened on 14th May 2020. Since then, the Taskforce has issued a series of recommendations on mode of birth, breastfeeding and rooming-in, as well as recommendations the use of disease-modifying treatments and respiratory interventions

(extracorporeal membrane oxygenation and prone ventilation) for pregnant and postpartum women. These recommendations will be updated in response to new evidence and are expanding to include other prioritised interventions.

8. Conclusion

Maternal and newborn health guidance has been rapidly produced in response to the COVID-19 pandemic. Our review identified 81 unique guidelines from 48 different organisations related to the antenatal, intrapartum and postpartum care of women during the pandemic. We found lower consensus between guidelines regarding nitrous oxide during labour, policies on birth companions, rooming-in, antenatal corticosteroids, anticoagulants and the use of antivirals and other disease modifying agents. Due to the large number of guidelines being produced as well as these areas of disagreement, it can be difficult for clinicians to determine how best to care for pregnant and postpartum women in the context of COVID-19. This review provides a summary of available recommendations to help guide clinicians and health services, as well as other maternal and perinatal health guideline developers. Given the rapidly evolving nature of the situation and the changes that have already occurred since our review in May 2020, it is vital that health workers seek out the latest guidance when making clinical decisions.

Authors' contributions

CH, JV and AW conceptualised the study. JV, KE, AW and CH wrote the study protocol. PP, KE, LP, EF, MC, RL, AW and JV identified papers and extracted and analysed data. PP wrote the initial draft of the manuscript with revisions from JV. All authors have contributed to the final manuscript.

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Conflicts of interest

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References

- [1] World Health Organization, Rolling Updates on Coronavirus Disease (COVID-19), (2020) Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>. (Updated 4 May 2020).
- [2] World Health Organization, Naming the Coronavirus Disease (COVID-19) and the Virus That Causes It Available from:, (2020) . [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-\(covid-2019\)-and-the-virus-that-causes-it](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it).
- [3] World Health Organization, Coronavirus Disease (COVID-19) Situation Report – 171, (2020) 9 July 2020.
- [4] Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), A Message for Pregnant Women and Their Families, The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2020 23 April 2020.
- [5] F. Elshafeey, R. Magdi, N. Hindi, M. Elshebiny, N. Farrag, S. Mahdy, et al., A systematic scoping review of COVID-19 during pregnancy and childbirth, *Int. J. Gynaecol. Obstet.* 150 (1) (2020) 47–52.
- [6] Trip, (2020) . Available from: <https://www.tripdatabase.com>.
- [7] Burnet Institute, Rapid Review of Maternal Health Recommendations Related to the COVID-19 Pandemic Available from:, (2020) . https://www.burnet.edu.au/projects/435_rapid_review_of_maternal_health_recommendations_related_to_the_covid_19_pandemic.
- [8] Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), Coronavirus Disease (COVID-19) in Pregnancy. A Guide for Resource-limited Environments, The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2020 27 March 2020.
- [9] Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), Coronavirus (COVID-19) Statement, The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2020 29 March 2020.
- [10] Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), COVID 19: Advice for GP Obstetricians and Regional Fellows, (2020) Available from: <https://ranzcof.edu.au/news/covid-19-advice-for-gp-obstetricians-and-regional>. (Updated 23 March 2020).
- [11] Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), COVID-19: Outpatient Services; Office Consultations and Procedures, The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2020 3 April 2020.
- [12] Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), COVID-19: Protection of Midwives and Doctors in the Birth Unit, The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2020 23 April 2020.
- [13] Queensland Clinical Guidelines, Maternity Care for Mothers and Babies During the COVID-19 Pandemic, (2020) 26 March 2020.
- [14] New South Wales Health, Guidance for Maternity and Neonatal Services Available from:, (2020) . <https://www.health.nsw.gov.au/Infectious/covid-19/Pages/clinical-guidance-and-resources.aspx>.
- [15] New South Wales Health, Guidance for Neonatal Services, (2020) Available from: <https://www.health.nsw.gov.au/Infectious/covid-19/Pages/covid-19-neonatal-services.aspx>. (Updated 17 April 2020).
