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Maternity care during a pandemic: Can a hybrid telehealth model comprising group interdisciplinary education support maternal psychological health?

Melissa Buultjens [a,*], Jessica Gill [a], Jennifer Fielding [a], Katrina A. Lambert [a], Kirsty Vondeling [a], Sally E. Mastwyk [c], Sarita Sloane [c], Wendy Fedele [c], Leila Karimi [e], Jeannette Milgrom [b], Kathryn von Treuer [d], Bircan Erbas [a]

[a] School of Psychology and Public Health, La Trobe University, Melbourne, Australia
[b] Parent-Infant Research Institute (PIRI), Australia and Melbourne School of Psychological Science, University of Melbourne, Australia
[c] School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Australia
[d] Cairnmillar Institute, Melbourne, Australia
[e] School of Applied Health, Psychology Department, RMIT University, Melbourne, Australia

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ABSTRACT

Background: The transition to parenthood is one of the most challenging across the life course, with profound changes that can impact psychological health. In response to the coronavirus disease 2019 (COVID-19), came the rapid implementation of remote antenatal care, i.e., telehealth, with fewer in-person consultations. A change in service delivery in addition to the cancellation of antenatal education represented a potential threat to a woman's experience – with likely adverse effects on mental health and wellbeing.
Aim: To explore a hybrid model of pregnancy care, i.e., telehealth and fewer in-person health assessments, coupled with concurrent small group interdisciplinary education delivered via video conferencing, extending into the postnatal period.
Methods: Using a quasi-experimental design with an interrupted time series and a control group, this population-based study recruited low-risk women booking for maternity care at one community health site affiliated with a large public hospital in Victoria, Australia.
Findings: Whilst there was no difference in stress and anxiety scores, a significant interactive effect of the hybrid model of care with time was seen in the DASS depression score (−1.17, 95% CI: −1.81, −0.53) and the EPDS (−0.83, 95% CI: −1.5, −0.15).
Discussion: The analyses provide important exploratory findings regarding the positive effects of a hybrid model of care with interdisciplinary education in supporting mental health of first-time mothers.
Conclusion: This study demonstrates that small group online education scheduled in conjunction with individual pregnancy health assessments can be executed within a busy antenatal clinic with promising results and modest but dedicated staff support.

Statement of Significance

Problem or Issue

The perinatal period is a time of significant changes that can place women at an increased risk of psychological distress. In addition, the ongoing pandemic of coronavirus disease 2019 (COVID-19) increases this vulnerability and the prevalence of mental health problems.

What is Already Known During the Covid-19 pandemic, many women have experienced a decrease in face-to-face pregnancy appointments, and the opportunity to build a support network with their peers during group-based antenatal education.

What this Paper Adds A hybrid model of care incorporating concurrent small group online education for first-time pregnant

* Correspondence to: La Trobe University, PO Box 305, 3086, Australia.
E-mail addresses: M.Buultjens@latrobe.edu.au (M. Buultjens), leila.karimi@rmit.edu.au (L. Karimi).

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women that extends into the postpartum period, can improve perinatal psychosocial health outcomes, particularly depression, as measured by the EPDS and DASS.

1. Introduction

Parenthood, a major developmental period, is experienced by the majority of the adult population. In Australia alone, there were 305,832 registered births in 2019 [6], with an increasing proportion of women giving birth from migrant and refugee backgrounds [15]. Further, the number of women having children aged 35–39 has more than doubled over the past 30 years, and for women aged 40–44, it has tripled [5]. The transition to parenthood is considered to be one of the most challenging across the life course [32], involving major psychological, physiological, and social lifestyle changes [3]. Collectively, these are all factors that maternity services should respond to in order to maximise opportunity for health gains in childbearing women [53].

Perinatal mental health is a significant public health concern. In high-income countries 20–25% of women are reported to experience perinatal mental health issues [23], while the estimated prevalence is higher among low- and middle-income countries [14]. Declines in mental health not only impact on a woman's health, but also contribute to adverse neonatal, infant and child outcomes [37]. Depression, anxiety and/or stress across the perinatal period, can affect the mother-infant bond [22,50] and further increases the risk of offspring having a wide range of ongoing adverse physical and behavioural outcomes [38,39,60,82]. This strengthens the rationale for a review of maternity care that collectively accommodate cultural, psychosocial, and clinical needs to more fully support health and wellbeing.

Mental health and maternity services are interconnected [26]. While the provision of effective maternity care continues to be a global health policy goal [11,43], unmet needs across episodes of maternity care remain [40,73,84]. For example, in high-income countries, antenatal care usually involves appointments with health care professionals (e.g., hospital midwives and obstetricians) with childbirth education classes referred as an adjunct, on an opt-in basis [52]. This is largely because typical clinic appointments are timebound, restricting consults to primarily focus on biomedical issues (e.g., measure blood pressure) and provide screening during the pregnancy. This leaves less time for more health promoting, educational activities that address different aspects related to pregnancy, birth, and infant care [1]. Whilst on the one hand it is expected that parents will attend antenatal education classes, they may not be available on-site or covered by health insurance schemes, and therefore, those with financial or transportation difficulties may not receive them [66].

Antenatal education curricula vary by program and health service, but the underlying objectives remain the same: to provide preparation for pregnancy, labour and birth, and to a lesser extent, parenting [33]. While the objectives and effectiveness of antenatal education vary [3,78,8], a recent review of health education strategies targeting pregnant women, authors commented that the continuation of health education strategies after childbirth contributed to improved maternal and child outcomes [45]. This is timely given the increasing evidence suggesting women feel dissatisfied with respect to their postnatal care [75], revealing an inability to access timely information when needed, thereby impacting on their parenting confidence, as well as physical and mental health outcomes [71]. All in all, acquisition of knowledge is important in influencing maternal behaviour, birth outcomes and postnatal health and parenting self-efficacy [45]. At the same time, "preparing mothers emotionally for birth, and promoting the mental health of parents and carers in pregnancy, can make a dramatic difference to how parents and carers experience birth, and how they cope in their transition from pregnancy to parenthood" ([67], p. 23).

Originally this study was designed to examine a face-to-face group pregnancy care model with integrated education. However in December 2019, cases of pneumonia of unknown etiology in Wuhan, China, were reported to the World Health Organization (WHO) [57], before spreading rapidly across the world. On March 11, 2020 the WHO defined the COVID-19 outbreak as a pandemic [86]. In response to this, pregnant women were identified as a vulnerable group and to reduce transmission risks for both pregnant women and health care workers, the International Federation of Gynecology and Obstetrics (FIGO) recommended the suspension of routine antenatal care and replacement with video or telephone consultations whenever possible [72]. This further resulted in antenatal education classes being either abandoned entirely during the lockdown period or provided online via PowerPoint slides made accessible to parents for self-directed learning.

As evidenced, perinatal mental health is a leading public health issue associated with negative effects on both maternal and child health outcomes and significant economic cost [23,29]. This is without the further risk of pandemic-related anxiety and social isolation that can lead to ongoing negative psychological outcomes [49]. Thus, in promoting mental health and wellbeing during a time where reconfiguration of service delivery was required, we sought to assess a hybrid model of pregnancy care, i.e., telehealth and fewer in-person health assessments, coupled with concurrent small group interdisciplinary psychoeducation delivered via video conferencing that extended into the postnatal period. The revised model was designed to mitigate the risks of COVID-19 transmission, whilst at the same time providing appropriate care and education at one hospital maternity outpatients clinic. We hypothesised that this model of care and education extended into the postnatal period would improve perinatal psychosocial health outcomes as measured by the Depression Anxiety Stress Scale (DASS) and Edinburgh Postnatal Depression Scale (EPDS), in comparison to women receiving standard maternity care only, during a global pandemic. In summary, to reduce the transmission and spread of COVID-19, pregnancy care telehealth appointments were implemented and antenatal education was suspended. Thus, this research was comparing a hybrid model of pregnancy care, i.e., telehealth and fewer in-person health assessments, coupled with concurrent small group interdisciplinary psychoeducation delivered via video conferencing (intervention), to the control groups who received their standard care.

