



Contents lists available at ScienceDirect

Women and Birth

journal homepage: www.sciencedirect.com/journal/women-and-birth

Does midwifery continuity of care make a difference to women with perinatal mental health conditions: A cohort study, from Australia

Allison Cummins^{a,*}, Kathleen Baird^b, Sarah J. Melov^{c,d}, Lena Melhem^e, Carolyn Hilsabeck^e,
Monica Hook^e, James Elhindi^c, Dharmintra Pasupathy^{c,d}

^a School of Nursing and Midwifery, College of Health, Medicine and Wellbeing, University of Newcastle, Australia

^b Centre for Midwifery, Child and Family Health, University of Technology Sydney, 235 Jones St, Ultimo, NSW 2007, Australia

^c Reproduction and Perinatal Centre, Faculty of Medicine and Health, University of Sydney, Australia

^d Westmead Institute for Maternal and Fetal Medicine, Women's and Newborn Health, Westmead Hospital, NSW, Australia

^e Women's and Newborn's Health, Westmead Hospital, Western Sydney Local Health Districts, Australia

ARTICLE INFO

Keywords:

Perinatal mental health

Midwifery continuity of care, pre-term birth

ABSTRACT

Background: Perinatal mental health (PMH) conditions are associated with an increased risk of adverse perinatal outcomes including preterm birth. Midwifery caseload group practice (continuity of care, MCP) improves perinatal outcomes including a 24 % reduction of preterm birth. The evidence is unclear whether MCP has the same effect for women with perinatal mental health conditions.

Aim: To compare perinatal outcomes in women with a mental health history between MCP and standard models of maternity care. The primary outcome measured the rates of preterm birth.

Methods: A retrospective cohort study using routinely collected data of women with PMH conditions between 1st January 2018 – 31st January 2021 was conducted. We compared characteristics and outcomes between groups. Multivariate logistic regression models were performed adjusting for a-priori selected variables and factors that differ between models of care.

Results: The cohort included 3028 women with PMH, 352 (11.6 %) received MCP. The most common diagnosis was anxiety and depression (n = 723, 23.9 %). Women receiving MCP were younger (mean 30.9 vs 31.3, p = 0.03), Caucasian (37.8 vs 27.1, p < 0.001), socio-economically advantaged (31.0 % vs 20.2, p < 0.001); less likely to smoke (5.1 vs 11.9, p < 0.001) and with lower BMI (mean 24.3 vs 26.5, p < 0.001) than those in the standard care group. Women in MCP had lower odds of preterm birth (adjOR 0.46, 95 % CI 0.24–0.86), higher odds of vaginal birth (adjOR 2.55, 95 % CI 1.93–3.36), breastfeeding at discharge (adj OR 3.06, 95 % CI 2.10–4.55) with no difference in severe adverse neonatal outcome (adj OR 0.79, 95 % CI 0.57–1.09).

Conclusions: This evidence supports MCP for women with PMH. Future RCTs on model of care for this group of women is needed to establish causation.

Statement of Significance

Problem or issue

Perinatal mental health (PMH) conditions such as anxiety and depression are common. Women with PMH conditions are more likely to have a baby born preterm.

What is already known

Midwifery continuity of care is beneficial to mothers and babies with a demonstrated effect of reducing preterm birth. Midwifery continuity of care (caseload) typically provides care to women with a normal or low risk pregnancy, therefore women with PMH conditions are often unable to access the model due to psychosocial risk factors.

* Corresponding author.

E-mail address: Allison.cummins@Newcastle.edu.au (A. Cummins).

<https://doi.org/10.1016/j.wombi.2022.08.002>

Received 13 April 2022; Received in revised form 31 July 2022; Accepted 2 August 2022

1871-5192/© 2022 The Authors. Published by Elsevier Ltd on behalf of Australian College of Midwives. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

What this paper adds

Women with a perinatal mental health condition who received midwifery continuity of care were less likely to experience preterm birth and the risk of adverse neonatal outcomes were similar to women receiving standard care. The findings indicate that pregnancy outcomes in women with this model of care may be comparable to women who received standard care (mix of midwives, obstetricians and general practitioners). They were also more likely to have a vaginal birth and be breastfeeding at the time of discharge. The women in the midwifery caseload group were younger, more likely to be Caucasian, had a lower BMI and live in an area of advantage compared to those who received standard care.

1. Background

The perinatal period from conception up to 12 months post-birth, can be a time of increased risk for mental health disorders. Studies from Australia and other parts of the world have found that up to one in ten women will experience depression during pregnancy and one in seven the year following birth [1]. Anxiety disorders are also predominant in the antenatal and postnatal period with around one in five women at risk of developing anxiety [1].

