Maternal mental health outcomes after low birth weight and preterm deliveries at Tygerberg and Karl Bremer Hospitals

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Thesis presented in fulfilment of the requirements for the degree of Master of Medicine at the Department of Paediatrics, Stellenbosch University.

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the authorship owner thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date**: March 2023**

Signature:

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Without everyone who pushed and prodded me along, this thesis would not have been possible. My greatest thanks and appreciation, always.

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Dedication

“Jy is nooit te goed om sleg te word nie en nooit te sleg om goed te wees nie”.

Susan Fredericks, my paternal grandmother

She displayed a great love for midwifery – she saw the gap in obstetric care in the Lenasia area, a mixed-race region within the Gauteng province during Apartheid years. I believe my passion is ignited from her fire to make changes and ensure service delivery within a forgotten community.

I therefore dedicate this thesis to her.

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List of Abbreviations

AOP	Anaemia of prematurity
BC	Blood culture
BF	Breastfeeding
C/S	Caesarean section
CBS	Community home based services
CLD	Chronic Lung Disease
CMV	Cytomegalovirus
COVID 19	Coronavirus disease 2019
CPAP	Continuous positive airway pressure
CRP	C-reactive protein
EOS	Early onset sepsis
EPDS	Edinburg postnatal depression score
GAD7	Generalised Anxiety Disorder - 7
HRC	High risk clinic
HIV	Human immunodeficiency virus
KMC	Kangaroo Mother Care
KBH	Karl Bremer Hospital
LOS	Late onset sepsis
LMIC	Low-and-middle-income-countries
MPNHP	Maternal Perinatal and Neonatal Health Policy
MOD	Mode of delivery
NICU	Neonatal intensive care unit
PDA	Patent Ductus Arteriosus
PHQ9	Patient Health Questionnaire 9
PI	Principal investigator
PHDC	Provincial Health Data Centre
RDS	Respiratory Distress Syndrome
SPV	Single Patient Viewer
TPN	Total parental nutrition
TBH	Tygerberg Hospital
US	United States
USD	United States Dollar
VLBW	Very Low Birth weight
WBOTS	Ward based outreach teams' strategy
WHO	World Health Organisation

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Abstract

Introduction:

Perinatal mental disorders disproportionately affect mothers in low- and middle-income countries (LMIC) and may affect both maternal responses to their infant and infant outcomes. This study aimed to determine the mental health of mothers of vulnerable infants (preterm and low birth weight infants) using a variety of mental health screening tools and to determine infant outcomes of these mothers within the first 6 months after birth.

Methods:

This was a prospective cohort study of infants and their mothers hospitalized at Karl Bremer and Tygerberg Hospital, of the Northern and Tygerberg health sub-districts, Western Cape, South Africa. Participants were recruited from 1 November 2020 to 31 October 2021. Dyads were recruited if the low birth weight or preterm infant was admitted to either hospital at birth or within the first 3 months of life. Maternal mental health screening was performed using the Edinburgh Postnatal Depression score (EPDS), Patient History Questionnaire (PHQ9) and Generalised Anxiety Disorder scale (GAD7). Infants were followed until 6 months chronological age.

Results:

A total of 95 mother-dyad pairs were recruited, equating to 103-infants. Sixty-two mothers (65%) screened at risk for mental health problems. Significant differences between at-risk-mothers and not-at-risk mothers were HIV positive status, previous mental illness, , low neonatal birth weight z-score and respiratory distress. Infant survival after 6-months was90% whilst the mortality rate was 4% (5% were lost to follow up).

Conclusion:

This is the first study performed at Karl Bremer and Tygerberg Hospital to evaluate the risk for maternal mental health illnesses in premature and low birth weight births. The high prevalence of at-risk mothers justifies the need for screening in this population. There are risk factors that may assist in identifying at-risk mothers.

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Chapter 1: Introduction

Background

Perinatal mental health, defined as a woman's mental health from conception, during pregnancy and up to 12months postpartum, has implications for maternal, fetal, neonatal, and early childhood outcomes (1). The perinatal period represents a particularly vulnerable period for the expectant woman to develop mental health problems due to a combination of biological, psychological and social factors(2).

Globally, the prevalence of maternal mental health disorders, including but not limited to depression, anxiety and psychosis, is estimated to affect one out of every five mothers(3,4).The World Health Organisation (WHO) reported that perinatal depression was experienced by 13% of women living in low-middle income countries (LMIC) (5) and may be higher in poorer rural areas (5). In South Africa, perinatal depression, stress, and anxiety has been reported to range between 16 -50% (6,7,8). An international study by O' Hara et al estimates the prevalence of perinatal depression and anxiety to be approximately 20%, peaking during pregnancy and the first 3 months postpartum (9).

The consequence of untreated antenatal depression is progression to postnatal depression, adverse obstetric outcomes, birth complications as well as poor infant growth and adverse developmental effects(10). Maternal mental illness during pregnancy may disrupt neurocognitive changes, known as maternal programming, in the mother that would ordinarily prepare women to respond to their infants. (11).

Both anxiety and depression act as physical and psychological stressors which activate the hypothalamic-pituitary-adrenal axis (12,13). The resultant excess in cortisol results in maternal hypercortisolaemia can lead to preterm delivery (12,13). The excess cortisol also affects the placenta, contributing to intra-uterine growth restriction(12,13). Research has further supported this theory and demonstrated an association with increased rates of infant hospitalisations, infection rates, higher risk of preterm birth, low birth weight and poor physical growth in infants exposed to perinatal depression and anxiety(14,15).

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Untreated perinatal mental health problems generate substantial human suffering and high financial costs(16). In the United States alone, the societal costs of untreated perinatal depression and anxiety were over 14 billion US$ in all births in 2017(17). In South Africa, the lifetime cost of both perinatal depression and anxiety were estimated to amount to US$ 2.8 billion per annum per cohort of mothers (18)

Public Health context and Mental Health

In 2004, the South African Mental Health Care Act (No 17 of 2002) was promulgated to ensure the provision for integration of mental health services into the primary healthcare system and community-based services(19). In June 2021, the Maternal, Perinatal and Neonatal Health Policy (MPNHP) was adopted and provided a framework for the delivery of quality, comprehensive, and integrated maternal, perinatal and neonatal services on all levels of care to reduce the maternal, perinatal and neonatal morbidity and mortality rates by 50% by 2030 (20). Prior to the adoption of the MPNHP barriers to the progress and scaling up of mental health services have been attributed to underinvestment, under resourcing and major implementation challenges(21).

In the Western Cape, few studies have evaluated the maternal mental health of hospitalised mothers. The Drakenstein Child Lung Health Study recruited mothers antenatally in a poor peri- urban area of the Western Cape (22). The study longitudinally investigated maternal health and the association with birth outcomes and child lung health (22). Despite the poor socioeconomic setting and significant maternal psychosocial adversity, the majority of infants (80%) were born at term with only 7% of infants requiring immediate hospitalisation after birth (22). In a review of perinatal mental disorders in a peri-urban area in Cape Town (Khayelitsha), 32-47% of mothers screened at risk for depression and 16-35% were diagnosed with postnatal depression(23). No neonatal or infant data were presented for these studies.

The Northern and Tygerberg subdistricts of Cape Town are impoverished urban communities for which no data exist regarding the prevalence of maternal mental health status. Although

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much data are available for the outcomes of neonates for the hospitals in these areas (Karl Bremer and Tygerberg Hospitals), there is a paucity of evidence regarding the mental health status of the mothers of these at-risk neonates (low birth weight, premature and/ or sick) while hospitalised, which may represent an additional stressor which could trigger or unmask underlying maternal mental disorder.

This research project aims to look at infant-mother dyads and the following objectives as listed below.

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Chapter 2: Methods

RESEARCH QUESTION

What is the postnatal maternal mental health status of women delivering low birth weight and premature infants born within the Northern and Tygerberg Subdistricts, admitted within the first 3months of life?

OBJECTIVES, AIMS AND HYPOTHESIS

Overall objective

To describe any possible associations between any postnatal mental health risk (depression and/or anxiety) and infant morbidities, and outcomes within the first 6 months of life.

Primary Aim

The primary aim is to describe any association between postnatal mental health risk and infant morbidities, inclusive of post discharge outcomes.

Secondary Aims

I. To estimate the prevalence of possible postnatal mental health risk,
II. To describe the demographics of women screening positive for a postnatal mental health risk

PRIMARY HYPOTHESIS

There is an association between postnatal mental health risk and outcomes of premature and low birth weight infants in the first 6 months of life.