2. Methods

The study used a quasi-experimental design; a useful way to answer questions within the field of health service provision when a randomised controlled trial is not appropriate [2]. This design is appropriate here when assessing the feasibility of participant recruitment and retention in the intervention. Using a quasi-experimental design with an interrupted time series [48] and a control group, we examined a hybrid model of pregnancy care, i.e., telehealth and fewer in-person health assessments, coupled with concurrent small group interdisciplinary psychoeducation delivered via video conferencing that extended into the postnatal period. The rationale for a controlled interrupted time series (CITS) design was to provide a more robust methodology, with a set of measurements taken at intervals over a period of time, as opposed to pretest-posttest only. Control groups were recruited following the intervention groups due to a limited number of low-risk first-time women, and the tight timelines bound by funding. Thus, this design further strengthened the study's validity allowing for comparisons across time in a single population [13].

2.1. Intervention: perinatal care, education and support [PECS]

The PECS intervention was designed to align with the World Health Organizations recommendations, i.e., to go beyond perinatal survival, with a view to maximising the psychosocial health and potential of all childbearing women and their families [85]. Several pregnancy clinical care models are offered at the health service and women opt-in based on

their preference, location and pregnancy suitability. The PECS hybrid model of care consisted of one-to-one pregnancy clinical care integrating the usual pregnancy health assessment (as outlined in Table 1) with the addition of concurrent structured online small-group interdisciplinary education and peer support, thus incorporating broader psychosocial aspects. A description of each pregnancy clinical care model is depicted in Table 1.

Additionally, given the hospital postnatal stay is short, the PECS intervention programme provided extended online support into the early postnatal period. This consisted of timely education, referral and access to women's health interdisciplinary professionals, and peer support. The following Tables (2a, b) outline the ante- and postnatal schedule of online education as facilitated by each women's health professional. An outline of content presented across each session can be obtained by contacting the corresponding author.

The PECS intervention consisted of four group education sessions antenatally, and four group education sessions postnatally, with six to eight women in each group. The women were grouped based on their estimated delivery date.

2.1.1. Pilot testing

In our published pilot study (Buultjens, Murphy, Milgrom, Taket, Poinen, 2018; [21]), the findings informed the development of the current PECS-intervention, with further review and codesign by current health care staff, including maternity manager and women's allied health research-clinicians. To account for the online modality and any changes over time in health literacy, we conducted a single online group pilot to pragmatically test the intervention prior to recruitment.

2.2. Recruitment

All eligible women booking for maternity care at one community health site affiliated with a large public hospital in Victoria, Australia were considered as the population. The women's medical records were labelled as "low-risk, eligible to participate in PECS model of care" (intervention), and following this, women were invited to participate in the research at their booking-in appointment by their midwife. In Australia, women are recommended to attend antenatal care in the first trimester but commonly the first visit is closer to 20 weeks gestation [46].

Table 1
Pregnancy Clinical Care.

Models of Standard Pregnancy Care (Control Group) Telehealth and fewer in-person health assessments	Description of Pregnancy Care
Caseload (continuity of carer)	a single midwife for pregnancy and birth
Collaborative (decreased continuity of carer)	a mix of midwives and doctors work together to provide pregnancy care
Team Midwife Care (decreased continuity of carer)	many midwives form team midwifery care. Because team midwives work rostered shifts, pregnant women may receive care from a team midwife when in labour and during their hospital stay
Other (continuity of carer)	a hospital obstetrician or obstetric doctor
Speciality Care	provides care due to a higher level of complexity
Shared Care	a women's accredited affiliate in the community (e.g., General Practitioner, Obstetrician or midwife) and the hospital
Obstetrician (non-hospital)	A private obstetrician
PECS Hybrid Model of Care (Intervention) **Telehealth and fewer in-person health assessments**	Any pregnancy care model as detailed above, plus small group interdisciplinary education scheduled concurrently, extended into the postnatal period

Table 2a
PECS Intervention Antenatal Schedule of Education (approx. gestation) and Women's Health Presenter.

EDUCATOR / WOMEN'S HEALTH PROFESSIONAL	A-Session 1 30–32 weeks gestation	A-Session 2 33–34 weeks gestation	A-Session 3 35–37 weeks gestation (evening with partners)	A-Session 4 38–40 weeks gestation
Midwife	X	X	X	X
Dietitian	X			
Physiotherapist	X		X	
Psychologist		X	X	
Yoga / occupational therapist		X		X

Table 2b
Postnatal Schedule of Education and Women's Health Presenter.

EDUCATOR / WOMEN'S HEALTH PROFESSIONAL	P-Session 5[a]2 – 4 weeks	P-Session 6[a]5 – 7 weeks	A-Session 7[a]8 – 10 weeks	A-Session 8[a]12 – 14 weeks (in-person)
Midwife	X	X	X	X
Dietitian		X		
Physiotherapist		X		
Psychologist	X			X
Yoga / occupational therapist			X	
Lactation Consultant	X	X	X	X

[a] Approximate number of weeks postnatal

Women were recruited to the study at their first hospital visit if they met the following inclusion criteria:

1. First pregnancy
2. Aged $\geq$ 18 years
3. $\geq$ 12-weeks of gestation at time of recruitment
4. No history of mental illness (as declared by woman at booking-in appointment with midwife)
5. Deemed medically low risk by obstetrician by 28-weeks gestation
6. Must be able to read, understand and speak English

Intervention and control participants were strategically not recruited at the same point in time. As a result of COVID-19, hospital protocols were established to minimise spread of the virus and consequently, external researchers were prohibited in hospitals. Considerable time was lost amending the research protocol and ethics to provide a sustainable intervention model that not only met the needs of childbearing women, but one that considered midwifery workloads too. A further limitation was the small number of pooled low-risk women who met the study criteria, especially given the need to recruit small groups for the PECS intervention. Given the identified challenges, and limited time remaining to complete the research project and meet funding guidelines, we recruited the intervention group first. Despite this, given the extended COVID-19 lockdown in Melbourne, participants in both the intervention and control arms both experienced their pregnancy care during stage 3 restrictions – participants were only permitted to leave the house for one of four reasons (food and supplies (one person per household, once per day); exercise (up to two-hours); urgent medical care; and work (if necessary and unable to work from home)).

