



# Obstetric outcomes for women with severe mental illness: 10 years of experience in a tertiary multidisciplinary antenatal clinic

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## Abstract

**Purpose** This study aims to describe 10 years of antenatal care and outcomes for women with a severe mental illness (SMI).

**Methods** A retrospective cohort study of 420 completed pregnancy records over the last 10 years (2007–2017). Findings were compared to the Western Australian (WA) pregnancy data. Antenatal attendance, demographic, obstetric, neonatal and psychosocial variables were analysed using *t* tests,  $\chi^2$ , ANOVA and odds ratio (OR).

**Results** Overall, women with a SMI had high rates of comorbidity (47%), antenatal complications, and preterm birth at 12.6% compared to WA mothers ( $p < 0.001$ ). Those with schizophrenia were at highest risk with increased risk of threatened preterm labour OR 8.25 (95% CI 4.64–14.65), gestational diabetes OR 3.59 (95% CI 2.18–5.91) and reduced likelihood of a spontaneous vaginal birth OR 0.46 (95% CI 0.29–0.71). Late presentation and antenatal attendance for women with SMI were significantly associated with maternal substance use, psychiatric admission during pregnancy, and child welfare involvement. Women with schizophrenia had significantly lower attendance rates at scheduled antenatal care (ANC) appointments than those with bipolar disease (87.1% vs 94%,  $p = 0.003$ ).

**Conclusion** Obstetric outcomes are poorer for women with SMI compared to the general population. They have higher rates of medical comorbidities, lifestyle and psychosocial risks factors that are known to contribute to poor obstetric outcomes. Effective delivery of regular and appropriate ANC is essential in addressing these multifactorial risks. Targeted strategies addressing comprehensive medical management, preterm birth prevention, lifestyle modifications and increased psychosocial support could improve both short- and long-term outcomes for these women and their children.

**Keywords** Antenatal care · Severe mental illness · Schizophrenia · Bipolar

## Introduction

The management of pregnant women with a severe mental illness is complex, and increasingly a multidisciplinary model is acknowledged as essential for their maternity care [1]. Fragmented care or reluctance to engage in maternity services can be problematic [2]. Preventative health, pregnancy planning and risk reduction through the delivery of early and comprehensive antenatal care (ANC) can lead to better maternal and newborn outcomes [3, 4] and is vital for this group of women.

The World Health Organisation (WHO) states that ‘effective ANC is known to reduce maternal and perinatal morbidity and mortality through identification of risk, prevention and management of pregnancy related complications and/or medical conditions, and health education and promotion’ [5]. The recommendation for a positive pregnancy experience is

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a minimum of eight ANC visits, with the initial visit occurring in the first trimester [5].

Limited evidence suggests that women with a severe mental illness (SMI) attend ANC less frequently and later [2]; however, a recent study comparing women with mental health disorders to controls reported women with psychotic diagnoses both under and overutilize services [6].

Obstetric and neonatal outcomes are poorer in women with schizophrenia and bipolar affective disorders [7]. With this knowledge, an antenatal model of care was established, based on an initiative ‘healthy babies for mothers with a severe mental illness’ in 2007 [8]. Preliminary data from the first 138 births confirmed higher rates of poorer obstetric and neonatal outcomes for women with SMI [9].

Recently, our service has reached its tenth anniversary and as such, we examined antenatal care and outcomes from our specialist multidisciplinary antenatal clinic.

## Methods

### Model of care

The Childbirth and Mental Illness (CAMI) antenatal clinic was established in 2007 at King Edward Memorial Hospital (KEMH) in Western Australia (WA) for women with a diagnosed SMI. Women with schizophrenia or psychosis (ICD code: F20, F25, F28), bipolar affective disorders (F31), or a severe non-psychotic condition are referred to this state-wide service. Severe non-psychotic conditions include major depression (F32), severe anxiety (F41.1), obsessive compulsive (F42), post-traumatic stress (F43.1), and emotionally unstable personality disorders (F60.3). Initial assessment includes a full psychiatric evaluation by a perinatal psychiatrist, considering ICD 10 diagnostic criteria [10], and continued psychiatric medical treatment and monitoring during the pregnancy via consultant liaison within CAMI clinic and the community.