- [16] Western Australian Department of Health, COVID-19 Guidance for Neonatal Services Statewide, Government of Western Australia, 2020 14 April 2020.
- [17] Western Australian Department of Health, Management of COVID-19 Infection in Pregnant Women, Government of Western Australia, 2020 24 April 2020.
- [18] Western Australia Department of Health, COVID-19 Public Hospital Visitor Guidelines, Government of Western Australia, 2020 8 April 2020.
- [19] Canberra Health Services, COVID-19: Advice for Pregnant Women, ACT Government, 2020 April.
- [20] Australian Capital Territory Government, Health Service Update, (2020) Available from: <https://www.covid19.act.gov.au/news-articles/health-service-update>. (Updated 1 April 2020).
- [21] South Australia Department of Health, COVID-19 Frequently Asked Questions Maternity Patients, SA Government, 2020 24 March 2020.
- [22] Australian and New Zealand College of Anaesthetists (ANZCA), Summary of Considerations for Obstetric Anaesthesia and COVID19 Available from:, (2020) . <http://www.anzca.edu.au/fellows/special-interest-groups/obstetric-anaesthesia/summary-of-considerations-for-obstetric-anaesthesia>.
- [23] Department of Health and Human Services Victoria, Coronavirus Disease (COVID-19): Maternity and Newborn Care Guidance for Clinicians, Department of Health and Human Services (DHHS), Victoria, 2020 23 April 2020.
- [24] Department of Health Tasmania, Temporary Changes to the Maternity Service in Response to Coronavirus (COVID19) – LGH Available from:, (2020) . https://www.dhhs.tas.gov.au/pregnancy/news_and_events/pregnancy_birth_and_early_parenting_news/temporary_changes_to_the_maternity_service_in_response_to_coronavirus_-_lgh.
- [25] Department of Health Tasmania, Temporary Changes to the Maternity Service in Response to Coronavirus (COVID19) – RHH Available from:, (2020) . https://www.dhhs.tas.gov.au/pregnancy/news_and_events/pregnancy_birth_and_early_parenting_news/temporary_changes_to_the_maternity_service_in_response_to_coronavirus_covid_19_-_rhh.
- [26] Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), COVID-19 and Gestational Diabetes Screening, Diagnosis and Management, The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2020 7 April 2020.
- [27] The Australasian Diabetes in Pregnancy Society (ADIPS), The Australian Diabetes Society (ADS), The Australian Diabetes Educators Association (ADEA) and Diabetes Australia (DA), Diagnostic Testing for Gestational Diabetes Mellitus (GDM) During the COVID-19 Pandemic: Antenatal and Postnatal Testing Advice, The Australasian Diabetes in Pregnancy Society (ADIPS), the Australian Diabetes Society (ADS), the Australian Diabetes Educators Association (ADEA) and Diabetes Australia (DA), 2020 30 April 2020.
- [28] Queensland Clinical Guidelines, Gestational Diabetes Mellitus, Queensland Clinical Guidelines, 2020.
- [29] Ministry of Health New Zealand, COVID-19 – Breastfeeding Advice for Pregnant Women, or Those Who Have Recently Given Birth, (2020) Available from: <https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-novel-coronavirus-information-specific-audiences/covid-19-information-parents-during-alert-level-3/covid-19-breastfeeding-advice-pregnant-women-or-those-who-have-recently-given-birth>. (Updated 30 March).

- [30] Ministry of Health New Zealand, COVID-19 – Information for Pregnant Women, and Those Who Have Recently Given Birth, (2020) Available from: <https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-novel-coronavirus-information-specific-audiences/covid-19-information-pregnant-women-and-those-who-have-recently-given-birth>. (Updated 28 April 2020).
- [31] Ministry of Health New Zealand, Information for Community-based Midwives, New Zealand Government, 2020 1 April 2020.
- [32] Ministry of Health New Zealand, Information for Radiologists on Community Based Maternity Ultrasounds, New Zealand Government, 2020 28 April 2020.