2.3. Participants and procedure

In total 90 women were eligible for participation. Fifty-five women were invited to participate in the PECS intervention at their booking-in visit, while 35 women were recruited to the control group. Fig. 1 provides full details on the numbers enrolled and drop-out rates. Online

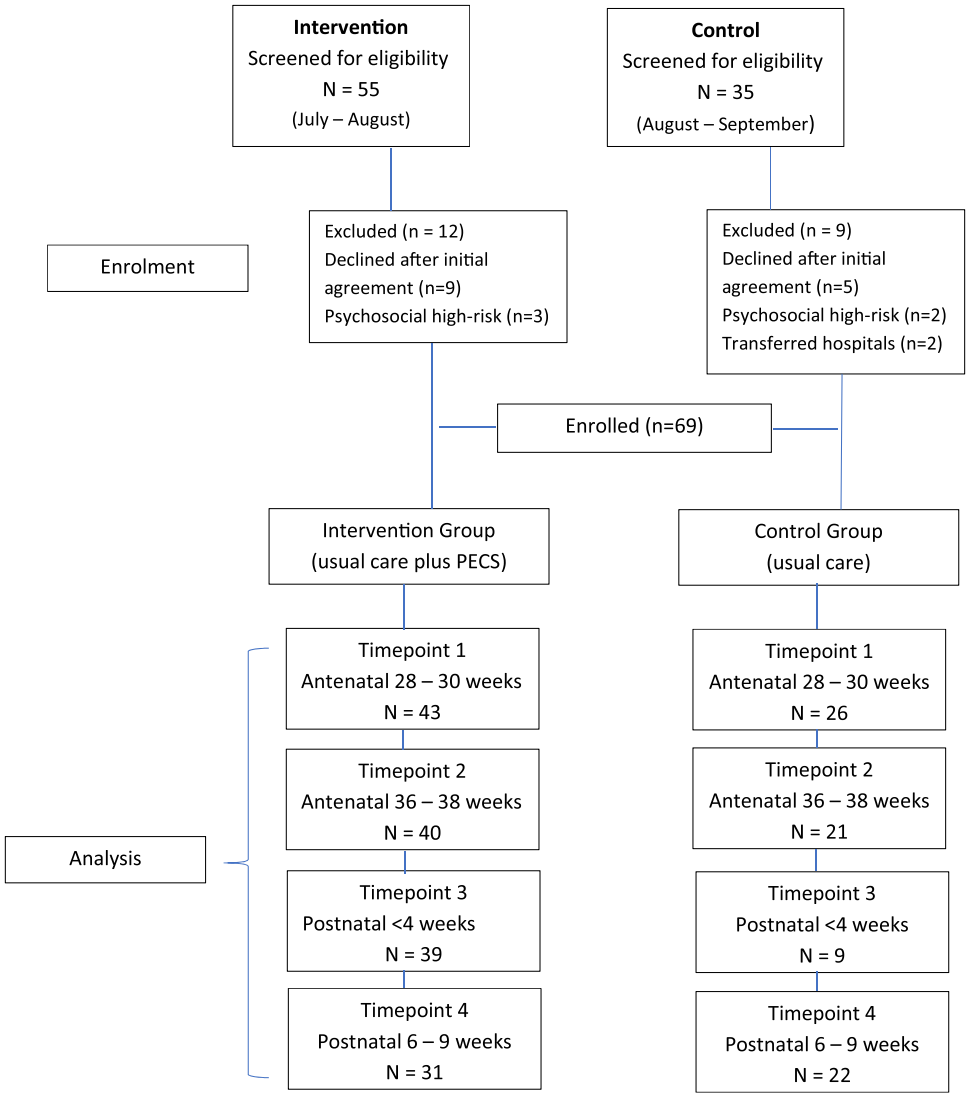

Fig. 1. Flowchart describing participant recruitment: screening, enrolment, and analysis.

consent was obtained prior to the completion of the first set of questionnaires (approximately 28 – 30 weeks' gestation), including demographic information. Women were recruited from August to October 2020.

2.4. Measures

Maternal mental health was assessed at four time-points (Fig. 1) using the Edinburgh Postnatal Depression Scale (EPDS) and the short form of the Depression, Anxiety and Depression Scales (DASS-21). The Demographic data were collected at baseline (time point one) using an online self-reported questionnaire.

2.4.1. EPDS

The Edinburgh Postnatal Depression Scale (EPDS) [27] was used to screen for depressive symptoms, a validated tool used among Australian samples in the antenatal and postnatal periods [68]. The EPDS is a 10-item self-administered questionnaire, rated 0–3 on each item, ranging from 0 to 30, where higher scores indicate more depressive symptoms. The cutoff score ≥ 13 was used to categorize women with and without depressive symptoms [51]. In an Australian study that used the EPDS among a sample of 4148 women, researchers reported a sensitivity of 100% and specificity of 89% [17].

2.4.2. DASS

The 21-item short form of the Depression Anxiety and Stress Scales (DASS-21) [59] is frequently used in both clinical and public health research [44]. The DASS-21 is a self-report measure, in which items are rated on a 4-point scale ("not at all" to "most of the time") assessing symptoms of depression, anxiety, and stress experienced during the past week. Scores for each of the three categories: Depression, Anxiety, and Stress subscales (7 items each) were included. Given we used the DASS-21, each score was multiplied by two to calculate the final scores. Higher scores indicate poorer mental health.

2.5. Statistical analysis

Statistical analysis was performed using Stata, version 14.2 (College Station, TX: StataCorp LP). Chi-squared analysis was used to assess differences in demographic variables between the control and intervention groups. To assess the intervention on the DASS components and the EPDS, generalised mixed effects models with a random effect for participant id were used given the time element of the study. Results were presented as the raw effect of time and the effect of the intervention over time, with 95% confidence intervals. A p-value of < 0.05 was considered statistically significant. For ease of interpretation, predictive marginal mean plots for the fixed proportions of significant interventional effects in the main model were produced. Sensitivity analysis was

conducted to ensure no effects of previous mental health issues impacted the analysis (See Table S1).

Further sub-analysis was carried out comparing model of care and the effect of the PECS intervention within each model of care using the same generalised mixed effects models. Given the reduction of power inherent in the subsampling, results with a p-value < 0.1 are considered to be of interest.

2.6. Ethical considerations

Ethics approval from the hospital, (Reference: RES-20–0000–157A), was obtained before the commencement of the study. All participants were briefed in detail on the research process before their consent were obtained. Participation was strictly voluntary, and participants were informed they may withdraw at any time without consequence.

3. Results

The study recruited 69 women, 43 in the intervention and 26 in the control group with no statistically significant demographic differences (Table 3). All women (69, 100%) provided EPDS and DASS-21 data at baseline and 53 (77%) provided EPDS and DASS-21 data at one or more subsequent timepoints. Full recruitment and participant flow are shown in the consort diagram, Fig. 1.

The small group psychoeducation component of the PECS-Intervention was well attended. Of the 43 women who enrolled, 33 (76.74%) attended five or more of the sessions. Despite the sample group being drawn from a pool of first-time mothers who indicated no history of mental health issues during their pregnancy booking-in appointment, 19% of the control group and 37% of the intervention group disclosed a history of mental health issues (i.e., a diagnosis of anxiety and/or depression) in the first antenatal questionnaire (Timepoint 1). A significant interactive effect of the hybrid model of care with time was seen in the DASS depression score (−1.17, 95% CI: 1.81, −0.53) and the EPDS (−0.83, 95% CI: 1.5, −0.15) (Table 4).

By timepoint 4, the participants in the intervention show a clear reduction in marginal mean depression scores compared to the controls, which increased from baseline (Fig. 2).

The DASS stress score was not affected by time or the intervention (Table 4), while the DASS anxiety score decreased over time in all participants, regardless of intervention group. Sensitivity analysis (Table S2), removing those with a history of mental health issues, shows similar associations.

The team midwifery model of care showed significant increases in stress and depression over time compared to other models with increased continuity of carer (Table S3).

Within this sub-population, the PECS hybrid intervention reduced depression over time as measured by the DASS depression score (−0.98 95% CI:−1.84, −0.13) (Table 5).