METHODS

Study design

This study was a prospective, longitudinal study. Infant-mother dyads were recruited between 1 November 2020 to 31 October 2021 at two public hospital sites in the Northern

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and Tygerberg Substructure District, Western Cape (specifically Karl Bremer and Tygerberg Hospitals).

Subjects

Selection criteria

All postpartum women with a low birth weight or premature infant admitted to the neonatal or paediatric medical wards were eligible for recruitment. Dyads were recruited within 3 months after delivery.

Inclusion criteria

All mothers of infants admitted to the neonatal or paediatric medical wards were eligible including adolescent mothers under the age of 18.

All infants born with a low birth weight (birth weight less than 2.5kg) and or prematurity (gestational age at delivery ≤ 37 weeks) admitted to neonatal or paediatric medical ward within the first three months of life

All mothers with English, Afrikaans and Xhosa as their first language were eligible for inclusion

All dyad pairs residing in the Northern and Tygerberg subdistrict.

Exclusion criteria

Imminent emigration to another community within the next year

No informed consent or questionnaire completed.

Mothers who were acutely psychotic or depressed within first 3 days post-delivery and were unable to consent

Dyad pairs not residing in the Northern and Tygerberg subdistrict.

Sampling technique

Study Setting

Patients were recruited from Karl Bremer Hospital (KBH) from 1 November 2020 to 30 June 2021 and Tygerberg Hospital (TBH) from 1 July 2021 to 31 October 2021 . Double site recruitment would enable a wider, more comprehensive population to be recruited due to

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the different levels of health care provided by the hospitals and the different primary drainage areas.

A convenience sampling strategy was applied. Mothers were recruited during working hours on weekdays only.

Karl Bremmer Hospital (KBH) is a public sector health facility categorised as district hospital in the Northern- Tygerberg substructure, which is part of the broader Cape Town Metro East Health District. The Neonatal Unit consists of two wards: the admission ward which has 16 beds, providing a combination of high care and level one and two care, as well as the Kangaroo Mother Care (KMC) ward with 20 beds. The Pediatric Department can accommodate up to 32 beds in the ward.

Tygerberg Hospital (TBH) is also a public sector health facility and is a tertiary level referral hospital for parts of the Cape Town Metropolitan and two health regions of the Western Cape. The neonatal platform consists of four neonatal wards (120 beds). The Neonatal Intensive Care unit (NICU) can accommodate 12 neonates. The medical pediatric platform consists of four paediatric wards, a pediatric emergency department inclusive of surgical and orthopaedic admission which are managed by separate surgical and orthopaedic units. The four pediatric wards consist of a general medical admissions ward, an oncology ward, and two mixed speciality wards (120 beds) pulmonology, neurology, endocrinology, infectious diseases, cardiology, and gastroenterology. The Pediatric Intensive Care Unit can accommodate 14 infants and children up to the age of 12years.

Study procedures

Screening, enrolment, and study procedures

Enrolment and screening occurred simultaneously once informed consent was obtained (figure 1)

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Eligible participants were identified by Karl Bremer Hospital (KBH) and Tygerberg Hospital (TBH) nursing staff or doctors and was communicated to the Principal Investigator (PI) who obtained informed consent from mothers.

The questionnaire was completed by the postpartum mothers. Completion of all 3 questionnaires took approximately 20 minutes. No other study procedures were undertaken.

Infants were recruited with the mother but underwent no procedures. Only demographic and outcome measures were collected. Neonatal data were collected from birth until 6 months chronological age. This was up to the point of the 6-month vaccinations.

Measures

Maternal and neonatal demographic data

Annexure C demonstrates the maternal data that were collected.

The following maternal data working definitions were used:

- Employment status (permanent employment, part time employment, unemployed). South African Labour Law defines fulltime employment as working 30-40 hours per week and part time employment working less than 30 -40 hours per week (24)
- Booking time period -early was defined as before 20 weeks, late defined as after 20 weeks or not booked when no antenatal clinic had been attended
- Gestational age was defined according to an early (before 24 weeks gestation) or late (after 24 weeks) antenatal ultrasound or symphysis-fundal height or certain dates.
- Prematurity was defined as a gestational age < 37 weeks.
- Very low birth weight was a birth weight less than 1500g.
- Low birth weight was defined a s birth weight < 2500g.

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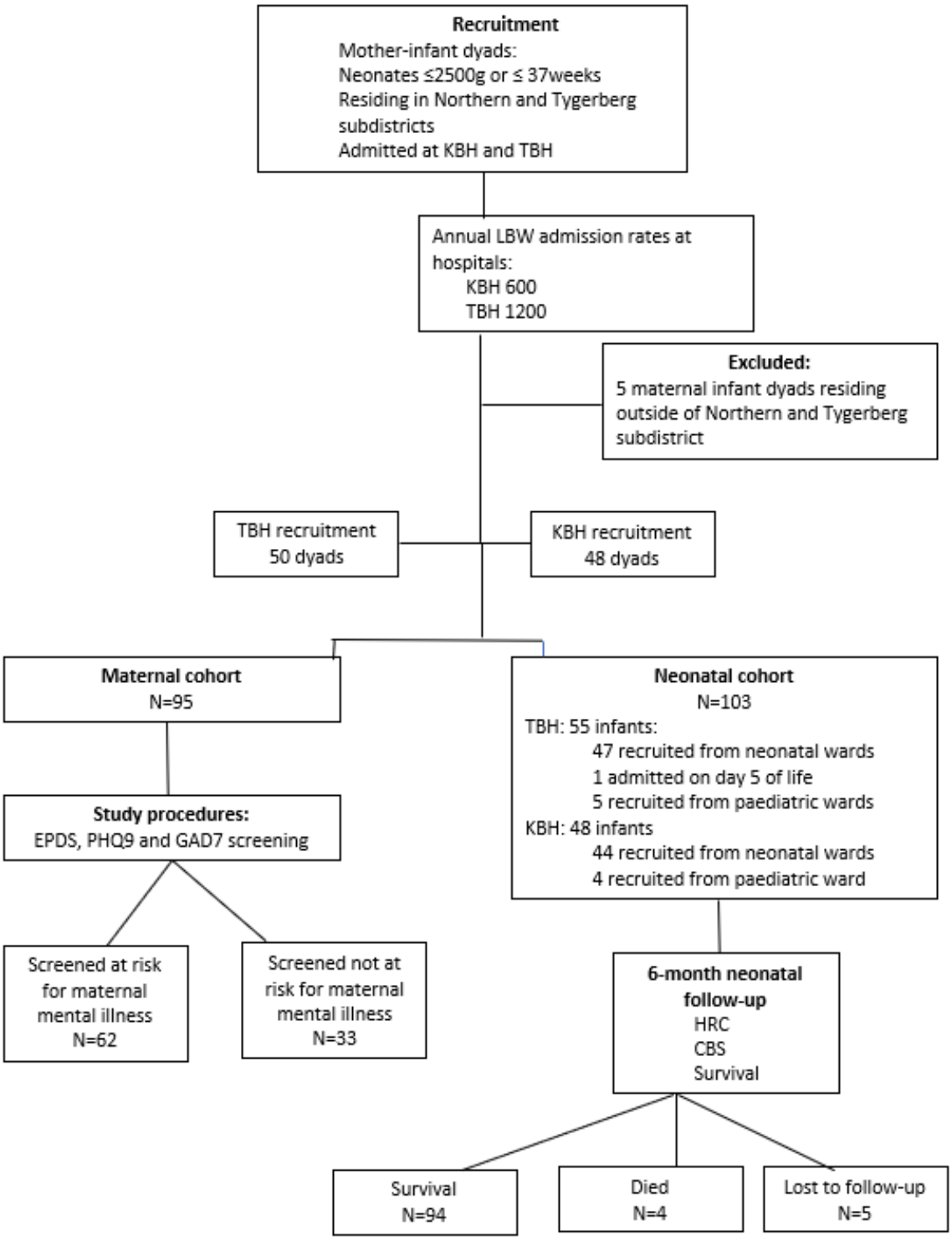
Figure 1: Flow diagram showing recruitment and study procedures



CBS – community based service; EPDS – Edinburgh Postnatal Depression score; GAD7 – General Anxiety 7-item; KBH – Karl Bremmer Hospital, HRC – high risk clinic, PHQ9 – Patient Health Questionnaire; TBH – Tygerberg Hospital.