Perinatal mental health conditions are significantly associated with maternal morbidity, mortality and adverse neonatal outcomes [2,3]. Perinatal mental health conditions are often undetected and untreated, imposing a great burden on women, their families, the health system, and society more broadly [4–7].

Women who suffer from perinatal mental health conditions such as depression and anxiety are more likely to have a baby born preterm [4, 8]. A systematic review that measured the effects of maternal depression, anxiety, and perceived stress during pregnancy on preterm birth, included 39 papers [4]. The reported preterm birth rates for this group of women ranged from 4.1 % to 23 % (mean = 9.1) [4]. This is higher than the Australian preterm birth average of 8.6 % (<37 weeks gestation) [9]. Preterm birth is a major contributor to global rates of stillbirth, neonatal death, and longer-term health problems for surviving infants [7,10,11]. Considerable research has been conducted with a focus on the prevention of preterm birth one intervention found to be successful is midwife-led continuity of care [10]. A Cochrane systematic review conducted in 2016 compared midwife-led continuity of care, defined as care provided by one midwife or a small group of midwives through pregnancy, birth and the postnatal period, with standard models of maternity care (a mix of midwifery staff, general practitioners (GPs) and/or obstetric staff). The review confirmed midwife-led continuity of care, reduced preterm birth by 24 % [12]. However, most of the studies included in the review [12] excluded women with a known medical complication and psychosocial conditions. Presently, there is limited evidence on the effect of midwifery continuity of care for women with substantial medical or obstetric complications [12]. Studies from the United Kingdom (UK) have established a significant reduction in the preterm birth rate in women with increased social diversity including Black, Asian and Minority Ethnic (BAME) groups, when care was provided within a midwifery continuity of care model [13,14]. In Australia, a midwifery continuity of care model for young women (aged 21 years or less) increased engagement and reduced predictors for preterm birth such as smoking and genitourinary infections [15]. A recent pilot trial of midwifery continuity of care for women with known risk factors for preterm birth found no significant differences on a composite of appropriate and timely interventions for the prevention and/or management of preterm labour and birth or secondary outcomes but did find that the woman had more than 75 % of antenatal and postnatal visits provided by a named/partner midwife, and a midwife from the team was present at 80 % of the births [16]. The authors concluded larger

appropriately powered trials are needed to evaluate the impact of relational continuity and the effect of trust and engagement, improved care coordination, and earlier referral for women with complex social factors and social vulnerability [16]. Evidence suggests counselling interventions led by midwives can result in improved physical and mental health outcomes for women [17]. However organisational barriers such as busy workloads, lack of time, lack of privacy, infrequent visits and conflicts in the organisation's priorities can hinder midwives' ability to incorporate mental healthcare into their practice [17,18]. An international systematic review conducted by Webb et. al (2021) proposes perinatal mental health services should be flexible and woman centred, facilitated by well-trained health professionals working within a structure that facilitates continuity of carer [19]. Midwives providing continuity of care habitually develop and sustain a sense of connection and rapport with women, a prerequisite for discussing perinatal mental health condition [20]. Fragmented models of care and insufficient time is reported as a barrier to building rapport and discussing perinatal mental health conditions with women [20]. The Australian Clinical Practice Guidelines for Mental Health Care in the Perinatal Period also articulates the benefits of midwifery continuity of care for women with perinatal mental health conditions, however, in practice, this is seldom implemented [1]. Most Australian MCP's are established to focus on women with a normal or low risk pregnancy and therefore a referral is often necessary for women with perinatal mental health conditions [21].

Irrespective of the increasing evidence confirming the benefits of midwifery continuity of care [22], the first Australian National Report on Models of Care in 2021 corroborated that only 15 % of pregnant women have access to midwifery continuity of care [19]. Almost half of all Australian women (41 %) receive public hospital maternity care, where they receive antenatal care in hospital outpatient clinics by midwives and/or obstetricians. Intrapartum and postnatal care is usually provided by different midwives and obstetricians as required [23]. Whereas women accessing midwifery continuity of care defined as midwifery group practice caseload care (MCP) receive antenatal, intrapartum and postnatal care by a known primary midwife (with a support midwife in a team of four midwives), in collaboration with obstetricians in the event of any medical or obstetric risk factors [23]. The majority of women accessing MCP have what is considered to be a low risk pregnancy, although some models of care (not specifically midwifery group practice caseload) specifically target just 4 % of women with a mental health condition [23].

The aim of this study is to determine if midwifery group caseload practice (MCP) is associated with improved perinatal outcomes for women who have anxiety and/or depression and/or another perinatal mental health condition compared to standard models of care (mixed midwife/GP/obstetric). The primary outcome of interest was preterm birth.

2. Methods**2.1. Study design**

Retrospective cohort study that compared the outcomes of women who received MCP with those who received standard maternity care using routinely collected data from 1st of January 2018 until the 31st of January 2021.