The EPDS showed some reduction over time associated with the PECS hybrid intervention in both the Team Midwifery and Collaborative care populations but did not reach significance.

4. Discussion

This quasi-experimental study examined a hybrid model of pregnancy care, i.e., telehealth with fewer in-person health assessments, coupled with concurrent small group interdisciplinary education delivered via video conferencing, that extended into the postnatal period. This research was initially designed to examine an in-person group pregnancy care model based on evidence that suggests improvements in some markers of psychological health outcomes with group pregnancy care [20]. However, the hybrid model was implemented due to the COVID-19 pandemic. This feasibility study demonstrates that small group education scheduled in conjunction with individual pregnancy health assessments can be executed within a busy antenatal clinic with promising results and modest but dedicated staff support.

The intervention showed significant improvement over time in depression scores across both measures – the EPDS and DASS-21 – for women in the PECS hybrid model (intervention). At 6 – 9 weeks

Table 3
Comparison of Control and Intervention groups at baseline.

	Control (n = 26)	Intervention (n = 43)	p-value
Age Group			0.157
18–25	5 (19%)	5 (12%)	
26–35	21 (81%)	33 (77%)	
36–40	0 (0%)	5 (12%)	
Ethnicity			0.269
Caucasian	17 (65%)	24 (56%)	
South Asian	6 (23%)	17 (39%)	
Other	3 (12%)	2 (5%)	
Education			0.398
High School	6 (23%)	9 (21%)	
Incomplete Higher Education	3 (12%)	6 (12%)	
TAFE	6 (23%)	8 (19%)	
Bachelor's degree	11 (42%)	15 (34%)	
Master's degree	0 (0%)	6 (14%)	
Employment			0.471
Full-time	18 (69%)	25 (58%)	
Part-Time/Casual	5 (19%)	8 (19%)	
Unemployed	3 (12%)	10 (53%)	
Relationship Status			0.880
De-facto	8 (31%)	11 (26%)	
Married	16 (62%)	29 (67%)	
Single	2 (8%)	3 (7%)	
Annual Household Income			0.322
Less than $50,000	4 (15%)	6 (14%)	
$50,000 - $100,000	5 (19%)	17 (40%)	
$100,00 - $200,000	16 (62%)	18 (43%)	
More than $200,000	1 (4%)	1 (2%)	
History of Mental Health Issues[1]			0.116
No	21 (81%)	27 (63%)	
Yes	5 (19%)	16 (37%)	
Model of Care[2]	Control (n = 26)	Intervention (n = 43)	0.304
Caseload (continuity of carer)	3 (12%)	4 (9%)	
Collaborative (decreased continuity of carer)	5 (19%)	17 (40%)	
Team Midwife Care (decreased continuity of carer)	15 (58%)	20 (47%)	
Other (continuity of carer)	0 (0%)	2 (5%)	
Speciality Care	2 (8%)	0 (0%)	
Shared Care	1 (4%)	0 (0%)	
Obstetrician (non-hospital)			
Type of Telehealth Visits			0.351
Combination of telephone and web camera	13 (52%)	29 (67%)	
Telephone contact only	4 (16%)	3 (7%)	
Web camera	(32%)	11 26%)	

1. Disclosed in first antenatal questionnaire. 2. Caseload = A single midwife; Collaborative Care = Collaborative care between rotational midwifes and hospital-based doctors; Team Midwife Care = rotational midwives; Other - Shared Care = Care with a Monash accredited affiliate in the community (e.g., GP) and the hospital; Speciality Care = hospital obstetrician or obstetric doctor only; and Obstetrician (non-hospital) = Obstetrician in private practice.

Table 4
Time and interaction effects of the PECS hybrid intervention compared to standard care.

	Time	Time*Intervention
DASS: Stress Score	0.10 (−0.63, 0.83)	-0.63 (−1.56, 0.30)
DASS: Anxiety Score	-0.78 (−1.34, −0.21)**	-0.01 (−0.73, 0.71)
DASS: Depression Score	0.57 (0.01, 1.13)*	-1.17 (−1.81, −0.53)***
EPDS	0.53 (−0.01, 1.06)	-0.83 (−1.5, −0.15)*

* p-value< 0.05
** p-value< 0.01
*** p-value< 0.001

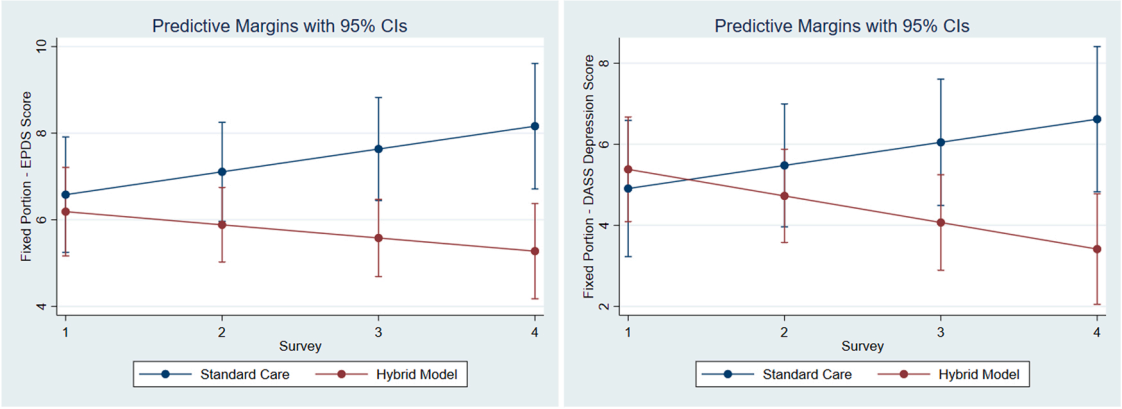

Fig. 2. Marginal mean plots for the fixed proportions of a) EPDS and b) DASS Depression Score. Questionnaire 1 = Antenatal 28–30 weeks; 2 = Antenatal 36–38 weeks; 3 = Postnatal < 4 weeks; 4 = Postnatal 6–9 weeks.

Table 5
Time and interaction effects of the intervention by model of care (Team Midwifery Care) compared to Collaborative, compared to All Other Pregnancy Care Models (increased continuity of carer).

	Time	Time*Intervention
Midwifery Team (n = 35)		
DASS: Stress Score	0.78 (−0.13, 1.69)†	-0.84 (−2.06, 0.38)
DASS: Anxiety Score	-0.71 (−1.36, −0.05)*	0.29 (−0.59, 1.16)
DASS: Depression Score	0.87 (0.23, 1.51)**	-0.98 (−1.84, −0.13)*
EPDS	0.77 (0.11, 1.43)	-0.77 (−1.66, 0.09)†
Collaborative Care (n = 22)		
DASS: Stress Score	-0.17 (−1.60, 1.26)	-0.51 (−2.17, 1.15)
DASS: Anxiety Score	-0.64 (−1.80, 0.52)	-0.33 (−1.67, 1.01)
DASS: Depression Score	-0.17 (−1.17, 0.84)	-0.69 (−1.86, 0.47)
EPDS	0.48 (−0.30, 1.27)	-0.75 (−1.67, 0.16)†
Caseload and Other (n = 12)		
DASS: Stress Score	-1.24 (−3.10, 0.61)	-0.02 (−2.61, 2.58)
DASS: Anxiety Score	-1.19 (−2.73, 0.33)	0.31 (−1.83, 2.46)
DASS: Depression Score	0.57 (−1.16, 2.27)	-1.92 (−4.31, 0.46)
EPDS	0.02 (−1.59, 1.62)	-1.30 (−3.55, 0.95)

***p-value< 0.001
† p-value< 0.1
* p-value< 0.05
** p-value< 0.01

postnatal, no women in the PECS intervention group were identified as depressed (as measured by the EPDS), as compared to the control group. A possible explanation for this finding is the increased support from both health professionals and other parents, which can in-turn bolster self-efficacy. Difficulties reported by women during COVID-19 included the lack of access to formal supports within the maternity services to allay fears of the potential impact of COVID-19 on both mother and infant [62], however the PECS program was able to reduce disruptions and diligently equip women (and partners/ support people) with 'live' education, care and support.