- Infection was based on clinical suspicion based on signs of possible infection, such as temperature or glucose instability, tachycardia, tachypnoea and mottled skin. Sterile

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blood culture and a C-reactive protein (CRP) was collected at the treating clinician's discretion. The initiation of antibiotics was empiric. With the above in mind infection was further categorised into:

a) Early onset sepsis (EOS): Defined by sepsis within the first 72hours of life, with a positive blood culture or CRP ≥ 10mg/L.
b) Late onset sepsis (LOS): Defined by sepsis after 72hours of life, with a positive blood culture or CRP ≥ 10mg/L
c) Confirmatory EOS or LOS: Based on a positive blood culture.
d) Presumed EOS or LOS: Based on a CRP ≥ 10mg/L
e) Congenital infection: Confirmed perinatal transmission of syphilis or Cytomegalovirus (CMV)

- High risk clinic (HRC) is a specialised postnatal developmental screening clinic which is routinely scheduled for all VLBW infants at Tygerberg Hospital

Annexure E-G demonstrates the maternal mental health risk questionnaires that were used in the study: Patient Health Questionnaire-9 (PHQ9), The Generalised Anxiety Disorder 7-item (GAD7), and the Edinburgh Postnatal Depression Scale (EPDS) These questionnaires were self-completed by the mother.

Maternal mental health screening questionnaires

- Patient Health Questionnaire (PHQ-9)

This was developed for primary care evaluation of mental health disorders and is used for the detection of depression. It has been tested for validity in South Africa with a score of ≥ 10 having a sensitivity of 88% and score of 85% (25).

- Generalised Anxiety Disorder 7-item (GAD-7)

This is a 7-item self-administered questionnaire for screening and severity determination of generalised anxiety disorder. It has been validated for use in South Africa. The cut off score of 8 has a sensitivity of 83% and specificity of 84% with pooled cut off estimates of 7-10 with similar sensitivity and specificity rates (26).

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- Edinburgh Postnatal Depression Scale (EPDS)

This is a 10-item screening questionnaire which measures recent depressive symptoms specifically for perinatal depression. It has been validated for use in South Africa and a score of ≥ 11 has a sensitivity of 80% and specificity of 76%(27).

Data management plan

Data collection

Data were collected by the principal investigator.

Data sources

Routine maternal and neonatal outcome data, whilst hospitalised, were collected from various data sources:

- The Western Cape Provincial Data Centre (PHDC), governed within the Department of Health consolidates person-level clinical data across governmental services, inclusive of hospitals and primary health care facilities (28). This allows joint accountability to oversight committees for information technology, data governance and health research. It utilizes a unique identifier or patient mass index with patient registration to ensure that all data is represented on a digital forum to document all encounters (inferred health service contacts), episodes (health conditions) and cascades (health outcomes of conditions).
- Clinicom is a Department of Health tool, is a single shared hospital patient administration system which collects all data encounters, episodes, cascades and deaths(28)
- Single Patient Viewer (SPV) is a Department of Health tool derived from Clinicom, which is utilized by clinicians is displayed as a patient dashboard which allows a holistic overview of the patient history(28).

Data entering, storage and validation.

Data were collected onto data record forms and transcribed into Excel. A data dictionary and a relational database was developed in Microsoft Excel. Ongoing quality assurance was completed prior to data entry. Data integrity was ensured by a password protected folder with an automated daily back up system saved on Stellenbosch University's secure OneDrive

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cloud server. Study dyads (mother and infant pairs) folder numbers were saved in a different folder and a unique study ID ensuring anonymised data.

Statistical considerations

Sample size and power

The prevalence of maternal mental illness at Tygerberg and Karl Bremmer hospitals is unknown.

Based on the WHO report of Maternal Mental illness prevalence of 20% in LMIC, a sample size of 246 was calculated (based on a 95% confidence interval, 80% power and a significance level of 0.05) to ensure a cohort large enough.

In order to determine whether a single neonatal illness factor would be likely to influence maternal mental health, prematurity was used for factor sample size calculation. A sample size of 19 per group was calculated to allow comparison of groups with or without mental illness. This was based on a prevalence of 40% (29)of postpartum depression in mothers with prematurity was used, with a 95% confidence interval, 80% power and a significance level of 0.05 and 1:1 ratio)

Data analysis plan

Compiled data were analysed with the help of a biostatistician at the Department of Epidemiology and Biostatistics at Stellenbosch University.

Data were presented as means and standard deviation or median and interquartile range, depending on whether data were normally distributed or not. Categorical data were reported as number and percentage. Data were compared for mothers screening at risk or at no risk for mental health issues.

Data were compared for mothers who screened “at risk” and “not at risk” based on an amalgamation of the 3 screening tools (i.e., any high score on any test). Student’s t-test and chi2 were used, as appropriate.

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Data were analysed using STATA IC15 (Stata Corp, 2017, College Station, TX, USA.

Ethical considerations

The study was approved by University of Stellenbosch ethics committee (Ethics reference number S19/10/212) and Department of Health Research Committee for Western Cape Province, South Africa (Project number WC_202104_014)

Informed consent

Posters communicating the scope of the study were placed within the Baby room, Kangaroo Mother Care (KMC) unit and Paediatric ward of KBH and TBH. This enabled mothers to volunteer to participate when approached by the Principal Investigator (PI).

The PI identified eligible participants within Neonatal and Paediatric Department at KBH and TBH. Written informed consent, or assent, as applicable, was obtained in the home language (English, Afrikaans, or Xhosa) of the participant.

Assent was taken from adolescent mothers, under 18years of age. This was paired with telephonic consent from maternal grandmothers.

Confidentiality

The PI maintained standard procedure which ensured patient confidentiality. This included ensuring a confidential location for the completion of questionnaires and anonymous coding of confidential data with a unique study identification number for all variables recorded.

Standard of care

This study did not impact on study dyads' routine standard of care. Any mother who screened at risk with the questionnaire was referred according to existing, standard protocols for mental health assistance existing in the hospital and referrals were either made to local mental health community clinics or community-based psychologists.

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The study PI was not the mother's or infant's treating clinician, so this eliminated the therapeutic coercion for participation.

Study/ routine maternal follow-up

No routine maternal health screening occurs at either Karl Bremmer or Tygerberg Hospitals. Mothers with clinically identified possible mental health illness are referred at the infant or obstetric treating clinician's discretion.

All screening procedures were for study purposes only. Three self-administered questionnaires aided in identifying possible mental health illness. In the case of any abnormality being detected on the screening referral to mental health practitioner occurred via the appropriate pathways.

Study and routine LBW/ premature infant follow-up

All VLBW neonates are routinely referred to the Tygerberg Hospital High Risk Clinic at discharge. All low birth weight and premature infants are routinely referred to Community Based Home services to provide home visits and surveillance post discharge.

For the study, the PI telephonically monitored outcomes of these infants post discharge, through the assistance of community-based care workers network or via Clinicom or Single Patient Viewer (SPV).

Inclusion of vulnerable populations

Neonates and children are a vulnerable population. In this study they were not subjected to any study procedures. Only clinical data were collected. As such this was a minimal risk study for the neonatal component of the dyad.

Any patient with mental health issues is considered a vulnerable population. The prevalence of mental health illness in the study setting (TBH and KBH) is unknown. The study will thus provide an insight into this issue. The questionnaires pose the risk of identifying underlying mental health issues in a mother that may not be aware of the issue. This is however mitigated by the well-established pathways which are and were utilised in this study. This component

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can therefore be considered a moderate risk study but offers possible benefit to the patient, by ways of pro-active referral.

The inclusion of teenage mothers, being considered as both a possible child and a mental health patient, raises additional concerns of vulnerability. However, this population is at higher possible risk of numerous issues. In the Western Cape, teenage (15–19-year-olds) pregnancy rates are high (30) (40 per 1000 deliveries), representing a large proportion of pregnancies, as well as being at possible increased risk of mental illness due to a variety of factors. Their inclusion can therefore be justified on these grounds. Teenage mothers in the study signed assent as well as confirming their inclusion with a maternal grandmother. All similar referral pathways were followed. Although also a moderate risk category, inclusion could also provide potential benefit to the patients.

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Chapter 3: Results

In this study a total of 95 mothers and 103 infants were recruited from both Karl Bremer and Tygerberg Hospitals' neonatal and pediatric wards over a one-year period. Five maternal-infant dyads were excluded from this study as they resided outside of the Northern and Tygerberg subdistrict (figure 1). Most infants 91 (88%) were hospitalised since birth and recruited whilst still hospitalised. Twelve (12%) infants were recruited within the first 12weeks of life who had presented after 4days of life: 11 infants presented after day 4 of life and were recruited from the pediatric wards and 1 infant who was re-admitted to the neonatal ward. Dates of birth were used to exclude double recruiting. All mothers also confirmed that they had not been previously screened. This ensured single dyad recruitment within 3 months of birth.