2.2. Setting

The study was set in a large tertiary referral hospital with approximately 5500 births per year. Midwifery group practice caseload care (MCP) is provided by sixteen full-time equivalent hospital employed midwives. Fifteen midwives were employed in a full-time position and two midwives were employed in a part-time position, seventeen midwives working in pairs or small teams of up to four midwives in each group. Antenatal and postnatal care is provided in the woman's home

(community) and in the hospital setting. Women give birth in the hospital setting with a known midwife. Since collecting this data publicly funded homebirth has been offered to women receiving MCP however none of the women in this study cohort birthed at home.

At the time of their antenatal booking appointment women would have been classified as having a low – risk pregnancy with no immediate health or obstetric risk factors as defined by the Australian College of Midwives guidelines for consultation and referral [21]. Most women self-refer to MCP before the woman's first antenatal appointment. The woman is categorised as low risk via a phone call or by reviewing the referral letter from a General Practitioner (GP). Most women in MCP will have their first visit with the MCP midwife who will continue to provide care throughout pregnancy, birth and the postnatal period. Women who have their first antenatal visit in the standard model of care can request MCP if they are categorised low risk. This group of women are placed in a low-risk midwives' antenatal clinic while they await confirmation of a MCP place. Women who have medium risk (e.g., history of premature birth, hypothyroidism, or vaginal birth after caesarean) can request MCP, but require approval by an obstetrician before they can access MCP. Only women with a category of a high-risk pregnancy (e.g., Pre-existing diabetes, fetal anomalies, or hypertension) are unable to request MCP.

Regardless of any pregnancy or medical complication that may develop during the pregnancy women remained in this model of care. Midwives care for an annual caseload of 35 women per midwife per year. The woman's primary midwife is on-call and available five days per week; in the event of the midwife being unavailable (e.g., day off or annual leave) the woman was cared for by a back-up, support caseload midwife that the woman would have met previously. Women receiving standard care saw a mix of General Practitioners, hospital employed midwives and obstetricians.

2.3. Study population

The study population included all women who received MCP care or standard care from the 1st of January 2018 until the 31st of January 2021. This cohort has a sample size of convenience, with a start date when the updated standardised maternity electronic database (that collected all the variables of interest) was fully implemented. The database 'Maternity Information System' is used for the health district and is part of a statewide maternity database system that provides data collection and reporting for inpatient documentation, outpatient electronic medical records, research, and mandated state reporting to the Ministry of Health. All data is entered by the midwife during episodes of care antenatally, during labour and birth and postnatally [24].

Women were included in the study if they met the inclusion criteria; 'women who booked and birthed at the hospital with a singleton pregnancy, baby without a diagnosed congenital abnormality, attendance for at least two scheduled antenatal appointments and were classified as having a public insurance status'.

Australian women with the universal health insurance scheme (Medicare) can access maternity care at no cost. Around 30 % of Australian women will choose to use private health insurance to pay for an obstetrician for pregnancy care, birth and postnatal visits (which may provide some level of continuity of care) [25]. This study only compared women admitted under Medicare to ensure we were comparing the MCP (continuity of care) with no continuity of care. Women were excluded if they had a multiple birth, baby with a congenital abnormality or in-utero transfer to and from another hospital (due to complications of pregnancy). Women who were referred to a specialised service, missing data in the hospital records and women who were receiving private obstetric, or midwifery care were excluded from the study.

2.4. Study cohort

The cohort of interest from the study population were women who

self-reported a history or current diagnosis of anxiety, depression, bipolar affective disorder, eating disorder, personality disorder, schizophrenia or other perinatal mental health condition. During the first antenatal visit, midwives undertake a comprehensive medical and social history that includes assessing psychosocial factors that can affect the woman's emotional health and wellbeing. This assessment includes the completion of the Edinburgh Postnatal Depression Scale (EPDS) as per the Australian Government Department of Health, Pregnancy Care Guidelines [26]. The EPDS is a set of ten screening questions, used as a screening tool in pregnancy to indicate whether a woman has symptoms common with depression and anxiety. However, the tool itself does not provide a diagnosis [1]. The first four questions are scored as 0 for the top box and the bottom box is scored as 3. The next questions are reversed scored with the top box scored as a 3 and the bottom box scored as 0. Question 10 is about suicidal thoughts and should be completed in the presence of a health care professional to ensure the woman had timely and appropriate referral. The sum of each question provides guidance on actions as follows; a score of 0–9 may indicate the presence of some symptoms of distress that are unlikely to interfere with day-to-day ability, a score of 10–12 indicates symptoms of distress and the EPDS should be repeated in 2 weeks. A score at 13 or above requires referral to a psychiatrist/psychologist as depression is likely [1]. The validity and reliability of this tool was established in 1987 and has been validated more recently and forms part of the Centre of Excellence for Perinatal Mental Health[1,27]. Women were included in this study if they scored ≥ 13 on the EPDS or scored 1, 2, 3 to question 10 (the thought of harming myself has occurred to me).