Further, whilst COVID-19 lockdown represented a particularly high-risk period for deterioration in mental health given the level of uncertainty around the transition to parenthood and limited social contact [41], the group format enabled women to maintain social connections. They could openly share experiences within a safe context with other women of similar gestational age, thus helping to normalize and validate collective experiences [61]. Social support, often divided into emotional, instrumental, and informational support, refers to a person's perception of the availability of help or support from others [12], while parenting self-efficacy refers to an individual's belief in their capacity to be a competent parent [79]. Although we did not measure perceived social support or self-efficacy, the broader evidence suggests that higher support and maternal self-efficacy is associated with lower levels of postpartum depressive symptomology [42]. In fact, research further suggests that high self-efficacy is a protective factor for postpartum depression [87]. Therefore, by equipping parents with more support, knowledge and skills so they can feel more competent as parents, we may also decrease depression.

Interestingly, women who receive less social support are thought to be at an increased risk for anxiety [10,69]. Despite this, the present study did not find a significant difference between groups on the DASS-Anxiety measure, as DASS anxiety scores decreased over time in all participants. Existing research summarises risk factors for new onset anxiety and anxiety worsening during the perinatal period, which incorporates psychological, social, and biological exposures [36]. Given this, it is entirely possible that the COVID-19 pandemic heightened anxiety for all women in the present study as supported by a Nationwide survey of pregnant women where it was found that COVID-19 profoundly affected pregnant women's mental health, and factors independent of pregnancy appeared to be driving changes in pregnancy-specific anxiety [63].

In a discrete analysis of pregnancy clinical care, we observed that women in models comprising increased continuity experienced reductions in stress over time while women experiencing less continuity in team midwifery care showed significant increases in stress and depression over time compared to other models. Previous studies of childbearing women who experience continuity of care report that it enables the development of trusting, emotionally supportive relationships with midwives that further allows women to feel safe to disclose sensitive information (e.g., mental health) [30,35,56]. It may be that because women in continuity models feel safer and more positive, it is possible that this care acts as a moderator of the effects of stress [34]. There are two possible explanations for why continuity is difficult to achieve. Firstly, while team midwifery care was originally designed to provide continuity of care with small teams of midwives in collaboration with obstetric staff (e.g., [16]), it appears that continuity is becoming realistically unachievable in a tertiary obstetric hospital. Further, as literature consistently highlights, working in organisations with excessive or stressful workloads is likely to detract midwives from being able to provide quality care [24,28,55].

The other possible explanation may be due to the lack of in-person engagement with the service. Women assigned to team midwifery care are deemed medically low-risk and thus have fewer pregnancy care visits. Further, as a result of the pandemic, women received half or greater of their visits via telehealth. A report of a survey undertaken by the Australian College of Midwives (ACM) earlier in the first wave of the pandemic confirmed that the impact of service changes on women in Australia during the pandemic was substantial [25]. This is a concern for the future of maternity services with the reduction of face-to-face antenatal appointments is likely to continue as part of routine service

delivery [19].

Another interesting finding that emerged involved several disclosures from women of a previous history of mental health. During the hospital booking-in appointment it is routine practice for women to be asked about their psychosocial circumstances. This criteria (no history of mental health) was used to recruit low-risk women into the study. Despite this, several women disclosed a history of mental health via the online questionnaire. In Australia, a psychosocial assessment inclusive of mental health screening is recommended as part of a holistic and woman-centred approach to care in both the *Mental Healthcare in the Perinatal Period* guidelines [4] and the *Clinical Practice Guidelines for pregnancy care* [47]. The present study findings go some way to support existing literature in that screening is poorly implemented into routine practice [18]. Study findings further substantiate the role of continuity in care, as it may potentially support women's disclosure of sensitive information [64], as well as being an important factor in determining the acceptability of mental health care [83].

Overall, our results showed that the PECS intervention had a meaningful effect, with reductions over time on both the EPDS and DASS. No differences were detected among models of care with increased continuity (n = 12), which may be because they already have continuity of care, or it may be an artifact of the small sample size leading to not enough power to detect a difference. DASS scores were marginally higher in the experimental group (PECS-Intervention) than the control group, decreasing over time and following the intervention, which may be further indicative for the efficacy of the intervention programme in reducing depression. While a relatively small sample, a strength of this study is that it is population-based study, so results can be generalized to the wider population of women. However, as part of the study selection criteria, women were required to speak and understand English and be deemed medically low-risk which restricted the pool of eligible women. Further, women with poor internet accessibility were likely not included in the study, creating a selection bias in the population studied. Nevertheless, we did recruit women from different ethnic groups. This is an important finding as women from ethnically diverse communities and migrant backgrounds are often reluctant to access health services, while also being at higher risk of poor health outcomes [54,81].

Given the tight timelines and thus the possibility of not recruiting sufficient numbers of women into the intervention arm, this study did not use random allocation. Rather, control groups were recruited following the intervention groups due to a limited number of low-risk first-time women. While recruitment for both arms of the study occurred during lockdown without major changes in government measures, it is possible the mental health of women may have declined due to the prolongation of the pandemic. For example, a longitudinal study showed that prenatal anxiety and depression increased progressively throughout the pandemic [58]. Nevertheless, the fact we were able to recruit a control group in this feasibility trial is a strength given finding participants for trials can be difficult [80]. All the same, while there was good uptake in the education, the results are limited by the small sample size in the control group which was under powered. This further limited additional subgroup analyses regarding the model of care and obstetric outcomes, e.g., birth outcomes. Despite this, the analyses provide important exploratory findings regarding the positive effects of a hybrid model of care with interdisciplinary education in supporting mental health of first-time mothers.

During the pandemic the need for antenatal education was multifarious. In addition to supporting the transition to parenthood, reduced perinatal health attendance led to the sense of unsatisfactory social support [70] and psychological distress was significantly increased [7]. This is now evidenced by preliminary results suggesting the possibility of long-term mental complications from the COVID-19 pandemic [31]. A question for consideration as we move out of restrictions, is whether online antenatal education may be as effective, when compared to in-person participation. It may be that simply getting some continuity and education in preparation for birth and early parenting at a time when face-to-face antenatal education was not available, influenced our results. While online delivery was necessitated, future research could explore the modalities of antenatal education against women's perceptions and clinical outcomes. Further, while we cannot generalise our results to all settings, particularly those where not all women receive antenatal education, this model shows feasibility in online delivery. Thus, it may be an equitable solution in other settings and for those who otherwise miss out, e.g., rural and remote women, provided there is suitable telecommunication infrastructure.