MATERNAL DEMOGRAPHICS

Maternal demographics are shown in table 1. The majority of mother's (74%) were in the 19 – 35-year age range with a teenage (10-19year) pregnancy prevalence of 14%. The mother HIV prevalence was 20% and 3 (16%) of HIV positive mothers had a lower than detectable level viral load at delivery. Most mothers only had primary school education, were unemployed, but nearly half of mothers were married. Thirty-eight (40%) mothers had experienced previous obstetric complications or infant losses. One-fifth of mothers were unbooked.

INFANT DEMOGRAPHICS

Neonatal demographics are shown in table 2. Most neonates were preterm and very low birth weight (VLBW), in keeping with recruitment criteria. The most common admission diagnoses were respiratory distress (64/103(62%) and any type of sepsis. Respiratory distress syndrome was present in half of the population and required mostly non-invasive respiratory support as well as surfactant replacement in 21% of neonates with RDS (table 3). Congenital infections, early

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Table1: Maternal demographics

		All N=95
Maternal age, years, mean±SD		27.5 ± 6.8
Adolescent (10-19 years), n (%)		13 (14)
Gravidity, mean±SD		2.3±1.2
Parity, mean±SD		2.2±1.2
Current pregnancy, n (%)	Twins	6 (6)
	Triplets	1 (1)
Booking gestation, n (%)	<12weeks	27 (28)
	13-22weeks	33 (35)
	23-28weeks	9 (9)
	>28weeks	7 (7)
	Unbooked	19 (20)
HIV positive, n (%)		19 (20)
Mode of delivery, n (%)	NVD	52 (55)
	C-section	43 (45)
Delivery complication, n (%)		23 (24)
Education, n (%)	Primary	5 (5)
	Secondary	75 (73)
	Tertiary	15 (15)
Relationship, n (%)	Married	26 (27)
	Relationship	43 (45)
	Single	25 (26)
	Widow	1 (1)
Employment, n (%)	Permanent employment	22 (23)
	Temporary employment	7 (7)
	Student	16 (17)
	Unemployed	50 (53)
Previous mental health illness, n (%)		17 (18)
Any medical illness, n (%)		18 (19)
Any medication, n (%)		31 (33)
Substances used n (%)		15 (16)

HIV – human immunodeficiency virus; NVD – normal vertex delivery; SD – standard deviation

onset sepsis, late onset sepsis and necrotising enterocolitis were admission diagnoses in 8%, 11%, 11% and 6%, respectively (table 3).

Of the 19/103 (18%) of neonates who were HIV exposed at birth, all received anti-retroviral for prevention of mother-to-child transmission. Three neonates (3/19 (16%) showed positive HIV PCR's at birth whilst 1 infant (1/19 (5%) was PCR positive at the 10 week re-test.

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Table 2: Neonatal demographics

Variable		N=103
Male, n (%)		51 (50)
Gestational age, mean±SD		31.5±3.2
Prematurity, n (%)		96 (93)
BW z-score, mean±SD		0.32±1.49
BW centile, mean±SD		56.9±35.1
VLBW, n (%)		54 (52)
HC, mean±SD		29.0 ± 2.8
HIV exposed, n (%)		19 (18)
Neonatal resuscitation, n (%)		30 (29)
NICU admission birth, n (%)		3 (3)
Hospital of birth, n (%)	KBH	69 (73)
	TBH	25 (26)
	GSH	1 (1)
Admission diagnosis, n (%)	Respiratory distress syndrome	52 (50)
	Pneumonia	14 (14)
	Any Sepsis	30 (29)
	GIT disease	25 (24)
	Cardiac disease	7 (7)
	Other	28 (27)
Exclusive BF during hospitalisation, n (%)		79 (77)
Length of stay, mean±SD		33.8±26.8
Neonatal Outcomes		
Readmission, n (%)		36 (35)
HRC booked, n/N (%)		44 (43)
HRC attended, n/N (%)		25 (24)
6-month outcome, n (%)	Alive	94 (91)
	Death	4 (4)
	LTFU	5 (5)
OPD 6-month, n/N (%)		64 (62)

BW – birth weight; CS – Caesarean Section; GSH – Groote Schuur Hospital; HC – head circumference; KBH – Karl Bremmer; GIT – gastro-intestinal; HIV-human immunodeficiency virus; LTFU – lost to follow-up; MOD – mode of delivery; NVD – normal vertex delivery; OPD – outpatient department; SD – standard deviation; TBH – Tygerberg Hospital; VLBW – very low birth weight.

MATERNAL MENTAL HEALTH RISK SCREENING

The majority of mothers (65%) screened at risk for a mental health disorder ("at-risk") based on the results of the screening tools (as based on scores for referral within Tygerberg and Karl Bremer Hospital, EPDS ≥ 10, PHQ9 ≥ 6 and GAD7 ≥ 6) (table 4). The EPDS tool identified the highest percentage of mothers at risk, followed by PHQ9 and the GAD7 (table 4).

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Table 3: Infant admission diagnosis

Variable		**Total population infants N = 103**	
Disease category	Disease specifics		
Respiratory distress n (%)	Respiratory distress syndrome (RDS)	n (%)	52 (50)
	Management of RDS	Requiring high flow/nasal prongs	17(33)
		Requiring CPAP	23(44)
		Requiring surfactant	11 (21)
		Developed pulmonary haemorrhage	1 (2)
		Required mechanical ventilation	2 (4)
	Pneumonia	n (%)	14 (11)
	Pneumonia management	Requiring high flow	5 (36)
		Requiring CPAP	5 (36)
		Requiring mechanical ventilation	4 (29)
	Evolving CLD neonatal period		3 (3)
Sepsis n (%)	Any sepsis		30 (29)
	Presumed EOS (CRP>10)		7 (7)
	Confirmed EOS sepsis (BC positive)		4 (4)
	Late onset sepsis (LOS) CRP > 10		8 (8)
	Confirmed LOS (BC positive)		3 (3)
	Congenital infection (syphilis, CMV)		8 (8)
GIT n (%)	NEC (all stages)		6 (6)
	NEC management	TPN	3 (3)
		ventilation	1 (1)
	Abdominal mischief/ feeding intolerance		11 (11)
	Acute gastroenteritis		1 (1)
	Failure to thrive		3 (3)
Cardiac n (%)	Congenital acyanotic heart lesion (VSD/PDA)		4 (4)
	Blood transfusion AOP		3 (3)
Other, n (%)	Neonatal jaundice		17 (17)
	Electrolyte disturbances (hypo/hyperglycaemia, hypo/hypernatremia, hypo/hyperkalaemia)		14 (14)
	Undescended testes work-up		1 (1)
	Bilateral inguinal hernia surgery		2 (2)

AOP – anemia of prematurity; BC – Blood culture; CLD – Chronic Lung Disease; CMV – Cytomegalovirus; CRP – C reactive protein; EOS-Early onset sepsis; LOS – Late onset sepsis; NEC – necrotising enterocolitis; PDA – patent ductus arteriosus; RDS – respiratory distress syndrome; VSD – ventricular septal defect

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Nearly one fifth (18%) of the maternal study cohort had previously identified mental health issues. All the mothers (n=62) who screened high risk were referred to a mental health practitioner. Two mothers were seen whilst still n hospital with their infant (table 4).

Table 4: Postnatal mental health screening

Variable		**All mothers N= 95**	**"At-risk" mothers N=62**	**"Not at-risk "mothers N=33**	**p-value**
Screened at risk n (%)		62 (65)	14.4± 5.3	5.8± 2.3	**<0.001**
EPDS	Score, mean±SD	15 ± 5	52 (84)	2 (6)	**<0.001**
	Screened high risk (score >10), n (%)	54 (57)	9.6±5.4	2.1±2.0	**<0.001**
PHQ9	core, mean± SD	10 ± 4	47 (76)	2 (6)	**<0.001**
	Screened high risk (score >6), n(%)	49 (52)	8.5±.6	1.6±0.2	**<0.001**
GAD7	core, mean ± SD	9 ± 4	43 (69)	0 (0)	**<0.001**
	Screened high risk (score >6), n(%)	43 (45)			
Previous history of psychiatric diagnosis n (%)		5 (5)	5 (8)	0	0.096
Previous mental health illness history n (%)		17 (18)	13 (21)	4 (12)	**0.036**
Maternal in-hospital psychologist consultations, n (%)		2(3)	2 (3)	0	0.317
Psychiatric medications prescribed as inpatient n (%)		2 (3)	2 (3)	0	0.317

EPDS – Edinburg postnatal depression score; PHQ9 – Patient Health Questionnaire9; GAD7 – Generalised Anxiety Disorder 7 questionnaire; SD – standard deviation

Comparison of mothers who screened at risk of mental health issues.