- [33] Ministry of Health New Zealand, Recommendations for the Use of Nitrous Oxide/entonox for Labour Analgesia During the COVID-19 Pandemic, New Zealand Government, 2020 24 April 2020.
- [34] Society for Obstetric Anesthesia and Perinatology (SOAP), Interim Considerations for Obstetric Anesthesia Care Related to COVID19, Society for Obstetric Anesthesia and Perinatology, 2020 5 April 2020.
- [35] Society for Obstetric Anesthesia and Perinatology (SOAP), Society for Maternal Fetal Medicine (SMFM), Labor and Delivery COVID-19 Considerations, Society for Obstetric Anesthesia and Perinatology (SOAP), Society for Maternal Fetal Medicine (SMFM), 2020.
- [36] American College of Obstetricians and Gynaecologists (ACOG), COVID-19 FAQs for obstetrician-gynecologists, Gynaecology (2020) Available from: <https://www.acog.org/clinical-information/physician-faqs/covid19-faqs-for-ob-gyns-gynecology>.
- [37] American College of Obstetricians and Gynaecologists (ACOG), COVID-19 FAQs for Obstetrician-Gynecologists, Obstetrics Available from: (2020) . <https://www.acog.org/clinical-information/physician-faqs/covid-19-faqs-for-ob-gyns-obstetrics>.
- [38] American College of Obstetricians and Gynaecologists (ACOG), Novel Coronavirus 2019 (COVID-19), (2020) Available from: <https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2020/03/novel-coronavirus-2019> (Updated 23 April).
- [39] Centers for Disease Control and Prevention (CDC), Pregnancy & Breastfeeding | Information about Coronavirus Disease 2019, (2020) Available from: https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/pregnancy-breastfeeding.html?CDC_AA_reVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fprepare%2Fpregnancy-breastfeeding.html#anchor_158416926. (Updated 15 April).
- [40] Centers for Disease Control and Prevention (CDC), Interim Considerations for Infection Prevention and Control of Coronavirus Disease 2019 (COVID-19) in Inpatient Obstetric Healthcare Settings, (2020) Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-healthcare-guidance.html>. (Updated 4 April 2020).
- [41] Society for Maternal Fetal Medicine (SMFM), COVID-19: Changes in Pregnancy and Maternity Care Advice for Women and Their Families, Society for Maternal-Fetal Medicine, 2020 8 April 2020.
- [42] The American College of Obstetricians and Gynaecologists (ACOG), American Academy of Family Physicians (AAFP), Society for Maternal-Fetal Medicine (SMFM), American College of Nurse-Midwives (ACNM), Patient-Centered Care for Pregnant Patients During the COVID-19 Pandemic, The American College of Obstetricians and Gynaecologists (ACOG), American Academy of Family Physicians (AAFP) Society for Maternal-Fetal Medicine (SMFM), American College of Nurse-Midwives (ACNM), 2020 30 March 2020.
- [43] American College of Obstetricians and Gynaecologists (ACOG), Outpatient Assessment and Management for Pregnant Women with Suspected or Confirmed Novel Coronavirus (COVID-19), The American College of Obstetricians and Gynecologists (ACOG), 2020 24 April 2020.
- [44] Society for Maternal Fetal Medicine (SMFM), Management Considerations for Pregnant Patients with COVID-19, Society for Maternal Fetal Medicine (SMFM), 2020 30 April 2020.
- [45] Royal College of Obstetricians and Gynaecologists (RCOG), Coronavirus (COVID-19) Infection in Pregnancy, Royal College of Obstetricians & Gynaecologists (RCOG), 2020 17 April 2020.
- [46] Royal College of Obstetricians and Gynaecologists (RCOG), Guidance for Antenatal and Postnatal Services in the Evolving Coronavirus (COVID-19) Pandemic, Royal College of Obstetricians & Gynaecologists, 2020 24 April 2020.