The study hypothesis was MCP improves perinatal outcomes for women who have anxiety and depression and/or other perinatal mental health conditions.

2.5. Outcomes measured

The primary outcome of interest was preterm birth defined as birth before 37 completed weeks of pregnancy [28]. Secondary outcomes included vaginal births, severe adverse neonatal outcomes and full breastfeeding at the time of discharge.

Severe neonatal adverse outcome was defined as a composite outcome which included stillbirth, any resuscitation, admission to NICU, or an Apgar score below 7 at 5 min.

2.6. Ethics

Ethical clearance was granted, Western Sydney Local Health District HREC reference number: 2020/ETH03342. Site-specific approval was granted, SSA reference number 2020/STE00010. LHD Research Office number: 2020/PID03772.

2.7. Data source

Following ethical approval, data were extracted from the routinely collected maternity electronic databases by the data custodian at the hospital. Measures of self-reported mental health conditions were completed during the antenatal period by either the hospital midwives in the standard model of care or the MCP midwife.

Data were collected from the following drop-down boxes in the dataset.

1. Anxiety
2. Bipolar Affective Disorder
3. Depression
4. Eating Disorder
5. Personality disorder
6. Schizophrenia
7. Other

Data from drop-down boxes was enhanced by data scraping methods of accompanying free text fields to enhance the detection of all mental health disorders. A computer script searched all fields for key terms (including misspellings and abbreviations) in all 17,000 files. A sample of 500 entries were manually inspected to confirm the script's accuracy.

In addition, data were collected from women who had an EPDS score of ≥ 13 and/or who had scored 1,2, or 3 for question 10 (*the thought of harming myself has occurred to me*).

3. Data analysis

Descriptive statistics were used to present characteristics such as age, parity, relationship status and socio-economic data of the pregnant women. Chi-Square test and student t-test were used to compare the frequency (percentage) and mean (standard deviations) of different variables between women who received MCP model of care and those who received standard care as appropriate.

The primary and secondary outcomes were analysed using multi-variable logistic regression models with adjustments for clinically (a-priori) and statistically relevant covariates. Adjustment factors in the first multivariable model were maternal age (continuous), gestational age (continuous), ethnicity, smoking / drugs / alcohol composite, Socio-Economic Indexes for Areas ([SEIFA] provides measures of socio-economic conditions by geographic area based on postcode) (continuous), BMI (continuous), maternal medical disorders in pregnancy (Gestational Diabetes Mellitus (GDM)/ hypertensive disorders). These factors were decided a-priori and upon by inspecting the variables that differed significantly between MCP and Standard Care in Table 1. The second multivariable model included an additional adjustment factor of perinatal mental health condition. Missing data in the multivariable model was handled using a missing indicator variable to detect possible statistical significance of missing values. Analysis was performed with Stata Version 14.2 [29]. Statistical analysis was completed by a statistician and supervised by an obstetric epidemiologist.

4. Results

Between 1st January 2018 and 31st of January 2021, there were 17,567 women in the study population. Women with non-singleton ($n = 398$), less than 24 weeks gestation ($n = 135$), missing EPDS ($n = 637$), missing mental health history ($n = 49$), missing model of care ($n = 0$) were excluded. Data was assessed for co-missingness of variables and no significant correlations were found. Missing values were used as a category in regression for relevant variables (e.g., Ethnicity) and results were reported accordingly. Following exclusion there were 16,820 women, of whom 3028 (18 %) reported a perinatal mental health condition which were included in the study cohort. As per the flowchart in Fig. 1.

4.1. Mental health outcomes

Overall, 3028 women had a self-reported perinatal mental health condition classified as an existing mental health condition and/or a history of a mental health condition and/or an EPDS score ≥ 13 and/or scored 1,2 or 3 in response to question 10 (*the thought of harming myself has occurred to me*). The self-reported history or current condition was a separate item to the EPDS score and there could be some overlap. The most common condition was anxiety and depression ($n = 723$, 23.9 %). The classification of mental health conditions including the number and percentage of women who scored ≥ 13 on the EPDS are reported in Table 1.

4.2. Demographic outcomes

Women receiving MCP were more likely to be younger (mean 30.9 vs 31.3, $p = 0.03$), had a lower body mass index (BMI) (mean 24.3 vs 26.5,

Table 1
Maternal characteristics by model of care.