Few statistically significant differences were apparent in maternal demographics for mothers who screened "at risk" for possible mental illnesses compared to mothers who screened "not at risk" (table 5). As expected, all scores differed significantly between mothers at risk and not at risk (table 4). Previous mental illness, HIV positivity and the use of any medication were significant factors ($p \leq 0.05$) with borderline significance of any delivery complication for differences "at risk" compared to "not at risk" (table 5).

Some neonatal demographic factors were significantly different between mothers who screened "at risk" compared to those "not at risk": birth weight centile and length of stay ($p \leq 0.05$) and borderline significance of birth weight z-score (table 62). Neonates of mothers requiring referral were large than those who did not require referral. The diagnoses of respiratory distress syndrome and "other" differed significantly between mothers at risk and

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not at risk. More neonates born to mothers "not at risk" were diagnosed with respiratory distress syndrome but more neonates born to mothers "at risk" with RDS required surfactant replacement. The higher incidence of "other diagnoses" was due to the higher incidence of glucose and electrolyte disturbances in neonates born to "at risk" mothers cohort (table 7)

Table 5: Maternal demographics stratified by maternal postnatal mental health screening risk

		All N=95	**"At-risk" mothers N=62**	**" Not at-risk" mothers N=33**	**p-value**
Maternal age, years, mean±SD		27.5 ± 6.8	27.3±6.8	27.7±7.0	0.788
Adolescent (10-19 years), n (%)		13 (14)	10 (16)	3 (9)	0.342
Gravidity, mean±SD		2.3±1.2	2.4± 1.4	2.3±1.1	0.688
Parity, mean±SD		2.2±1.2	2.2±1.2	2.1±1.3	0.921
Current pregnancy, n (%)	Twins	6 (6)	3 (4.9)	3 (1)	0.157
	Triplets	1 (1)	1 (1.6)	0	
Booking gestation, n (%)	<12weeks	27 (28)	16 (25)	11 (33)	0.602
	13-22weeks	33 (35)	20 (32)	13 (39)	
	23-28weeks	9 (9)	7 (11)	2 (6)	
	>28weeks	7 (7)	6 (10)	1 (3)	
	Unbooked	19 (20)	13 (21)	6 (18)	
HIV positive, n (%)		19 (20)	16 (26)	3 (9)	**0.050**
Mode of delivery, n (%)	NVD	52 (55)	33 (53)	19 (58)	0.642
	C-section	43 (45)	29 (47)	14 (42)	0.642
Delivery complication, n (%)		23 (24)	15 (24)	8 (24)	1.000
Education, n (%)	Primary	5 (5)	3 (5)	2 (6)	0.165
	Secondary	75 (73)	46 (74)	29 (87)	
	Tertiary	15 (15)	13 (21)	2 (6)	
Relationship, n (%)	Married	26 (27)	18 (29)	8 (8)	0.485
	Relationship	43 (45)	29 (19)	13 (14)	
	Single	25 (26)	13 (14)	22 (23)	
	Widow	1 (1)	1 (1)	0	
Employment, n (%)	Permanent employment	22 (23)	14 (23)	8 (24)	0.332
	Temporary employment	7 (7)	3 (5)	4 (12)	
	Student	16 (17)	13 (21)	3 (9)	
	Unemployed	50 (53)	32 (52)	18 (54)	
Previous mental health illness, n (%)		17 (18)	13 (21)	4 (12)	**0.036**
Any medical illness, n (%)		18 (19)	11 (18)	7 (21)	0.416
Any medication, n (%)		31 (33)	25 (40)	6 (18)	**0.043**
Substances used n (%)		15 (16)	8 (13)	7 (21)	0.290

HIV – human immunodeficiency virus; NVD – normal vertex delivery; SD – standard deviation

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There were also no difference in neonatal outcomes (readmission, mortality or clinic follow-ups) between neonates of mothers screened at-risk and not at-risk (table 6)

INFANT OUTCOMES AND POST-DISCHARGE FOLLOW-UP

Just under one fifth of infants required readmission, with just over half being attributed to pneumonia. Five (0.05%) of these admissions required intensive care admissions: pneumonia (n=3), sepsis (n=1) and surgical (n=1)). Readmission occurred within 6 days post discharge.

Just over half of the study cohort (54(52%) qualified for high-risk clinic (HRC) follow-up based on TBH HRC criteria (birth weight <1500g), of which only 60% actually attended the clinic appointment. Primary health care visits varied between 0-5 visits during the 6-month follow-up period with the majority of mothers (45%) taking their infant for 5 visits.

The majority of infants (91%) were alive at 6months chronological age. The mortality incidence within this study was 4%. On initial analysis 10 (10%) infants were lost to follow up. After attempts at telephonic tracing of these infants, 3 infants were found to have migrated (Eastern cape (n=3), another sub-district (n=1). The other five infants could not be traced.

Feedback from community based services (CBS) was only available in one quarter (27/103) of infants. During CBS visits, the following procedures were able to be performed: weight check (4(15%)), feeding choice (6(22%), immunisation status check (2 (7%)), appointment adherence check (6(22%)), maternal mental health screen (1 (4%)), death confirmation (2(7%)), vitals checked (3(11%)), and check of child support grant in place (1 (4%)). In 15 CBS visits, inability to provide feedback was stated to be: refusal of entry to home (3(20%)) and migration or change of residence (12 (80%)).

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Table 6: Neonatal demographics and outcomes stratified by maternal postnatal mental health screening risk

Variable		**All**	**"At-risk" mothers**	**"Not at-risk" mothers**	**P-value**
Number of mothers, (n)		95	62	33	
Number of neonates, (n)		103	67	36	
Male, n (%)		51 (50)	34 (33)	13 (14)	0.152
Gestational age, mean±SD		31.5±3.2	31.3±3.2	31.8±3.4	0.503
Prematurity, n (%)		96 (93)	58 (89)	30 (91)	0.639
BW z-score, mean±SD		0.32±1.49	0.63±1.38	0.01±1.67	**0.058**
BW centile, mean±SD		56.9±35.1	65.1±33.4	49.6±36.0	**0.039**
VLBW, n (%)		54 (52)	32 (49)	18 (55)	0.785
HC, mean±SD		29.0 ± 2.8	28.8±2.8	29.1±2.9	0.665
Neonatal resus, n (%)		30 (29)	19 (31)	9 (27)	0.991
NICU admission birth, n (%)		3 (3)	2 (3)	1 (3)	1.00
Hospital of birth, n (%)	KBH	69 (73)	15 (23)	10 (30)	0.638
	TBH	25 (26)	46 (74)	23 (70)	
	GSH	1 (1)	1 (2)	0 (0)	
Admission diagnosis, n (%)	Respiratory distress syndrome	52 (50)	27 (40)	25 (69)	**0.005**
	Pneumonia	14 (14)	12 (18)	2 (6%)	0.093
	Any Sepsis	30 (29)	18 (27)	12 (36)	0.365
	GIT disease	25 (24)	12 (18)	13 (36)	0.133
	Cardiac disease	7 (7)	5 (7%)	2(6)	0.555
	Other	28 (27)	22 (33)	6 (17)	**0.026**
Exclusive BF during hospitalisation, n (%)		79 (77)	48 (77)	26 (79)	0.878
Length of stay, mean±SD		33.8±26.8	37.3±29.5	25.8±19.4	**0.046**
Neonatal outcomes					
Readmission, n (%)		36 (35)	17 (25)	9 (22)	0.419
HRC booked, n/N (%)		44 (43)	29/32 (91)	15/18 (83)	0.902
HRC attended, n/N (%)		25 (24)	17/29 (59)	8/15 (53)	0.706
6-month outcome, n (%)	Alive	94 (91)	61 (91)	33 (92)	0.864
	Death	4 (4)	3 (4)	1 (3)	0.864
	LTFU	5 (5)	3(4)	2 (6)	0.649
OPD 6-month, n/N (%)		64 (62)	40/61 (66)	24/33 (73)	0.488

BW – birth weight; CS – Caesarean Section; GSH – Groote Schuur Hospital; HC – head circumference; KBH – Karl Bremmer; GIT – gastro-intestinal; HIV-human immunodeficiency virus; LTFU – lost to follow-up; MOD – mode of delivery; NVD – normal vertex delivery; OPD – outpatient department; SD – standard deviation; TBH – Tygerberg Hospital; VLBW – very low birth weight.