- [47] Royal College of Obstetricians and Gynaecologists (RCOG), Guidance for Antenatal Screening and Ultrasound in Pregnancy in the Evolving Coronavirus (COVID-19) Pandemic, Royal College of Obstetricians and Gynaecologists, 2020 17 April 2020.
- [48] Royal College of Obstetricians and Gynaecologists (RCOG), Guidance for Fetal Medicine Units (FMUS) in the Evolving Coronavirus (COVID-19) Pandemic, Royal College of Obstetricians and Gynaecologists, 2020 23 March 2020.
- [49] Royal College of Obstetricians and Gynaecologists (RCOG), Guidance for Maternal Medicine in the Evolving Coronavirus (COVID-19) Pandemic, Royal College of Obstetricians and Gynaecologists (RCOG), 2020 9 April 2020.
- [50] Royal College of Obstetricians and Gynaecologists (RCOG), Guidance for Provision of Midwife-led Settings and Home Birth in the Evolving Coronavirus (COVID-19) Pandemic, Royal College of Obstetricians and Gynaecologists (RCOG), 2020 17 April 2020.
- [51] Obsetric Anaesthetists' Association (OAA), Management of Pregnant Women with Known or Suspected COVID-19, Obsetric Anaesthetists' Association (OAA), 2020 16 March 2020.
- [52] Royal College of Paediatrics and Child Health (RCPCH), COVID-19 – Guidance for Neonatal Settings, Royal College of Paediatrics and Child Health (RCPCH), 2020 7 May 2020.
- [53] The Society of Obstetricians and Gynaecologists of Canada (SOGC), Updated SOGC Committe Opinion – COVID-19 in Pregnancy, The Society of Obstetricians and Gynaecologists of Canada, 2020 13 March 2020.
- [54] Canadian Paediatric Society, Breastfeeding When Mothers Have Suspected or Proven COVID-19, (2020) Available from: <https://www.cps.ca/en/documents/position/breastfeeding-when-mothers-have-suspected-or-proven-covid-19>. (Updated 9 April 2020).
- [55] Canadian Paediatric Society (CPS), NICU Care for Infants Born to Mothers with Suspected or Proven COVID-19, Canadian Paediatric Society (CPS), 2020 6 May 2020.
- [56] Ministry of Health and Indigenous Medical Service, Interim Guidelines for Field Maternal and Child Care Services During the Outbreak of COVID-19 Infection, Ministry of Health Sri Lanka, 2020 17 March 2020.
- [57] Ministry of Health and Indigenous Medical Service, Interim Guidelines for Maternal and Newborn Care Services in Hospitals During the Outbreak of COVID-19 Infection, Ministry of Health Sri Lanka, 2020 18 March 2020.
- [58] RCPI IoOaG, COVID-19 Infection – Guidance for Maternity Services, Institute of Obstetricians and Gynaecologists - Royal College of Physicians Ireland (RCPI), 2020 21 April 2020.
- [59] S.V. Ierssel, N. Dauby, E. Bottieau, R. Huits, C. Wyndham-Thomas, R.V. Loock, Interim Clinical Guidance for Patients Suspected of/confirmed with COVID-19 in Belgium, (2020) .
- [60] Ministry of Health Malaysia, Guideline on Management of Coronavirus Disease 2019 (COVID-19) in Pregnancy, (2020) 24 March 2020.
- [61] Philippine Obstetrical and Gynecological Society (POGS), Philippine Society of Maternal Fetal Medicine (PSMFM), COVID-19 and Pregnancy: a Guide to MFM Specialists and General Obstetric Practitioners. Philippine Obstetrical and Gynecological Society (POGS), Philippine Society of Maternal Fetal Medicine (PSMFM), 2020.
- [62] FOGSI, Good Clinical Practice Recommendation on Pregnancy with COVID-19 Infection, Federation of Obstetric and Gynaecological Societies of India (FOGSI), 2020 28 March 2020.
- [63] Società Italiana di Neonatologia (SIN), Allattamento E Infezione da SARS-CoV-2 (Coronavirus Disease 2019 – COVID-19), Società Italiana di Neonatologia (SIN), 2020 10 May 2020.