Characteristics	Midwifery Caseload Practice (n = 352) n (%)	Standard model of care (n = 2676) n (%)	P value
Mental health history	n = 77	n = 646	< 0.001
Anxiety	89 (25.3)	368 (13.7)	
Anxiety and depression	77 (21.9)	646 (24.1)	
Depression	56 (15.9)	541 (20.2)	
Other conditions	24 (6.8)	155 (5.8)	
EPDS ≥ 13	36 (10.2)	507 (18.9)	
EPDSQ10	1 (0.9)	63 (2.3)	
Unknown condition	69 (19.6)	396 (14.8)	
Sociodemographic			
Maternal age (yr, mean, SD)	30.9 (4.5)	31.5 (5.6)	0.03
Ethnicity			< 0.001
Aboriginal and Torres Strait Islander	4 (1.1)	81 (3.03)	
Caucasian/European	133 (37.8)	726 (27.1)	
Middle Eastern	34 (9.7)	429 (16.0)	
Other	89 (25.3)	629 (23.5)	
South Asian	26 (7.4)	297 (11.1)	
South-East Asian	32 (9.1)	213 (7.9)	
Unknown	34 (9.7)	301 (11.2)	
SEIFA quintiles			< 0.001
1 (most deprived)	69 (19.6)	856 (32.1)	
2	8 (2.8)	129 (4.8)	
3	55 (15.6)	414 (15.5)	
4	111 (31.5)	731 (27.4)	
5 (least deprived)	109 (30.9)	539 (20.2)	
Body Mass Index			< 0.001
Underweight (<18.5)	8 (2.3)	113 (4.2)	
Healthy weight (18.5–24.9)	220 (62.5)	1194 (44.6)	
Overweight (25.0–29.9)	98 (27.8)	738 (27.6)	
Obese (≥ 30.0)	26 (7.4)	631 (23.6)	
Nulliparous	140 (39.8)	1055 (39.4)	0.91
Smoking, alcohol, drug use			
*Smoking	18 (5.1)	317 (11.8)	< 0.001
*Alcohol	11 (3.1)	56 (2.1)	0.23
*Illicit drugs	6 (1.71)	90 (3.4)	0.09
Pregnancy complications			
#Gestational diabetes	14 (3.9)	463 (17.6)	< 0.001
¹ Hypertensive disorders	6 (1.7)	183 (6.8)	< 0.001

*women responded yes to smoking, alcohol and illicit drugs in the first half of pregnancy # Gestational diabetes diagnosis ¹ Hypertensive disorder diagnosis.

$p < 0.001$), classified as being Caucasian (37.8 vs 27.1, $p < 0.001$) and had a postcode of advantage (31.0 % vs 20.2, $p < 0.001$) (Table 1). A positive response to smoking was less likely in the MCP group (5.1 vs 11.9 %, $p < 0.001$). Women in the MCP group were also less likely to have been diagnosed with gestational diabetes (4.0 vs 17.6 %, $p < 0.001$) or hypertensive disorders in pregnancy (1.7 vs 6.9 %, $p < 0.001$).

4.3. Birth and neonatal outcomes

Women who had received MCP were less likely to experience a preterm birth and more likely to birth post 40 weeks compared to women in the standard model of care. Babies of women receiving MCP care were less likely to have an Apgar score of < 7 at 5 min and require significant resuscitation or be admitted to the neonatal intensive care unit. The women in the MCP group were more likely to have a vaginal birth and to be fully breastfeeding at the time of discharge from hospital

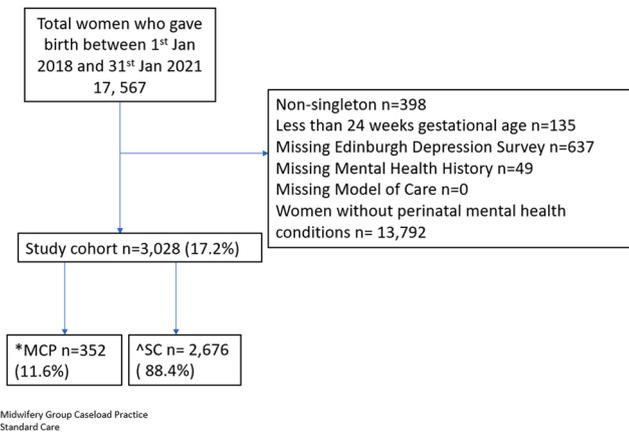


Fig. 1. Flowchart of study population included in the cohort.

(24–72 h) or from midwifery postnatal home visiting (5–6 days) (Table 2).