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Table 7: Infant admission diagnosis stratified by postnatal mental health.

Variable		Total population infants N = 103		Infants of mothers "at risk" N=67	Infant of mothers "not at risk" N=36	p-value
Diagnostic category	**Disease type and management**					
Admission diagnosis						
Respiratory distress n (%)	Respiratory distress syndrome (RDS)	n (%)	52 (50)	27(40)	25 (69)	**0.005**
	Management of RDS	Requiring high flow/nasal prongs	17(33)	8 (30)	9 (36)	0.536
		Requiring CPAP	23(44)	15(55)	8 (32)	**0.026**
		Requiring surfactant	11 (21)	5(19)	6 (24)	
		Developed pulmonary hemorrhage.	1 (2)	1(4)	0	0.552
		Required mechanical ventilation	2 (4)	2 (7)	0	0.105
	Pneumonia	n (%)	14 (11)	12(18)	2 (6)	0.093
	Pneumonia management	Requiring high flow	5 (36)	3 (25)	2 (100)	**0.048**
		Requiring CPAP	5 (36)	5(42)	0	0.269
		Requiring mechanical ventilation	4 (29)	4 (33)	0	0.355
	Evolving CLD neonatal period	3 (3)		3 (4)	0	0.226
Sepsis n (%)	Any sepsis	30 (29)		18 (27)	12 (36)	0.365
	Presumed EOS (CRP>10)	7 (7)		4 (6)	3(8)	0.700
	Confirmed EOS sepsis (BC positive)	4 (4)		2(3)	2 (6)	0.463
	Late onset sepsis (LOS) CRP > 10	8 (8)		4 (6)	4 (11)	0.367
	Confirmed LOS (BC positive)	3 (3)		3 (4)	0	0.226
	Congenital infection (syphilis, CMV)	8 (8)		5 (7)	3 (8)	0.853
GIT n (%)	NEC (all stages)	6 (6)		3 (5)	3 (8)	0.544
	NEC management	TPN	3 (3)	0	3(8)	0.019
		ventilation	1 (1)	1 (2)	0	0.395
	Abdominal mischief/ feeding intolerance	11 (11)		6 (9)	5 (14)	0.436
	Acute gastroenteritis	1 (1)		1 (2)	0	0.395
	Failure to thrive	3 (3)		1 (2)	2 (6)	0.287
Cardiac n (%)	Congenital acyanotic heart lesion (VSD/PDA)	4 (4)		4 (6)	0	0.135
	Blood transfusion AOP	3 (3)		1 (2)	2 (6)	0.287
Other, n (%)	Neonatal jaundice	17 (17)		14 (21)	3 (8)	0.091
	Electrolyte disturbances (hypo/hyperglycaemia, hypo/hypernatremia, hypo/hyperkalaemia)	14 (14)		13 (19)	1 (3)	**0.023**
	Undescended testes work-up	1 (1)		0	1 (3)	0.156
	Bilateral inguinal hernia surgery	2 (2)		1 (2)	1 (3)	0.750

AOP – anemia of prematurity; BC – Blood culture; CLD – Chronic Lung Disease; CMV – Cytomegalovirus; CRP – C reactive protein; EOS-Early onset sepsis; LOS – Late onset sepsis; NEC – necrotising enterocolitis; PDA – patent ductus arteriosus; RDS – respiratory distress syndrome; VSD – ventricular septal defect

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Chapter 4: Discussion

To the best of our knowledge, we present the first maternal mental health study within Tygerberg and Karl Bremer hospitals. Our study found a high prevalence of mothers at risk of maternal mental illness within the first 3 months after delivery of a preterm or low birth weight infant when using a combination of the EPDS, GAD7 and PHQ9 screening questionnaires. Various maternal and neonatal factors differed between mothers found to be at risk and not at risk of maternal mental illness.

The EPD scores in our study were higher than those in mothers of a German preterm cohort (9.0±5.69)(31) and Swedish cohort (11.7±6.2)(32). The GAD-7 score in our study was higher than that in the Swedish cohort (7.0±5.2)(32). The PHQ-9 score in our study was also higher than in an Indian study (median4 (IQR2-7))(33).

Just under two-thirds of the mothers in our study screened at risk for maternal mental illness and required referral to psychology services. Unfortunately, no follow-up data were available to confirm how many mothers attended referral appointments and if any mental illness was confirmed requiring further management. In an Australian study, using EPDS as a postnatal depression screening tool, it was found that mothers who had scores 10-12 had 4.5 times higher odds of experiencing probable postnatal depression than those who scored 9 or less(34). It can therefore be reasonably assumed, that a significant proportion of the mothers who screened at risk in our cohort had a high probability of experiencing depression and/ or anxiety.

A recent Cape Town study found that 32% of mothers, as screened by EPDS and a Mini International Neuropsychiatric Interview, had mood, psychotic, anxiety, or a combination of these, disorders(35). In a rural Gauteng study, 38.8% of pregnant patients screened positive for postnatal depression using an EPDS score >13(36). These studies are not comparable to our study. Our study showed double these numbers, but our study was aimed at screening

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for risk rather than illness, thus using lower score values than those that were used in the above studies.

The most frequently used psychometric scales for maternal mental health are the EPDS and PHQ9 questionnaires. The EPDS score has been shown to significantly correlate with the GAD-7 score when screening for anxiety disorders with co-morbid depression states in the perinatal population (37). However, the GAD-7 shows better specificity than the EPDS(37). The PHQ-9 has also been shown to have similar sensitivity, specificity and area under the curve values as the EPDS score(38).

Numerous studies have used varying EPDS cut-off values, ranging from 10 to13. In a recent systematic review utilising EPDS for postpartum depression, it was shown that an EPDS score ≥10 had a pooled sensitivity 85% and specificity 84%. When the cut-off was increased to ≥13, the sensitivity decreased to 66% but specificity increased to 95%(39). In another systematic review, increasing cut-off values (including those of EPDS, PHQ and GAD) showed decreasing sensitivity but increasing specificity but with validity that was linked to various external factors (ethnicity, age, socio-economic status)(40). Using a higher threshold (≥13) in our study, the prevalence rate would decrease by 15%.

Both the EPDS and PHQ-9, have been well validated. In a systematic review of these scores, as compared to standard care for postpartum depression, the use of the scores led to reduced rates of depression, anxiety and parental distress, a large increase in treatment seeking behaviour and increased quality of life(41). The use of these screening tools has also been shown to increase quality of life as well as being cost-effective(42). These screening tools have been stated to be easy to use (by medical personnel) and showed a high acceptability level by mothers as indicated by high completion rates and patient satisfaction(41).

The American Academy of Paediatrics has also recommended using the EPDS as a screening tool for all mothers at “wellness check” visits at 1,2- and 4-months after delivery. The recommended cut-off is ≥10, as was used in the current study(43).

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A high percentage of mothers in our cohort were teenagers. This is slightly higher than the South African and Western Cape teenage (15-19 years) pregnancy rate (12.5% and 10.8%, respectively) (44). A systematic review showed contradictory evidence of the effect of teenage pregnancy and maternal mental health, but social context was not included in all studies(45). In a South African setting, poor maternal mental health in teenagers was associated with substance abuse, a lack of perceived social support and community violence but not HIV status(46). This indicates a population that is at significant risk of maternal mental illness and should be monitored.

Parity has been associated with maternal mental illness, with higher parity mothers showing more mental health issues(47). Unemployment remains a significant risk factor for poor maternal health with numerous studies showing the association(48). This is in contrast to our study, where neither parity nor employment status showed any statistical difference in the maternal mental illness risk level.

Our study showed no difference between mothers at risk or not at-risk dependant on multiple births. This is contrary to studies suggesting that multiple births can increase maternal mental illness with depression and anxiety being present in one third of women(49,50).

Mothers living with HIV screened at risk more than mothers who were HIV negative. This is similar to findings in other studies showing a higher burden of mental illness in mothers living with HIV(51). Le Masters et al described the double burden of HIV diagnosis and pregnancy with associated increased risk of depression (52). This association was attributed to multiple bio-psychosocial factors including increased stress, HIV related stigma, lack of social support, concerns of HIV disease, infant health, and their HIV status (52) . In the South African context high prevalence coexist in mental illness and HIV within a complex framework (53). This coexistent relationship can potentially cause considerable morbidity and due to the quadruple burden of disease within South African, and may remain undetected by the physician(53).