Although digital technology offers new opportunities [76], preliminary evidence exploring childbirth educators experiences suggest women and their partners may not be getting the full experience [65]. We agree with this and would go one step further to acknowledge learner motivation as women don't always know what they need to know [21]. As a result of the spatial separation in online delivery, women need to be more proactive and self-driven to attend to avoid missing key learning opportunities. Further, while online education could transcend traditional geographic obstacles to reach more women, we must not ignore potential social inequalities [9]. For example, we cannot assume everyone has access to telco infrastructure and we must acknowledge the differences in digital literacy. Whilst there are numerous factors to consider, given its potential role, antenatal education merits higher prioritisation in contemporary maternity services [77].

5. Conclusion

In response to the coronavirus disease 2019 (COVID-19), came the rapid implementation of remote antenatal care, i.e., telehealth, with fewer in-person consultations, due to pregnant women being considered a vulnerable group. A change in service delivery to telehealth in antenatal care was brought in to manage public health measures such as social distancing and self-isolation to lower women's risk of exposure to the virus. However, this represented an increased threat to women's mental health, given the already heightened needs for both medical and social support during the transition to parenthood [74]. To facilitate the transition to parenthood, the PECS programme targeted known risk-factors and potentially modifiable factors, e.g., self-efficacy and social support, including access to women's health information and services. Whilst there was no difference in stress and anxiety, women in the PECS-Intervention group demonstrated significant improvement over time in depression scores. A future direction could be trialling the model in a more symptomatic cohort of women, particularly given the safeguard design of the model which includes several touchpoints with perinatal health professionals. This is of significance given that postnatal depression comes at a large cost to society and women—both in terms of the sustained health consequences for women and their children, and also the financial costs of healthcare services [23].

There are complex challenges in providing high-quality care to diverse and vulnerable populations, and as the COVID-19 pandemic continues to impact maternity care in Australia and globally, more consideration into evidence-based health care delivery is needed to support the often complex psychosocial and physical needs of childbearing women. This research has highlighted that education and support can be provided online and likely to contribute to improvements in mental health. Further, the current research presents a way of incorporating education and support into maternity care that enables, rather than obstructs, a range of needs being met via an interdisciplinary approach that shows promise beyond direct clinical features. Therefore, in totality this model has the potential application to upscale, outside pandemic, reaching remote and rural women. Now more than ever is an opportunity for public health intervention in antenatal care to address psychosocial risk that often leads to poor perinatal outcomes.

Ethical statement

None to declare.

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Conflict of interest

The authors declare no conflict of interest.

CRediT authorship contribution statement

Melissa Buultjens: Conceptualization, Writing – original draft, Methodology & analysis, Writing – review & editing. **Jessica Gill:** Conceptualization, Writing – original draft. **Jennifer Fielding:** Conceptualization, Writing – original draft. **Katrina A. Lambert:** Methodology & analysis, Writing – review & editing. **Kirsty Vondeling:** Conceptualization, Writing – review & editing. **Sally Mastwyk:** Conceptualization, Writing – review & editing. **Sarita Sloane:** Conceptualization, Writing – review & editing. **Wendy Fedele:** Conceptualization, Writing – review & editing. **Leila Karimi:** Methodology & analysis, Writing – review & editing. **Jeannette Milgrom:** Conceptualization, Writing – review & editing. **Kathryn von Treuer:** Writing – review & editing. **Bircan Erbas:** Writing – review & editing.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.wombi.2022.09.007.