The establishment of the service was undertaken with no additional funding and is delivered within a general antenatal setting. Due to complexity, women are encouraged to attend for their booking visit at 12 weeks gestation. Referrals are received from general practitioners, private psychiatrists, community mental health clinics and other hospitals, either through psychiatric inpatient services or antenatal clinics if they fulfil the diagnostic requirements of a having a severe mental illness.

The ‘small known team’ is comprised of general practice and obstetric doctors, midwives, psychiatrists and social workers. Ideally, continuity of care is delivered. The service provides care within one setting thereby facilitating access to services in a consistent, comprehensive and collaborative manner. Dietary review, comprising of assessment

and education is performed within the clinic by a qualified dietician, and is encouraged for women with increased or poor weight gain, Body Mass Index (BMI) of greater than 40, those with gestational diabetes mellitus (GDM) and any woman at her request.

Women are assessed both obstetrically and psychiatrically at each ANC visit. Social work assessment is completed over the course of the pregnancy. Pre-birth planning is undertaken in the third trimester in consultation with the woman and her partner. The ANC schedule as advocated in the hospital guidelines [11] is followed, with extra visits deemed necessary for obstetric or psychiatric concerns. Parent education is offered via a wide range of classes. These aim to prepare women for the birth of their baby and transition to motherhood [11], but for those who experience difficulty with this standard format, it can be provided on a one to one basis alongside their antenatal appointment. A special birth plan is developed and tailored to the individual woman, this being important in women with sensitive birth needs.

A Mother Baby Unit, located adjacent to the King Edward Memorial Hospital, is a state-wide inpatient treatment centre for acute psychiatric conditions in the perinatal period. Women who require inpatient treatment, and assessed as psychiatrically suitable, can be managed in the antenatal period or until 12 months postnatally. As part of pre-birth planning, a tour of the facility is offered and elective or acute admission in the postnatal period if required.

### Methodology

A retrospective cohort study of completed pregnancies over the last 10 years (2007–2017) for women attending the CAMI antenatal service was undertaken. Ethical approval was granted (2018005QK).

Data recorded demographic details: age, parity, country of birth, Aboriginal or Torres Strait Islander (ATSI) origin, socioeconomic status, smoking, drug, alcohol use, BMI and weight gain in pregnancy. Medical comorbidities were recorded and include asthma, chronic hepatitis, neurological conditions such as migraine, benign intracranial hypertension, sensory loss disorders, hydrocephalus, Tourette syndrome, chronic brain injury and epilepsy, cardiovascular diseases include arrhythmias, valvular disease, and pre-existing hypertension, musculoskeletal conditions such as autoimmune arthritis, hip replacement, osteoporosis, Ehlers Danlos Syndrome and fibromyalgia. Other comorbidities include chronic renal disease, endocrine disorders such as pre-existing diabetes, thyroid or polycystic ovarian syndrome and gastrointestinal disorders of inflammatory bowel disease, chronic pancreatitis and cholelithiasis.

Antenatal care outcomes included attendance rates defined by number of attended and booked ANC visits and gestation at booking. Antenatal complications included

threatened preterm labour—defined as hospital presentation with regular uterine contractions < 37 weeks gestation, urinary tract infection (UTI), antepartum haemorrhage (APH), premature rupture of membranes (PROM), and GDM. Maternal obstetric and neonatal outcomes: birthweight, preterm birth, gestation and birth mode and fetal death in utero (FDIU) were also collected. The Department of Health (WA) develops an annual report that contains state-wide information on women who gave birth from a Midwives Notification System. In 2013, 33,928 women gave birth in WA. Outcomes from our cohort were compared to the 2013 WA Mothers and Babies report [12].

Women were grouped for the purposes of analysis into primary psychiatric diagnoses: schizophrenia or related disorder, bipolar affective disorder, or severe non-psychotic condition to determine outcomes within diagnostic categories. Psychosocial outcomes include involvement with child welfare or protection services and psychiatric admission rates for both the antenatal and immediate postnatal period.