Nearly three-quarters of our study population were in a partnered relationship, with no differences between mothers at risk and not at risk. Single relationship status has been

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associated with increases in maternal health illness(54) . A recent systematic review has also shown a strong association between poor partner support and maternal mental distress(55).

A high percentage of our study mothers had a low level of education and were unemployed. This has been clearly associated with higher levels of maternal mental illness in numerous studies(56,57).

Aa German study showed increased EPDS scores in women with high-risk pregnancy and VLBW, with a resultant progression to postpartum depression (31).

Previous studies have also shown that mothers with previous history of depression are at an increased risk of maternal mental health issues, specifically depression(58,59). However, most studies concentrated on a single variable (prematurity) with numerous variables not having been included in analyses(60).

Although race was not examined as a separate entity in this study, the demographics of the Western Cape and the 2 subdistricts is of an impoverished mixed and African race. Similar to other countries with these populations, these cultures experience a higher risk of mental health concerns due to factors such as race (African), age (younger), socio-economic status (lower), employment status (unemployed), income (below the poverty line), level of stress (higher), number of children (higher) and racism(61). There may therefore be a higher need to monitor risk for maternal mental health issues in these communities.

The majority of our study's cohort were mothers of preterm and/or LBW neonates. Despite this, this was not a significant factor for risk of maternal mental illness. Numerous studies have shown that both prematurity and low birth weight are associated with increase psychological stress(62,63) . In a systematic review, postpartum depression was found to be present in up to 40% of women with premature infants and was associated with lower gestational ages, lower birth weight, ongoing illness or disability and a perceived lack of social support(64). In a Brazilian study, neither prematurity nor contrasting socio-economic statuses of 2 maternal cohorts were associated with postpartum depression within 6 months after childbirth, as determined by an EPD Score ≥12(65)

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In this study, most mothers were breastfeeding. No differences were shown between mothers who screened at risk and not at risk for maternal mental illness regarding breastfeeding status during hospitalisation. Breastfeeding has been shown to improve maternal mental health outcomes (66). However, this is counterbalanced by the possible negative effects of breastfeeding expectations and actual experience(66). The positive mental effects of breastfeeding may persist for the first postpartum year(67)

Studies have shown that maternal mental health illnesses are often multifactorial. Two Kwa-Zulu Natal studies reported prevalences of 42-72% of postnatal depression(56,57). Factors associated with depression were a preterm baby, baby health status, baby hospitalization, the baby's HIV status, level of maternal education, income and source of income. A significant difference in risk factors for postnatal depression was found in 2 cohorts from the Free State and Gauteng – with differences related to planned pregnancy, supportive partner, baby age, partner drinking alcohol, and stressful events(68). A study from Witzenberg, Western Cape showed a prevalence of 50.3% of depression according to the EPDS score. In a systematic review of the determinants of poor maternal health (postpartum depression) in Sub-Saharan Africa, 3 levels of factors were identified(69). The top ranked factors (OR 2-3 times level 2 and 3 factors) were intimate partner violence, poor social support, unplanned/ unwanted pregnancy and maternal age. Second level factors included maternal illness, single status, poor socioeconomic status and low education. Level 3 factors were perinatal death, undesired infant sex, caesarean section, substance abuse, antenatal depression, poor health of new infant, primiparous. Some of these factors were also evident in our study: high rate of primary school education, unemployment and previous antenatal mental illness. Risk factors may therefore be population and geography dependant and should be determined for the population being studied.

One-fifth of our study population was unbooked, i.e. mothers had not attended any antenatal clinic visits prior to delivery. Antenatal clinics are utilised by 88.6% of pregnant mothers in the Western Cape(70). Our study showed a higher unbooked rate (20% vs 13.4%). Although this may be attributable to numerous factors, the impact of the COVID-19 pandemic during the study time has to be considered. In March 2020 the World Health Organisation (WHO)

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declared a global pandemic of coronavirus disease 2019 (COVID-19) caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARs-CoV-2)(71). COVID-19 has affected the mental health of women more than men according to recent Global Burden of Disease data(72). However, evidence also indicates a significant decline in maternal mental health within the developed world during the COVID-19 pandemic(73).COVID-19 restrictive measures such as quarantine, physical distancing, closure of schools and essential social services have resulted in stress on vulnerable groups within communities(74).The other stressors include ensuing financial concerns(75) loneliness, fear of infection, grief after bereavement have been linked to anxiety and depression following emergence of COVID 19.

Maternal mental health has been associated with adverse neonatal outcomes – lower Apgar scores, any hospital admission during the neonatal period, respiratory distress syndrome, hypoglycemia, sepsis, dehydration, feeding problems, abstinence syndrome and mortality(76,77). This was similar to our study that showed a high incidence of respiratory distress syndrome as well as hypoglycemia. Neonatal intensive care stay has also been shown to be a significant stressor on parents(78). In our study the length of stay was significantly longer in mothers screened at risk compared not at risk. This is similar to a study that found that length of NICU hospitalisation was associated with anxiety symptoms rather than depressive symptoms in mothers(79)

Although preterm birth, low birth weight and other factors may predispose or increased maternal mental illness, the presence of maternal mental illness may also influence the mother-infant bonding ability as well as affecting infant development(86). It is therefore important to identify these mothers early to ensure infant physical and mental well-being. Co-morbid or prenatal maternal mental illness has been associated with adverse toddler social-emotional and cognitive development(87), altered brain development at 18 months(88), poorer toddler sleep patterns(89), as well as poorer global, behavioural, cognitive and socio-emotional development at school age(90). This links with the First 1000 days initiative to improve(91).

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The screening tools in this study represent those used for the identification of the most common mental health illnesses. Although validated and well established in the literature and clinical practice, there are still 3 questionnaires that are required to be completed by the mother. This may lead to frustration in the mothers. Screening tools are also complex and are also dependant on the population, health context, health system and validity varied according to ethnicity, socio-economic background and patient age(40). Recently, an ultra-short maternal mental health screening tool, based on the EPDS, PHQ and other screening tools was developed for the South African environment(84) . The simplistic 3 question screening tool for common perinatal mood disorders was initiated in 2017 by the Perinatal Mental Health Project. The 3 are: (1) felt unable to stop worrying or thinking too much; (2) felt down, depressed or hopeless, (3) had thoughts and plans to harm yourself or commit suicide(85). In comparison to the EPDS, this PMHP brief 3-item tool showed a 100% sensitivity but 43% specificity and was only able to correctly identify 54% of women at a cut-off of PMHP>1 as correlated with EPDS>13. This tool may help rapidly identify mothers at risk and improve the mental health status in our population but may not be sufficiently sensitive to identify perinatal mental health disorders. This requires more research.

AFFIRM, African focus on Intervention Research for Mental Health, is a collaborative research hub which investigates strategies for narrowing the treatment gap for mental disorders in Sub-Saharan Africa in four areas (80). Two of the four areas have relevance in this study namely sharing research related to task sharing and narrowing the treatment gap and building individual)and institutional capacity for intervention research in Sub-Saharan Africa(80). Rhoda et al recommends the provision of a postnatal care package as strategy to reduce child mortality, by providing a link between the hospital and home using the primary care ward-based outreach teams (WBOTS)(81).Lund et al built on this foundation to include this platform to train the community base services to potentially build capacity and effectively perform perinatal mental health screening to ensure early treatment and early detection of mothers at risk to improve childhood outcomes(80). This would therefore be an opportune time to screen and detect perinatal mental illness, integrating the evaluation within antenatal care and child health programmes as encouraged by Baron et al(82). Paradoxically, the judgemental attitudes of healthcare professionals present as an additional barrier to good

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antenatal care as research has shown that women with mental health disorders present late for antenatal care due to fear of stigma. or poor mental health awareness (83)

Although this study only examined the mental well-being of mothers, fathers should not be excluded. Although studies have shown fathers to develop slightly less postpartum depression,(31) their mental health is also at risk(92).

Limitations

This was a small prospective study. The study cohort was limited to the geographical region of the Northern and Tygerberg sub-district of the East Metropole, Western Cape province, South Africa. This represents the immediate drainage area for Tygerberg and Karl Bremmer hospital. However, these hospitals function as level 2 and 3 referral hospitals which significantly limited the sample size. The study was therefore underpowered. However, the results are suggestive of a high underlying “at risk” burden for maternal mental health illness and further studies are warranted to corroborate this study’s results.