- [64] Collège National des Gynécologues et Obstétriciens Français (CNGOF), Prise en charge aux urgences maternité d'une Patiente enceinte suspectée ou infectée par le coronavirus (COVID 19), Collège National des Gynécologues et Obstétriciens Français (CNGOF), 2020 17 March 2020.
- [65] Federation of the Societies of Gynaecology and Obstetrics of the Autonomous Communities of Spain (SEGO), Recomendaciones para la prevención de la infección y el control de la enfermedad por coronavirus 2019 (COVID-19) en la paciente obstétrica, Federation of the Societies of Gynaecology and Obstetrics of the Autonomous Communities of Spain (SEGO), 2020.
- [66] United Nations Population Fund, COVID-19 Technical Brief for Maternity Services, United Nations Population Fund (UNFPA), 2020 April.
- [67] United Nations Population Fund, UNFPA Statement on Novel Coronavirus (COVID-19) and Pregnancy, United Nations Population Fund (UNFPA), 2020 5 March 2020.
- [68] International Federation of Gynecology and Obstetrics (FIGO), Abortion Access and Safety with COVID-19, (2020) Available from: <https://www.figro.org/abortion-access-and-safety-covid-19>. (Updated 31 March 2020).
- [69] International Federation of Gynecology and Obstetrics (FIGO), Elective Surgery and COVID-19, (2020) Available from: <https://www.figro.org/elective-surgery-and-covid-19>. (Updated 30 March 2020).
- [70] International Federation of Gynecology and Obstetrics (FIGO), Non-Communicable Diseases and COVID-19, (2020) Available from: <https://www.figro.org/non-communicable-diseases-and-covid-19>. (Updated 30 March 2020).
- [71] International Federation of Gynecology and Obstetrics (FIGO), Safe Motherhood and COVID-19, (2020) Available from: <https://www.figro.org/safe-motherhood-and-covid-19>. (Updated 30 March 2020).
- [72] International Federation of Gynecology and Obstetrics (FIGO), SRH in Humanitarian Settings During COVID-19, (2020) Available from: <https://www.figro.org/srh-humanitarian-settings-during-covid-19>. (Updated 30 March 2020).
- [73] World Health Organization, Clinical Management of Severe Acute Respiratory Infection (SARI) When COVID-19 Disease is Suspected, World Health Organization, 2020 13 March 2020..
- [74] International Society of Ultrasound in Obstetrics & Gynecology (ISUOG), ISUOG Interim Guidance on 2019 Novel Coronavirus Infection During Pregnancy and Puerperium: Information for Healthcare Professionals, The International Society of Ultrasound in Obstetrics & Gynecology, 2020 12 March 2020.
- [75] L.C. Poon, H. Yang, A. Kapur, N. Melamed, B. Dao, H. Divakar, et al., Global interim guidance on coronavirus disease 2019 (COVID-19) during pregnancy and puerperium from FIGO and allied partners: information for healthcare professionals, *Int. J. Gynaecol. Obstet.* 149 (3) (2020) 273–286.
- [76] Inter-Agency Working Group (IAWG), Programmatic Guidance for Sexual and Reproductive Health in Humanitarian and Fragile Settings During COVID-19 Pandemic, Inter-Agency Working Group, 2020 10 April 2020.
- [77] JHPIEGO, Initial Assessment of Clients Presenting for Intrapartum Care: Summary of Key Considerations in the Context of COVID-19, JHPIEGO, 2020 25 March 2020.
- [78] United Nations Population Fund, Sexual and Reproductive Health and Rights, Maternal and Newborn Health & COVID-19, United Nations Population Fund, 2020 23 March 2020.

- [79] International Planned Parenthood Federation (IPPF), COVID-19 Impact Available from: (2020) . <https://www.ippf.org/covid19>.