Continuous data were examined for normality and medians, standard deviations and *t* tests were used to summarise group characteristics. Frequency distributions were used to summarise categorical data;  $\chi^2$  and one-way analysis of variance (ANOVA) and odds ratios (OR) were used to compare differences between groups. *p* values < 0.05 were considered

statistically significant. Analysis of results was undertaken using SPSS Software Version 24 [13].

## Results

Of 420 pregnancies completed over the period, 44 women returned for a second pregnancy with the service and 3 women returned for three pregnancies.

### Demographics and lifestyle factors

Demographic details are recorded in Table 1. The majority of CAMI women were Australian born (89.5%).

### Cigarette smoking

Overall, 49% smoked cigarettes, with a mean number of 13.24 per day (SD 8, range 1–40). Despite these high rates, only 29 women (8.3%) reported quitting. Rates of smoking were increased in women with schizophrenia (60%) but not statistically significant across diagnostic groupings (*p* = 0.088).

**Table 1** Demographic characteristics

Variable	CAMI women ( <i>n</i> = 420) %	WA mothers and babies 2013 ( <i>n</i> = 33,928) %	<i>p</i> value
Maternal age—mean (years)	29.2	29.8	0.032*
Country of birth			
Asia	5.6	14.3	< 0.001*
African/Middle East	3.2	6.3	0.01*
New Zealand/Pacific	1.2	4.8	< 0.001*
Americas	0.5	1.6	0.07
Aboriginal or Torres Strait descent	8.5	5.1	0.002*
Low socio-economic status <sup>a</sup>	19	35	< 0.001*
Parity			
Nil	46.2	42.6	0.14
1–2	41.7	49.2	0.001*
> 3	12.1	8.2	0.003*
Body mass index (kg/m <sup>2</sup> )			
< 18.5	2.2	3	0.33
18.5–24.9	33.2	48.0	< 0.001*
25–29.9	28.0	28.4	0.87
30–34.9	19.4	12.9	< 0.001*
35–39.9	11.8	5.3	< 0.001*
40+	5.4	2.4	< 0.001*
Smoker	49	10.7	< 0.001*

\**p* < 0.05 clinically significant

<sup>a</sup>SEIFA score in the lowest 2 quintiles

### Alcohol use

Only 43 of 377 (11.4%) of women confirmed that they used alcohol in pregnancy. Of these women, 6.4% reporting use less than once per week, 3.4% less than 4 times a week and 1.6% greater than 4 times a week.

### Illicit substance use

Illicit drug use during pregnancy occurred in 25.8%, with the most common substance cannabis (98%) followed by amphetamines (37%). Women with schizophrenia had significantly elevated rates (41.8%,  $p < 0.001$ ) compared to women with bipolar or non-psychotic disorders.

### Weight

Of the sample, 407 (96.9%) had a Body Mass Index (BMI) recorded at booking with 64.6% above normal weight range. Mean BMI at booking was not significant for diagnosis, with a mean BMI of 28.4 (SD 6.7, range 17.3–50) for women with bipolar disorders, 29.5 (SD 6.1, range 18.3–48) for those with schizophrenia and 28.1 (SD 6.6, range 14.8–49.5) for other diagnoses. The average weight gain in the second and third trimesters of pregnancy was 0.51 kg/week (SD 0.33). On classification of the women into BMI categories there was significant difference in weight gain during pregnancy with those underweight (BMI < 18.5) having a reduced mean weight gain of 0.26 kg/week (SD 0.25), as did those with a BMI > 40 of 0.25 kg/week (SD 0.47).

### Medical comorbidity

A concurrent medical condition, covering a range of conditions was recorded in 46.5% of the women at booking, with 14.9% indicating greater than two pre-existing conditions (Table 2). The most common comorbidity reported was asthma at 20.5%, which is significantly greater than the WA pregnancy population [12] at 10.2% ( $p < 0.001$ ). There was no reported difference in the number of pre-existing medical comorbidities and the woman's primary psychiatric diagnosis category ( $p = 0.44$ ).