Following multivariable analysis, women in midwifery group practice caseload (MCP) had lower odds of preterm birth (adjOR 0.46, 95 % CI 0.24–0.86), higher odds of vaginal birth (adjOR 2.55, 95 % CI 1.93–3.36), with no difference in severe adverse neonatal outcome (adj OR 0.79, 95 % CI 0.57–1.09). Women in the MCP group had higher adjusted odds ratio to be fully breastfeeding at discharge (adj OR 3.06, 95 % CI 2.10–4.55). Medical disorders were adjusted for in the multivariate models to account for differences in the population.

5. Discussion

Women with a self-reported perinatal mental health condition who received MCP had more favourable outcomes when compared to women who received standard hospital care. The findings replicate similar results from previous studies and systematic reviews [12,30,31]. Although these earlier studies only focussed on outcomes for women with a low-risk pregnancy or women who have developed obstetric and/or medical risks during pregnancy [30]. Only one early trial from the United Kingdom (2003) aimed to evaluate the effectiveness of midwifery continuity of care in reducing rates of postnatal depression in women with histories of depression [32]. They found midwifery continuity of care was successful in engaging women with perinatal mental health conditions in treatment, women were more likely to have had a psychiatric referral and felt able to ask the questions they wanted, when

Table 2
Birth and neonatal outcomes by model of care.

Characteristics	Midwifery Caseload Practice n (%)	Standard model of care n (%)	P value
<i>Preterm birth</i>			<0.001
<28 weeks	1 (0.3)	41 (1.5)	
28–31 ⁺⁶ weeks	0 (0.0)	53 (1.9)	
32–36 ⁺⁶	11 (3.1)	235 (8.8)	
37–39 ⁺⁶	280 (79.5)	2143 (80.1)	
≥ 40	60 (17.0)	204 (7.6)	
<i>Vaginal birth</i>	273 (77.6)	1401 (52.3)	< 0.001
<i>*Severe adverse neonatal outcomes</i>	60 (17.1)	982 (32.7)	< 0.001
Stillbirth	1 (0.3)	22 (0.8)	0.27
Apgar at 5 mins < 7	2 (0.6)	106 (4.0)	< 0.001
Resuscitation at birth	53 (15.1)	799 (29.9)	< 0.001
Admission to NICU	35 (9.9)	701 (26.5)	< 0.001
Full breastfeeding (discharge)	319 (91.4)	1686 (70.8)	< 0.001

*Severe adverse neonatal outcomes were a composite of stillbirth, APGAR score at 5 mins < 7, resuscitation at birth and admission to neonatal intensive care.

Table 3
Odds ratio for preterm birth, vaginal birth and adverse neonatal outcome.

Outcomes	Unadjusted OR (95 % CI)	Model 1 Adjusted OR (95 % CI)	Model 2 Adjusted OR (95 % CI)	P value
Preterm birth	0.40 (0.22, 0.75)	0.46 (0.25, 0.87)	0.46 (0.24, 0.86)	0.02
Vaginal birth	2.9 (2.23,3.79)	2.61 (1.99, 3.44)	2.55 (1.9, 3.4)	< 0.001
Severe adverse neonatal outcomes	0.54 (0.40, 0.73)	0.81 (0.59, 1.12)	0.79 (0.57, 1.09)	0.16
Full breastfeeding at discharge	4.3 (2.9, 6.25)	3.0 (2.0, 4.5)	3.1 (2.0, 4.5)	< 0.001

Model 1 – adjusted for maternal age, gestational age, ethnicity, composite substance use, SEIFA, BMI, and composite maternal pregnancy disorders.

Model 2 – adjusted for Model 1 covariates and perinatal mental health category were included separately.

Severe adverse neonatal outcomes were a composite of stillbirth, APGAR score at 5 mins < 7, resuscitation at birth and admission to neonatal intensive care.

they knew their midwife through continuity [32]. Women who have a known midwife are more likely to feel comfortable discussing their mental health concerns. Women are reluctant to share their story numerous times with multiple care givers [20] as found in standard models of care. Having a relationship of trust with a known midwife through MCP potentially enhances women’s access to perinatal mental health services [20] indicating that the MCP model could be expanded to target women with a perinatal mental health condition.

The majority of the women in this study who received MCP were younger, resided in an area with a postcode of relative socio-economic advantage and were Caucasian by ethnicity, demonstrating disparities in which group of women can gain access to MCP. Studies from the UK have shown that the rates of preterm births and stillbirths are higher when there are socioeconomic and ethnic inequalities [13,33]. A recent study from the UK measured outcomes for women and babies residing in areas of social deprivation in London who received caseload midwifery. Findings from the study found lower rates of preterm birth (5.1 % vs 11.2 %) and caesarean section (24.3 % vs 38.0 %), with no increase in the rate of stillbirth or admissions to the neonatal units, for women allocated to MCP versus those in the standard care model [13]. These findings were observed in the current study following adjustment for population differences observed amongst women receiving MCP and standard models of care.