References

[1] M.A. Al-Ateeq, A.A. Al-Rusaiess, Health education during antenatal care: the need for more, Int. J. Women'S. Health 7 (2015) 239.
[2] L. Ambroggio, M.J. Smith, S.S. Shah, Editorial Commentary: Quasi-experimental And Interrupted Time-series Design, Oxford University Press, 2012.
[3] N.A.L. Amin, W.W. Tam, S. Shorey, Enhancing first-time parents' self-efficacy: a systematic review and meta-analysis of universal parent education interventions' efficacy, Int. J. Nurs. Stud. 82 (2018) 149–162.
[4] M.P. Austin, N. Highet, E.W. Group, Mental Health Care in the Perinatal Period: Australian Clinical Practice Guideline, Centre of Perinatal Excellence, Melbourne, 2017, pp. 659–668.
[5] Australian Bureau of Statistics (Producer) ,2018. Births, Australia 2017 (Catalogue 3301.0). Retrieved from ⟨http://www.abs.gov.au/ausstat%5Cabs@.nsf/0/8668A9A0D4B0156CCA25792F0016186A?Opendocument⟩.
[6] Australian Bureau of Statistics., 2020. Births, Australia. Retrieved from ⟨https://www.abs.gov.au/statistics/people/population/births-australia/latest-release#data-download⟩.
[7] R. Ayaz, M. Hocaoğlu, T. Günay, O. devrim Yardımcı, A. Turgut, A. Karateke, Anxiety and depression symptoms in the same pregnant women before and during the COVID-19 pandemic, J. Perinat. Med. 48 (9) (2020) 965–970.
[8] M. Barimani, K.F. Frykedal, M. Rosander, A. Berlin, Childbirth and parenting preparation in antenatal classes, Midwifery 57 (2018) 1–7.
[9] E. Beaunoyer, S. Dupéré, M.J. Guitton, COVID-19 and digital inequalities: reciprocal impacts and mitigation strategies, Comput. Hum. Behav. 111 (2020), 106424.
[10] A. Bedaso, J. Adams, W. Peng, D. Sibbritt, The relationship between social support and mental health problems during pregnancy: a systematic review and meta-analysis, Reprod. Health 18 (1) (2021) 1–23.
[11] C. Benoit, E. Declercq, S.F. Murray, J. Sandall, E. van Teijlingen, S. Wrede, Maternity Care as a Global Health Policy Issue. In, in: E. Kuhlmann, R.H. Blank, I. L. Bourgeault, C. Wendt (Eds.), The palgrave international handbook of healthcare policy and governance, Palgrave Macmillan, London, 2015.
[12] L.F. Berkman, T. Glass, I. Brissette, T.E. Seeman, From social integration to health: Durkheim in the new millennium, Soc. Sci. Med. 51 (6) (2000) 843–857.
[13] J.L. Bernal, S. Cummins, A. Gasparrini, Interrupted time series regression for the evaluation of public health interventions: a tutorial, Int. J. Epidemiol. 46 (1) (2017) 348–355.
[14] A. Biaggi, S. Conroy, S. Pawlby, C.M. Pariante, Identifying the women at risk of antenatal anxiety and depression: a systematic review, J. Affect. Disord. 191 (2016) 62–77.
[15] Billett, H., Corona, M.V., Bohren, M.A., 2021. Women from migrant and refugee backgrounds' perceptions and experiences of the continuum of maternity care in Australia: A qualitative evidence synthesis. Women and Birth.
[16] M.A. Biro, U. Waldenström, J.H. Pannifex, Team midwifery care in a tertiary level obstetric service: a randomized controlled trial, Birth 27 (3) (2000) 168–173.
[17] P. Boyce, J. Stubbs, A. Todd, The Edinburgh postnatal depression scale: validation for an Australian sample, Aust. N. Z. J. Psychiatry 27 (3) (1993) 472–476.
[18] J.A. Boyle, S. Willey, R. Blackmore, C. East, J. McBride, K. Gray, N. Highet, Improving mental health in pregnancy for refugee women: protocol for the implementation and evaluation of a screening program in Melbourne, Australia, JMIR Res. Protoc. 8 (8) (2019), e13271.
[19] Z. Bradfield, Y. Hauck, C.S. Homer, L. Sweet, A.N. Wilson, R.A. Szabo, L. Kuliukas, Midwives' experiences of providing maternity care during the COVID-19 pandemic in Australia, Women Birth (2021).
[20] M. Buultjens, A. Farouque, L. Karimi, L. Whitby, J. Milgrom, B. Erbas, The contribution of group prenatal care to maternal psychological health outcomes: a systematic review, Women Birth 34 (6) (2021) e631–e642.
[21] M. Buultjens, G. Murphy, M. Ruddock-Hudson, J. Milgrom, A. Taket, A qualitative study of women's experience of a perinatal group health-promoting programme, Br. J. Midwifery 27 (2) (2019) 106–114.
[22] M. Buultjens, P. Robinson, P. Liamputtong, A holistic programme for mothers with postnatal depression: pilot study, J. Adv. Nurs. 63 (2) (2008) 181–188.
[23] E.J. Callander, J. Gamble, D.K. Creedy, Postnatal major depressive disorder in Australia: inequalities and costs of healthcare to individuals, governments and insurers, Pharmacoeconomics 39 (6) (2021) 731–739.
[24] C. Catling, C. Rossiter, Midwifery workplace culture in Australia: a national survey of midwives, Women Birth 33 (5) (2020) 464–472.
[25] Cooper, M., King, R., 2020. Women's experiences of maternity care during the height of the COVID-19 pandemic in Australia.
[26] L. Corscadden, E. Callander, S. Topp, D. Watson, Experiences of maternity care in New South Wales among women with mental health conditions, BMC Pregnancy Childbirth 20 (2020) 1–13.
[27] J.L. Cox, J.M. Holden, R. Sagovsky, Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale, Br. J. Psychiatry 150 (6) (1987) 782–786.
[28] J. Cull, B. Hunter, J. Henley, J. Fenwick, M. Sidebotham, "Overwhelmed and out of my depth": Responses from early career midwives in the United Kingdom to the Work, Health and Emotional Lives of Midwives study, Women Birth 33 (6) (2020) e549–e557.
[29] C.-L. Dennis, K. Falah-Hassani, R. Shiri, Prevalence of antenatal and postnatal anxiety: systematic review and meta-analysis, Br. J. Psychiatry 210 (5) (2017) 315–323.
[30] N. Dharni, H. Essex, M. Bryant, A. Cronin de Chavez, K. Willan, D. Farrar, J. Dickerson, The key components of a successful model of midwifery-led continuity of carer, without continuity at birth: findings from a qualitative implementation evaluation, BMC Pregnancy Childbirth 21 (1) (2021) 1–11.
[31] F. Durankuş, E. Aksu, Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study, J. Matern. -Fetal Neonatal Med. 35 (2) (2022) 205–211.
[32] A.A. Entsieh, I.K. Hallström, First-time parents' prenatal needs for early parenthood preparation-A systematic review and meta-synthesis of qualitative literature, Midwifery 39 (2016) 1–11.
[33] S. Ferguson, D. Davis, J. Browne, Does antenatal education affect labour and birth? A structured review of the literature, Women Birth 26 (1) (2013) e5–e8.
[34] C. Fernandez Turienzo, H. Rayment-Jones, Y. Roe, S.A. Silverio, K. Coxon, A. H. Shennan, J. Sandall, A realist review to explore how midwifery continuity of care may influence preterm birth in pregnant women, Birth 48 (3) (2021) 375–388.
[35] D.A. Forster, H.L. McLachlan, M.-A. Davey, M.A. Biro, T. Farrell, L. Gold, U. Waldenström, Continuity of care by a primary midwife (caseload midwifery) increases women's satisfaction with antenatal, intrapartum and postpartum care: results from the COSMOS randomised controlled trial, BMC Pregnancy Childbirth 16 (1) (2016) 1–13.
[36] M. Furtado, C.H. Chow, S. Owais, B.N. Frey, R.J. Van Lieshout, Risk factors of new onset anxiety and anxiety exacerbation in the perinatal period: a systematic review and meta-analysis, J. Affect. Disord. 238 (2018) 626–635.
[37] S. Gentile, Untreated depression during pregnancy: short-and long-term effects in offspring. A systematic review, Neuroscience 342 (2017) 154–166.
[38] V. Glover, Prenatal Stress and Its Effects on the Fetus and the Child: Possible Underlying Biological Mechanisms. Perinatal programming of neurodevelopment, Springer, 2015, pp. 269–283.
[39] V. Glover, Prenatal mental health and the effects of stress on the foetus and the child. Should psychiatrists look beyond mental disorders? World Psychiatry 19 (3) (2020) 331.
[40] B. Gray, Unmet need and antenatal care, N. Z. Med. J. (Online) 130 (1455) (2017) 133.
[41] V. Harrison, M.L. Moulds, K. Jones, Perceived social support and prenatal wellbeing; The mediating effects of loneliness and repetitive negative thinking on anxiety and depression during the COVID-19 pandemic, Women Birth (2021).