### Antenatal care visits

The mean gestation of first hospital antenatal visit was 19.6 weeks (SD 7.8, 6.4–38.4) with no difference within psychiatric diagnoses groups ( $p = 0.685$ ). This is consistent with women attending the tertiary maternity hospital where the mean gestation at booking is usually around 20 weeks. Substance use in pregnancy, but not smoking, was associated with later gestation at first visit (19.1–21.7 weeks,  $p < 0.008$ ), as was psychiatric admission during pregnancy

**Table 2** Comorbid conditions in women with a severe mental illness

Medical comorbidity	Number of women with condition <i>n</i> (%)
Number of medical comorbidities	
0	225 (53.6%)
1	134 (31.9%)
≥2	61 (14.9%)
Asthma	86
Chronic hepatitis	27
Neurological condition	36
Cardiovascular condition	17
Musculoskeletal	19
Other medical: endocrine/gastrointestinal/chronic renal	74

(19.2–22.8 weeks,  $p < 0.001$ ) and child welfare involvement (18.7–21.8 weeks,  $p < 0.001$ ). Low socioeconomic status had no association ( $p = 0.262$ ).

Only 71 (20%) of women attended their initial CAMI antenatal visit in the first trimester of pregnancy. Presentation in the third trimester was found to occur in 16% of women, mostly related to late transfer of care from another health service.

The mean number of ANC visits was 7.7 (SD 3.1, range 1–16). Of note, 81.2% had ≥ 5 antenatal appointments, with 44.6% having ≥ 8 ANC visits. Factors associated with > 8 ANC visits were a diagnosis of bipolar disorder (OR 1.55, 95% CI 1.05–2.29), and development of preeclampsia/pregnancy-related hypertension (OR 2.11, 95% CI 1.18–3.80).

Overall, CAMI women attended 91.5% (SD 15.9, 14.3–100) of their scheduled visits. Attendance rates were significantly reduced with schizophrenia (87.1%) compared to those with bipolar disorders (94%) ( $p = 0.003$ ), and lower than those with other SMI's at 91.3%. Other risk factors for reduced attendance include smoking (86.5%,  $p < 0.001$ ), substance use (83%,  $p < 0.001$ ), child welfare involvement (84.3%,  $p < 0.001$ ) and psychiatric admission during pregnancy (85.2%,  $p = 0.002$ ). Again, low socioeconomic status had no association ( $p = 0.351$ ).

### Obstetric and neonatal outcomes

Obstetric and neonatal outcomes are recorded for all 412 singleton pregnancies (Table 3). Antenatal complications rates were elevated, with 27.9% recording none compared to WA mothers at 68.7% ( $p < 0.001$ ) [12]. The risk of threatened preterm labour was elevated with an unadjusted OR 8.25 (95% CI 4.64–14.65) in women with schizophrenia and OR 5.04 (95% CI 3.08–8.24) in women with bipolar disorders compared to WA mothers [12].

**Table 3** Obstetric and neonatal outcomes (singleton pregnancies)

Variable	Schizophrenia <i>n</i> = 90 (%)	Bipolar <i>n</i> = 178 (%)	Other <i>n</i> = 141 (%)	<i>p</i> value	CAMI <i>n</i> = 409 (%)	WA mothers and babies 2013 <i>n</i> = 33,458 (%)	<i>p</i> value
<b>Antenatal complications</b>							
Threatened preterm labour	14 (15.6)	18 (10.1)	8 (5.7)	0.047*	9.8	2.2	<0.001*
Urinary tract infections	7 (7.8)	13 (7.3)	14 (9.9)	0.686	8.3	3.2	<0.001*
Preeclampsia/pregnancy induced hypertension	13 (14.4)	28 (15.7)	17 (12.1)	0.644	14.2	2.1	<0.001*
Antepartum haemorrhage	11 (12.2)	16 (9.0)	14 (9.9)	0.706	10	2.8	<0.001*
Premature rupture of membranes	7 (7.8)	21 (11.8)	9 (6.4)	0.220	9	3.6	<0.001*
Gestational diabetes mellitus	20 (22.2)	19 (10.7)	14 (9.9)	0.012*	13	7.4	<0.001*
Other	47 (52.2)	72 (40.4)	62 (44.0)	0.184	44.3	14.6	<0.001*
<b>Delivery outcomes</b>							
Spontaneous delivery	29 (32.2)	78 (43.8)	78 (55.3)	0.002*	45.2	50.9	0.03*
Assisted delivery	16 (17.8)	36 (20.2)	23 (16.3)	0.661	18.3	15.1	0.085
Elective caesarean section	22 (24.4)	31 (17.4)	29 (20.6)	0.391	20.0	17.2	0.153
Emergency caesarean section	23 (25.6)	33 (18.5)	11 (7.8)	0.001*	16.4	16.7	0.810
<b>Neonatal outcomes</b>							
Gestational age < 37 weeks	9 (10.1)	22 (12.4)	20 (14.4)	0.636	12.6	7.5	<0.001*
> 37 weeks and < 2500 g	2 (2.5)	2 (1.3)	3 (2.5)	0.751	2.0	1.6	0.470
> 37 weeks and > 4000 g	9 (11.3)	11 (7.1)	10 (8.4)	0.513	8.5	11	0.285