The cohort of women with a perinatal mental health condition in the current study who received MCP, also experienced improved outcomes, including lower odds of preterm birth. These findings are important as women who experience depression during pregnancy are at an increased risk of preterm birth [4,5,8]. Providing these ‘at risk’ women with midwifery continuity of care is in alignment with recommendations from the Centre of Research Excellence for Stillbirth that state maternity services should increase the availability of midwifery continuity of care for women with perinatal mental health conditions [34].

Currently in Australia, MCP is not available to most women [23] due to a restrictive criteria of having little to no risk associated with the woman’s pregnancy. Women with perinatal mental health conditions are often excluded from MCP and referred to complex referral pathways involving multiple caregivers[20]. Evidence from earlier studies suggest the midwife becomes the woman’s navigator when she comes from a socially diverse background and/or has a perinatal mental health condition. The midwife coordinates the woman’s individual care pathway and integrates support from a multi-professional team. These findings and the findings from the current study have important implications for future research and midwifery practice, to offer women with perinatal

mental health conditions access to midwifery continuity of care models. Future research will focus on the feasibility of undertaking a randomised controlled trial to determine if midwifery continuity of care improves outcomes for women with perinatal mental health conditions. Midwifery continuity of care is a complex intervention, and all stakeholders require input into a future trial. Midwives do require a defined caseload and perinatal mental health education and support to strengthen their competence and capability. This will allow them to effectively support women with ongoing and sometimes complex mental health conditions [17,18].

The findings from this study add to the increasing evidence that supports expanding midwifery continuity of care models for all women, not just women with a low risk pregnancy.

6. Strengths and limitations

The favourable outcomes observed in this study were despite sample size limitations and following adjustments with confounders associated with the outcomes of interest and observed differences in self-reported perinatal mental health diagnosis. However, we are unable to adjust for unmeasured confounders and this pilot data will inform a future trial to determine if MCP is associated with improved outcomes in women with perinatal mental health conditions. The demographic data demonstrate a socioeconomic disparity between the two groups of women with most women who had a perinatal mental health condition receiving standard maternity care. Other demographic findings indicate the cohort of women who are most readily able to access MCP are Caucasian women, non-smokers, with a low BMI who resided in a postcode of advantage, indicating that women who would benefit the most from MCP are unable to access this model of care and this should be considered in a future trial if inequities are to be addressed. Further research is needed to discover the enablers to facilitating this group of women to access MCP.

A sample size calculation was not undertaken, and it is acknowledged that the study is underpowered to draw definitive conclusions about the benefit or not of MCP for women with a perinatal mental health condition.

7. Conclusion

This study found women who have a perinatal mental health condition and receive MCP compared to those who received standard care had improved perinatal outcomes including a reduction in preterm birth. The favourable outcomes observed are consistent with the reported literature for women without a perinatal mental health condition. Demographic findings confirm women from a position of socioeconomic advantage are more likely to access MCP and it would be important to address this inequity in practice. The findings call for future more robust evidence to inform the provision of MCP care in women with perinatal mental health conditions.