[42] D.M. Haslam, K.I. Pakenham, A. Smith, Social support and postpartum depressive symptomatology: the mediating role of maternal self-efficacy, Infant Ment. Health J. 27 (3) (2006) 276–291.
[43] K. Heinonen, Strengthening antenatal care towards a salutogenic approach: a meta-ethnography, Int. J. Environ. Res. Public Health 18 (10) (2021) 5168.
[44] J.D. Henry, J.R. Crawford, The short-form version of the Depression Anxiety Stress Scales (DASS-21): construct validity and normative data in a large non-clinical sample, Br. J. Clin. Psychol. 44 (2) (2005) 227–239.
[45] Á.M. Herval, D.P.D. Oliveira, V.E. Gomes, A.M.D. Vargas, Health education strategies targeting maternal and child health: a scoping review of educational methodologies, Medicine 98 (26) (2019).
[46] C.S. Homer, D.L. Davis, L. Mollart, S. Turkmani, R.M. Smith, M. Bullard, M. Foureur, Midwifery continuity of care and vaginal birth after caesarean section: a randomised controlled trial, Women Birth (2021).
[47] C.S. Homer, J. Oats, P. Middleton, J. Ramson, S. Diplock, Updated clinical practice guidelines on pregnancy care, Med. J. Aust. 209 (9) (2018) 409–412.
[48] J. Hudson, S. Fielding, C.R. Ramsay, Methodology and reporting characteristics of studies using interrupted time series design in healthcare, BMC Med. Res. Methodol. 19 (1) (2019) 1–7.
[49] G. Iwanowicz-Palus, M. Mróz, A. Korda, A. Marcewicz, A. Palus, Perinatal anxiety among women during the COVID-19 pandemic—a cross-sectional study, Int. J. Environ. Res. Public Health 19 (5) (2022) 2603.
[50] Kasamatsu, H., Tsuchida, A., Matsumura, K., Shimao, M., Hamazaki, K., & Inadera, H., 2020. Understanding the relationship between postpartum depression one month and six months after delivery and mother-infant bonding failure one-year after birth: results from the Japan Environment and Children's study (JECS). *Psychological medicine*, 50(1), 161–169.
[51] D.J. Kavanagh, J. Connolly, J. Fisher, W.K. Halford, K. Hamilton, L. Hides, K. M. White, The baby steps web program for the well-being of new parents: randomized controlled trial, J. Med. Internet Res. 23 (11) (2021), e23659.
[52] L. Kearney, M. Kynn, A. Craswell, R. Reed, The relationship between midwife-led group-based versus conventional antenatal care and mode of birth: a matched cohort study, BMC Pregnancy Childbirth 17 (1) (2017) 1–7.
[53] M. Koblinsky, C.A. Moyer, C. Calvert, J. Campbell, O.M. Campbell, A.B. Feigl, Z. Matthews, Quality maternity care for every woman, everywhere: a call to action, Lancet 388 (10057) (2016) 2307–2320.
[54] A.Y. Lang, R. Bartlett, T. Robinson, J.A. Boyle, Perspectives on preconception health among migrant women in Australia: a qualitative study, Women Birth 33 (4) (2020) 334–342.
[55] L. Lewis, C. Barnes, L. Roberts, L. McLeod, A. Elliott, Y.L. Hauck, The practice reality of ward based midwifery care: an exploration of aspirations and restrictions, Women Birth 33 (4) (2020) 352–359.
[56] L. Lewis, Y.L. Hauck, C. Crichton, A. Pemberton, M. Spence, G. Kelly, An overview of the first 'no exit'midwifery group practice in a tertiary maternity hospital in Western Australia: outcomes, satisfaction and perceptions of care, Women Birth 29 (6) (2016) 494–502.
[57] Q. Li, X. Guan, P. Wu, X. Wang, L. Zhou, Y. Tong, J.Y. Wong, Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia, N. Engl. J. Med. (2020).
[58] H. López-Morales, M.V. Del Valle, L. Canet-Juric, M.L. Andrés, J.I. Galli, F. Poó, S. Urquijo, Mental health of pregnant women during the COVID-19 pandemic: a longitudinal study, Psychiatry Res. 295 (2021), 113567.
[59] Lovibond, S., Lovibond, P., 1995. Manual for the depression anxiety stress scales. (2nd. Ed.). Retrieved from ⟨http://www2.psy.unsw.edu.au/dass//⟩.
[60] N. Manzari, K. Matvienko-Sikar, F. Baldoni, G.W. O'Keeffe, A.S. Khashan, Prenatal maternal stress and risk of neurodevelopmental disorders in the offspring: a systematic review and meta-analysis, Soc. Psychiatry Psychiatr. Epidemiol. 54 (11) (2019) 1299–1309.
[61] Z. Massey, S.S. Rising, J. Ickovics, CenteringPregnancy group prenatal care: promoting relationship-centered care, J. Obstet. Gynecol. Neonatal Nurs. 35 (2) (2006) 286–294.
[62] S. Meaney, S. Leitao, E.K. Olander, J. Pope, K. Matvienko-Sikar, The impact of COVID-19 on pregnant womens' experiences and perceptions of antenatal maternity care, social support, and stress-reduction strategies, Women Birth (2021).
[63] C.A. Moyer, S.D. Compton, E. Kaselitz, M. Muzik, Pregnancy-related anxiety during COVID-19: a nationwide survey of 2740 pregnant women, Arch. Women's Ment. Health 23 (6) (2020) 757–765.
[64] U. Nagle, M. Farrelly, Women's views and experiences of having their mental health needs considered in the perinatal period, Midwifery 66 (2018) 79–87.
[65] M. Nolan, Educators' experience of facilitating antenatal education online, Int. J. Birth Parent Educ. (2021).
[66] G. Novick, Women's experience of prenatal care: an integrative review, J. Midwifery Women's Health 54 (3) (2009) 226–237.
[67] NSW Ministry of Health, 2019. The first 2000 days 5 Framework, NSW Health. Retrieved from North Sydney: ⟨https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2019_008.pdf⟩.
[68] F.A. Ogbo, J. Eastwood, A. Hendry, B. Jalaludin, K.E. Agho, B. Barnett, A. Page, Determinants of antenatal depression and postnatal depression in Australia, BMC Psychiatry 18 (1) (2018) 1–11.
[69] P.J. Peter, C.L. de Mola, M.B. de Matos, F.M. Coelho, K.A. Pinheiro, R.A. da Silva, L. A. Quevedo, Association between perceived social support and anxiety in pregnant adolescents, Braz. J. Psychiatry 39 (2016) 21–27.
[70] C. Polchleb, L. Sung, COVID-19 and pandemic perinatal mental health in Australia, Aust. J. Gen. Pr. (2021) *50*.
[71] D. Pollock, M. Cooper, A. McArthur, T. Barker, Z. Munn, Women's experiences of their interactions with health care providers during the postnatal period in Australia: a qualitative systematic review protocol, JBI Evid. Synth. 19 (3) (2021) 622–628.
[72] L.C. Poon, H. Yang, A. Kapur, N. Melamed, B. Dao, H. Divakar, E.M. Ferrazzi, Global interim guidance on coronavirus disease 2019 (COVID-19) during pregnancy and puerperium from FIGO and allied partners: Information for healthcare professionals, Int. J. Gynecol. Obstet. 149 (3) (2020) 273–286.
[73] L. Regan, Addressing unmet needs in global women's health, Br. Med. Assoc. (2018).
[74] D. Saxbe, M. Rossin-Slater, D. Goldenberg, The transition to parenthood as a critical window for adult health, Am. Psychol. 73 (9) (2018) 1190.
[75] V. Schmied, D. Bick, Postnatal care: current issues and future challenges, Midwifery (2014) 571–574.
[76] A. Skulmowski, K.M. Xu, Understanding cognitive load in digital and online learning: A new perspective on extraneous cognitive load, Educ. Psychol. Rev. (2021) 1–26.
[77] H. Spiby, J. Stewart, K. Watts, A.J. Hughes, P. Slade, The importance of face to face, group antenatal education classes for first time mothers: a qualitative study, Midwifery 109 (2022), 103295.
[78] J. Svensson, L. Barclay, M. Cooke, Randomised-controlled trial of two antenatal education programmes, Midwifery 25 (2) (2009) 114–125.
[79] D.M. Teti, D.M. Gelfand, Behavioral competence among mothers of infants in the first year: The mediational role of maternal self-efficacy, Child Dev. 62 (5) (1991) 918–929.
[80] S. Treweek, M. Pitkethly, J. Cook, C. Fraser, E. Mitchell, F. Sullivan, H. Gardner, Strategies to improve recruitment to randomised trials, Cochrane Database Syst. Rev. (2) (2018).
[81] H. Tuomainen, L. Cross-Bardell, M. Bhoday, N. Qureshi, J. Kai, Opportunities and challenges for enhancing preconception health in primary care: qualitative study with women from ethnically diverse communities, BMJ Open 3 (7) (2013), e002977.
[82] B.R. Van den Bergh, M.I. van den Heuvel, M. Lahti, M. Braeken, S.R. de Rooij, S. Entringer, S. King, Prenatal developmental origins of behavior and mental health: the influence of maternal stress in pregnancy, Neurosci. Biobehav. Rev. (2017).
[83] C.J. Viveiros, E.K. Darling, Barriers and facilitators of accessing perinatal mental health services: the perspectives of women receiving continuity of care midwifery, Midwifery 65 (2018) 8–15.
[84] I. Wiklund, J. Wiklund, V. Pettersson, A.-M. Boström, New parents' experience of information and sense of security related to postnatal care: a systematic review, Sex. Reprod. Healthc. 17 (2018) 35–42.
[85] World Health Organization, WHO recommendations on antenatal care for a positive pregnancy experience, World Health Organization, 2016.
[86] World Health Organization, 2020. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Press release]. Retrieved from ⟨https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020⟩.
[87] Y. Zhang, S. Jin, The impact of social support on postpartum depression: the mediator role of self-efficacy, J. Health Psychol. 21 (5) (2016) 720–726.