\**p* < 0.05 clinically significant

GDM was also significantly elevated in women with schizophrenia with an unadjusted OR 3.59 (95% CI 2.18–5.91) compared to WA mothers [12]. Fetal death in utero occurred in 3 (0.7%) pregnancies compared with 0.6% for the WA pregnancy population (*p* = 0.787) [12].

Women with schizophrenia were less likely to have a spontaneous vaginal delivery than WA mothers [12], OR 0.46 (95% CI 0.29–0.71). Of women having a first birth (*n* = 194), 20 (10.3%) had an elective caesarean section for either medical reasons or due to severe tokophobia, with these rates being comparable to the population at 10.2% [12].

There were no increased intrauterine growth restrictions or macrosomia in term births, but higher preterm delivery rates at 12.6% (*p* < 0.001). Overall (*n* = 420) mean birth weight was 3251.75 g (SD 663, range 260–5370) which was lower than WA mothers [12] mean of 3326.9 g (*p* = 0.021), although infants less than 2500 g represented 9.8% compared to 6.8% (*p* = 0.016). Special care nursery admission rate for babies born to CAMI women was 38.5% and have been reported on previously [14].

### Psychosocial outcomes

The psychosocial needs of women with a severe mental illness during pregnancy were substantial. When considering all CAMI women, 33.5% had child welfare and protective

services agency involvement with their current pregnancy, with statutory apprehension or out of home placement rates occurring in 14.8% of babies at birth. Psychiatric admission during the pregnancy occurred in 20.5%, with 24% admitted to the Mother Baby Unit in the immediate postpartum period.

### Discussion

We found that obstetric outcomes are poorer for all women with a SMI regardless of psychiatric diagnosis compared to the general population. They have significantly elevated rates of factors that could contribute, making the effective delivery of antenatal care essential in addressing these multifactorial risks.

First, antenatal care provides an opportunity to address preexisting health concerns and co-morbidities in women with SMI. Multimorbidity is known to coexist with an SMI diagnosis [15] and within our study of pregnant women, just under half of our cohort reported a pre-existing co-morbidity and one in seven reported two or more. The range of conditions vary widely, the most common being asthma, at twice the rate of the WA pregnancy population. Given the high rates of cigarette and cannabis use this is of concern.

Furthermore, 65% of women in our sample are above the healthy weight at their booking visit. Raised BMI has

also been shown to be associated with pre-existing medical conditions in pregnant women and increased pregnancy complications [12]. Based on our findings the importance of effective ANC in providing weight management goals, with lifestyle interventions addressing the higher rates of smoking and substance use, as well as investigation, treatment and follow-up of concurrent medical issues cannot be understated in women with SMI.

Previous studies have highlighted the increased rate of antenatal complications in women, particularly those with schizophrenia and bipolar disorders [2, 7]. Elevated rates for all antenatal complications regardless of psychiatric diagnosis suggest a vulnerability that is not unique to psychiatric diagnosis. However, our results demonstrated that women with a diagnosis of schizophrenia were particularly vulnerable to threatened preterm labour and GDM.

Women with schizophrenia were also more vulnerable to poor birthing outcomes than those with other SMI's. They were less likely to have spontaneous vaginal birth and more likely to have an emergency caesarean section and confirms previous research findings [16, 17] that this group of women have significant risk of birth intervention.