- [80] D. Chawla, D. Chirla, S. Dalwai, A.K. Deorari, A. Ganatra, A. Gandhi, et al., Perinatal-neonatal management of COVID-19 infection – guidelines of the Federation of Obstetric and Gynecological Societies of India (FOGSI), National Neonatology Forum of India (NNF), and Indian Academy of Pediatrics (IAP), *Indian Pediatr.* 57 (6) (2020) 536–548.
- [81] D. Chen, H. Yang, Y. Cao, W. Cheng, T. Duan, C. Fan, et al., Expert consensus for managing pregnant women and neonates born to mothers with suspected or confirmed novel coronavirus (COVID-19) infection, *Int. J. Gynaecol. Obstet.* 149 (2) (2020) 130–136.
- [82] H. Qi, X. Luo, Y. Zheng, H. Zhang, J. Li, L. Zou, et al., Safe delivery for pregnancies affected by COVID-19, *BJOG* 127 (8) (2020) 927–929.
- [83] P. Dashraath, J.L.J. Wong, M.X.K. Lim, L.M. Lim, S. Li, A. Biswas, et al., Coronavirus disease 2019 (COVID-19) pandemic and pregnancy, *Am. J. Obstet. Gynecol.* 222 (6) (2020) 521–531.
- [84] M.B. Schmid, J. Fontijn, N. Ochsenein-Kolble, C. Berger, D. Bassler, COVID-19 in pregnant women, *Lancet Infect. Dis.* 20 (6) (2020) 653.
- [85] D. Baud, E. Giannoni, L. Pomar, X. Qi, K. Nielsen-Saines, D. Musso, et al., COVID-19 in pregnant women – authors' reply, *Lancet Infect. Dis.* 20 (6) (2020) 654.
- [86] G. Favre, L. Pomar, X. Qi, K. Nielsen-Saines, D. Musso, D. Baud, Guidelines for pregnant women with suspected SARS-CoV-2 infection, *Lancet Infect. Dis.* (2020).
- [87] F. Capanna, A. Haydar, C. McCarey, E. Bernini Carri, J. Bartha Rasero, V. Tsibizova, et al., Preparing an obstetric unit in the heart of the epidemic strike of COVID-19: quick reorganization tips, *J. Matern. Fetal. Neonatal. Med.* (2020) 1–7.
- [88] J.J. McIntosh, Corticosteroid guidance for pregnancy during COVID-19 pandemic, *Am. J. Perinatol.* (2020).
- [89] Royal College of Physicians of Ireland (RCPI), COVID-19 Infection – Guidance for Maternity Services, Royal College of Physicians of Ireland (RCPI), 2020 21 April 2020.
- [90] Cochrane Pregnancy and Childbirth, COVID-19 Review of National Clinical Practice Guidelines for Key Questions Relating to the Care of Pregnant Women and Their Babies, Cochrane, 2020.
- [91] K. Narang, E.R. Ibirogba, A. Elrefaei, A.T.A. Trad, R. Theiler, R. Nomura, et al., SARS-CoV-2 in pregnancy: a comprehensive summary of current guidelines, *J. Clin. Med.* 9 (5) (2020).
- [92] E.A. Akl, J.J. Meerpohl, J. Elliott, L.A. Kahale, H.J. Schunemann, Living systematic reviews: 4. Living guideline recommendations, *J. Clin. Epidemiol.* 91 (2017) 47–53.
- [93] J.P. Vogel, T. Dowswell, S. Lewin, M. Bonet, L. Hampson, F. Kellie, et al., Developing and applying a 'living guidelines' approach to WHO recommendations on maternal and perinatal health, *BMJ Glob. Health* 4 (4) (2019) e001683.
- [94] C. English, M. Bayley, K. Hill, P. Langhorne, M. Molag, A. Ranta, et al., Bringing stroke clinical guidelines to life, *Int. J. Stroke* 14 (4) (2019) 337–339.
- [95] H. White, B. Tendal, J. Elliott, T. Turner, S. Andrikopoulos, S. Zoungas, Breathing life into Australian diabetes clinical guidelines, *Med. J. Aust.* 212 (6) (2020) 250–1 e1.