References

- [1] M.-P. Austin, H.N. Mental Health Care in the Perinatal Period: Australian Clinical Practice Guideline, Centre of Perinatal Excellence, Melbourne, 2017.
- [2] L.M. Howard, H. Khalifeh, Perinatal mental health: a review of progress and challenges, *World Psychiatry* 19 (3) (2020) 313–327.
- [3] Australian Institute of Health Welfare, Maternal deaths in Australia, AIHW, Canberra, 2020.
- [4] A. Staneva, et al., The effects of maternal depression, anxiety, and perceived stress during pregnancy on preterm birth: a systematic review, *Women Birth* 28 (3) (2015) 179–193.
- [5] U. Ghimire, et al., Depression during pregnancy and the risk of low birth weight, preterm birth and intrauterine growth restriction- an updated meta-analysis, *Early Hum. Dev.* 152 (2021), 105243.
- [6] S. Wallwiener, et al., Epidemiology of mental disorders during pregnancy and link to birth outcome: a large-scale retrospective observational database study including 38,000 pregnancies, *Arch. Gynecol. Obstet.* 299 (3) (2019) 755–763.
- [7] C. Buss, et al., High pregnancy anxiety during mid-gestation is associated with decreased gray matter density in 6–9-year-old children, *Psychoneuroendocrinology* 35 (1) (2009) 141–153.
- [8] N.K. Grote, et al., A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction, *Arch. Gen. Psychiatry* 67 (10) (2010) 1012–1024.
- [9] J. Morris, K. Brown, J. Newnham, The Australian preterm birth prevention alliance, *Aust. N. Z. J. Obstet. Gynaecol.* 60 (3) (2020) 321–323.
- [10] N. Medley, et al., Interventions during pregnancy to prevent preterm birth: an overview of Cochrane systematic reviews, *Cochrane Database Syst. Rev.* (11) (2018).
- [11] V. Flenady, et al., Stillbirths: recall to action in high-income countries, *Lancet* 387 (10019) (2016) 691–702.
- [12] J. Sandall, et al., Midwife-led continuity models versus other models of care for childbearing women, *Cochrane Database Syst. Rev.* (4) (2016).
- [13] R. Hadebe, et al., Can birth outcome inequality be reduced using targeted caseload midwifery in a deprived diverse inner city population? a retrospective cohort study, *London, UK, BMJ Open* 11 (11) (2021), e049991.
- [14] C.S.E. Homer, et al., Corrigendum to “Midwifery continuity of carer in an area of high socio-economic disadvantage in London: a retrospective analysis of Albany Midwifery Practice outcomes using routine data (1997–2009)” [Midwifery 48 (2017) 1–10], *Midwifery* 51 (2017) 53–53.
- [15] J. Allen, et al., Does model of maternity care make a difference to birth outcomes for young women? A retrospective cohort study, *Int. J. Nurs. Stud.* 52 (8) (2015) 1332–1342.
- [16] C. Fernandez Turienzo, et al., A realist review to explore how midwifery continuity of care may influence preterm birth in pregnant women, *Birth (Berkeley, Calif.)* 48 (3) (2021) 375–388.
- [17] D. Coates, M. Foureur, The role and competence of midwives in supporting women with mental health concerns during the perinatal period: a scoping review, *Health Soc. Care Commun.* 27 (4) (2019) e389–e405.
- [18] H. Bayrampour, A.P. Hapsari, J. Pavlovic, Barriers to addressing perinatal mental health issues in midwifery settings, *Midwifery* 59 (2018) 47–58.
- [19] R. Webb, et al., Barriers and facilitators to implementing perinatal mental health care in health and social care settings: a systematic review, *Lancet Psychiatry* 8 (6) (2021) 521–534.
- [20] 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.
- [21] Australian College of Midwives, National Midwifery Guidelines for Consultation and Referral, Australian College of Midwives, Canberra, 2021.
- [22] K. Dawson, et al., Implementing caseload midwifery: Exploring the views of maternity managers in Australia – a national cross-sectional survey, *Women Birth* 29 (3) (2016) 214–222.
- [23] Australian Institute of Health Welfare, Maternity care in Australia: first national report on models of care, 2021, AIHW, Canberra, 2021.
- [24] Western Sydney Local Health District. The Pulse: ematernity maternity information system (MIS) – WSLHD goes live.. 2017 [cited 2022 11th June]; Available from: (<https://thepulse.org.au/2017/05/16/ematernity-maternity-information-system-mis-wslhd-goes-live/#:~:text=eMaternity%2C%20as%20the%20Maternity%20Information,to%20the%20Ministry%20of%20Health>).
- [25] Commonwealth of Australia, Improving Maternity Services in Australia the report of the Maternity Services Review, Commonwealth of Australia, Barton ACT, 2009.
- [26] Department of Health, Clinical Practice Guidelines: Pregnancy Care, Canberra Australian Government Department of Health, 2018.
- [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 (1987) 782–786.
- [28] C. Howson, M. Kinney, J. Lawn, The Global Action Report on Preterm Birth, Born Too Soon. Geneva: March of Dimes, Partnership for Maternal, Newborn and Child Health, Save the Children, World Health Organisation, 2012.
- [29] StataCorp, Stata Statistical Software: Release 14, StataCorp LP, College Station, TX, 2015.
- [30] S.K. Tracy, et al., Caseload midwifery care versus standard maternity care for women of any risk: M@NGO, a randomised controlled trial, *Lancet* (2013) 382.
- [31] H. McLachlan, et al., Effects of continuity of care by a primary midwife (caseload midwifery) on caesarean section rates in women of low obstetric risk: the COSMOS randomised controlled trial, *BJOG: Int. J. Obstet. Gynaecol.* 119 (12) (2012) 1483–1492.
- [32] M.N. Marks, K. Siddle, C. Warwick, Can we prevent postnatal depression? a randomized controlled trial to assess the effect of continuity of midwifery care on rates of postnatal depression in high-risk women, *J. Matern Fetal Neonatal Med* 13 (2) (2003) 119–127.
- [33] J. Jardine, et al., Adverse pregnancy outcomes attributable to socioeconomic and ethnic inequalities in England: a national cohort study, *Lancet (Br. Ed.)* 398 (10314) (2021) 1905–1912.
- [34] Centre of Research Excellence Stillbirth, Safer Baby Bundle Handbook and Resource Guide: Working together to reduce stillbirth, Centre of Research Excellence Stillbirth, Australia, 2019.