Our study found elevated rates of preterm birth across all diagnostic groups. Judd et al. [2] demonstrated higher rates of preterm birth in women with schizophrenia and bipolar disorders. The aetiology of preterm birth can be multifactorial. Certainly, evidence suggests that smoking [18], cannabis use [19], and obesity [20] are all risk factors and these were all increased within our sample. Other known factors are medical comorbidities and pregnancy complications, especially GDM and hypertensive disorders [21], which were also elevated in our sample. These risks can be addressed by early and regular engagement with ANC and appropriate management strategies. Furthermore, initiatives like 'the whole nine months' [22] recently introduced into WA, offering early identification through universal cervical length screening at morphology scans, identification of risk factors for preterm birth and early intervention, may improve preterm birth rates and outcomes within this cohort.

Multidisciplinary management in the antenatal setting assists in coordination and collaboration of whole person care. Women with SMI have increased psychosocial needs with a third of our sample requiring referral to child protective services, and one in five having a psychiatric admission whilst pregnant. Psychiatric admission rates reported in the literature range from 12 to 41% [23, 24] for women with schizophrenia, and illness exacerbation in 23% of those with bipolar disorder [25]. Optimal management, particularly with regards to pre-birth planning and child welfare issues remains challenging with late or poor delivery of ANC.

High attendance rates overall of 91% found in this current study confirms the majority of women are engaged

with this specialised targeted multidisciplinary service. Earlier qualitative research demonstrated that the provision of a 'known small team' of multidisciplinary professionals offers a safe and trusting environment [26] that enhances engagement. Over a 10-year period, we have sustained an average of 7.7 ANC visits. Considering that the majority of women would have at least one further visit with their primary care practitioner, the CAMI model is offering ANC consistent with WHO recommendations [5].

In our cohort, factors affecting late gestation at first ANC visit and less frequent ANC attendance are substance use, psychiatric admission during pregnancy and child welfare involvement, but not low socioeconomic status, suggesting a possible link with the severity and stability of the woman's mental health during the pregnancy. Less frequent ANC visits were seen in those with a diagnosis of schizophrenia, indicating they may be particularly vulnerable to service access and ANC engagement. This is supported by Lin et al.'s [3] research where women with schizophrenia had reduced ANC visits compared to healthy controls, and those women who received inadequate care had poorer outcomes, such as higher rates of preterm birth and low birth weight babies.

## Strengths and limitations

Several limitations exist including the use of retrospective data from a single centre. The sample size although adequate demonstrates the challenge of research from low prevalence conditions. The sample remains underpowered to look at individual outcomes and confounding variables and would be better addressed in larger multicentred studies.

A further concern lies in the demographics of this cohort. Australian-born women represent the majority, with underrepresentation of women born overseas, just over 10%, and those from low socioeconomic areas at 19%. We are uncertain if this is due to poor identification and referral issues, particularly within immigrant populations, or due to the nature of SMI and its diagnosis prevalence within these communities.

The number of ANC visits is likely to be under reported as only ANC visits to the clinic and not those that occurred in other health services were recorded. A strength of the study is that we are able to obtain a greater depth of information for women with SMI than is often associated with data linkage research.

Further areas of research could explore SMI prevalence in culturally and linguistically diverse pregnant populations and what factors may be involved in the high intervention rates at birth in women with schizophrenia.

## Conclusion

Women with a SMI in pregnancy have high rates of morbidities and risk factors associated with poor obstetric outcomes. This requires input from a multidisciplinary team of health providers ideally with a ‘one stop shop’ approach. Their complexity and poor health outcomes for mother and baby, places a burden on a health care system. This is especially challenging when health providers work in isolation and are not part of a cohesive team. ANC is essential to identify risks, target treatments to address preterm birth prevention and lifestyle modifications, offer psychosocial support, and provide a comprehensive medical and psychiatric management plan. This multidisciplinary model of care has the potential to improve both short- and long-term outcomes for these women and their families.

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## Compliance with ethical standards

**Conflict of interest** The authors declare they have no conflicts of interest.

**Research involving human participants** Ethical approval was granted from the hospital Human Research Ethics Committee (2018005QK) and carried out in accordance with The National Statement on Ethical Conduct in Human Research.

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