Various variables known to possibly affect maternal mental health were not examined in this study. Although booked/ unbooked status of the pregnancy was documented this does not translate to a wanted or unwanted infant. Pattern of violence and partner/ spousal support were not interrogated or questioned and should be investigated in further studies with the relevant psychological support for caregivers. Substance abuse was poorly documented in notes and was often not freely acknowledged by mothers in this study. This also requires more investigation in this impoverished community setting.

Mothers were recruited within 3 months of birth and the screening tool applied at a single time point within this period. The non-standardization of screening time frame makes the onset, extent, and duration of the possible maternal mental illness difficult to determine. This would impact on the optimal timing of the screening process.

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Recommendations

This study suggested high rates of postnatal mental illness on screening tools and highlights the need to improve screening in mothers with premature or low birth weight infants.

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Annexures

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Annexure A: Health Research Ethics Committee (HREC) Approval Notice

UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

5/09/2020

Project ID: 11823

Ethics Reference No: S19/10/212

Project Title: Outcomes of low birth weight and premature infants admitted to Karl Bremer Hospital stratified by Maternal Mental Health Dear Dr Cordelia ELY
We refer to your amendment request received 04/08/2020.

Through an expedited review process, the Health Research Ethics Committee (HREC) reviewed and **approved** your request to continue with study activities. The committee is satisfied with the measures the researchers will put into place to protect the research participants and staff.

Where to submit any documentation

Kindly note that the HREC uses an electronic ethics review management system, *Infonetica*, to manage ethics applications and ethics review process. Tosubmit any documentation to HREC, please click on the following link: https://applyethics.sun.ac.za.

Please remember to use your project ID 11823 and ethics reference number S19/10/212 on any documents or correspondence with the HREC concerning your research protocol.
Yours sincerely,

Mrs. Melody Shana
Coordinator: Health Research Ethics Committee 1

National Health Research Ethics Council (NHREC) Registration Number: REC-130408-012 (HREC1)REC-230208-010 (HREC2)
Federal Wide Assurance Number: 00001372
Office of Human Research Protections (OHRP) Institutional Review Board (IRB) Number:IRB0005240 (HREC1)IRB00

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Annexure B:

Tygerberg Hospital Research Approval Letter

Western Cape Government
Health

TYGERBERG HOSPITAL
REFERENCE:
Research Projects
ENQUIRIES: **Dr GG Marinus**
TELEPHONE:**021 938 5752**

Project ID: 11823

Ethics Reference: S19/10/212

TITLE: **The outcome of low birth weight and premature infants requiring admissions to hospital, from the Northern and Tygerberg Health sub-districts in the Cape Metropole, stratified by Maternal Mental Health**

Dear Dr Cordelia Ely

PERMISSION TO CONDUCT YOUR RESEARCH AT TYGERBERG HOSPITAL.

1. In accordance with the Tygerberg Hospital Health Research Policy and Protocol of **April 2018,** permission is hereby granted for you to conduct the above-mentioned research here at Tygerberg Hospital for a year based on your HREC approval.

2. Researchers, in accessing Provincial health facilities, are expressing consent to provide the Department with an electronic copy of the final feedback within six months of completion of research. This can be submitted to the Provincial Research Co-Ordinator (Health.Research@westerncape.gov.za).

DR GG MARINUS
MANAGER: MEDICAL SERVICES

Date: 8/6/2019

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Annexure C: Clinical recording form: Maternal Demographics

Maternal Demographics

Study Number: _____

Age		
	<16	
	16 – 20	
	21-25	
	26-30	
	31-35	
	36-40	
	>40	
Gravidity		
Parity		
Previous miscarriage	Yes	No
	Trimester 1	
	Trimester 2	
Previous TOP	Yes	No
	Number	
HIV positive	Yes	No
- **Diagnosis**	Preconception / antenatal / delivery / postpartum	
ARVS commenced	Yes	No
ARvs default	Yes	No
Unbooked		
Booked	Yes	No
Gestation at booking		
<12weeks/ 13-22/ 22- 28/ > 28		
Relationship:		
Married/ single/ living with partner/ separated		
Education:		
< primary school / completed primary school / Gr 10 / Grade 12/ Tertiary		
Other		
Employment:		
Unemployed / temporary/ permanent		
Previously diagnosed with mental illness	Yes	No
Medications	Yes	No
…. specify		
Substance abuse	Yes	No
Specify		
Current address: **Contact numbers x 4:**		

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Email address:		
Follow up telephonically	Yes	No
Specify		
Feedback:	Date	

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Annexure D: Clinical recording form: Infant demographics

Infant clinical details

Study Number: _____

Birthweight:	**Head circumference:**	**Length:**
Gestation:		
Agars: **Minute 1 –**	**Minute 5 -**	**Minute 10 -**
Previous admission		
Date:		
Hospital / ward:		
Diagnosis:		
Length of stay:		
Complication:		
Date of KMC/ day of KMC:		
Exclusive breastfeeding:	Yes	No
Mixed feeding:		
Exclusive formula feeds:		
Birth PCR done:	Yes	No
Birth PCR result:	Positive	Negative
Date of transfer in:		
Admission if occurs after discharge home		
Date of admission:		
Admission weight:	**Head circumference**	**Length**
Diagnosis:		
Intervention:		
Escalation:		
Complications:		
Transfer:	YES	NO
Outcome: **Mortality**	Yes	No

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Outpatient follow up	Yes	No
Referral to CBS	Yes	No
Date of referral		
Name of CCW:		
Follow up		
Date:		
Feedback:		

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Annexure E: Edinburgh postnatal depression scale

Edinburgh Postnatal Depression Scale[1] (EPDS)

Name:_____ Address:

_____

Your Date of Birth: _____

_____

Baby's Date of Birth:_____ Phone:

_____

As you are pregnant or have recently had a baby, we would like to know how you are feeling. Please checkthe answer that comes closest to how you have felt **IN THE PAST 7 DAYS**, not just how you feel today.

Here is an example, already completed.I have felt happy:

☐ Yes, all the time
☒ Yes, most of the time This would mean: "I have felt happy most of the time" during the
☐ past week.No, not very often Please complete the other questions in the same way.
☐ No, not at all

In the past 7 days:

1. I have been able to laugh and see the funny side of things
☐ As much as I always could able
☐ Not quite so much now
☐ Definitely not so much now coping as well
☐ Not at all

2. I have looked forward with enjoyment to things
☐ coping as well as everAs much as I ever did
☐ Rather less than I used to
☐ Definitely less than I used to
☐ Hardly at all

*3. I have blamed myself unnecessarily when things went wrong
☐ Yes, most of the time
☐ Yes, some of the time
☐ Not very often
☐ No, never

4. I have been anxious or worried for no good reason
☐ No, not at all

*6. Things have been getting on top of me
☐ Yes, most of the time I haven't been to cope at all
☐ Yes, sometimes I haven't been as usual
☐ No, most of the time I have coped quite well
☐ No, I have been

*7 I have been so unhappy that I have had difficulty sleeping
☐ Yes, most of the time
☐ Yes, sometimes
☐ Not very often
☐ No, not at all

*8 I have felt sad or miserable
☐ Yes, most of the time
☐ Yes, quite often
☐ Not very often No, not at all

*9 I have been so unhappy that I have been crying

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Hardly ever
Yes, sometimes
Yes, very often

*5

I have felt scared or panicky for no very good reason
Yes, quite a lot
Yes, sometimes
No, not much
No, not at all

*10

Yes, most of the time
Yes, quite often
Only occasionally
No, never

The thought of harming myself has occurred to me
Yes, quite often
Sometimes
Hardly ever
Never

Administered/Reviewed by_____ Date _____

[1]Source: Cox, J.L., Holden, J.M., and Sagovsky, R. 1987. Detection of postnatal depression: Development of the 10-itemEdinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150:782-786 .

[2]Source: K. L. Wisner, B. L. Parry, C. M. Piontek, Postpartum Depression N Engl J Med vol. 347, No 3, July 18, 2002,194-199

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Edinburgh Postnatal Depression Scale[1] (EPDS)

Postpartum depression is the most common complication of childbearing.[2] The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a valuable and efficient way of identifying patients at risk for "perinatal"depression. The EPDS is easy to administer and has proven to be an effective screening tool.

Mothers who score above 13 are likely to be suffering from a depressive illness of varying severity. The EPDSscore should not override clinical judgment. A careful clinical assessment should be carried out to confirm thediagnosis. The scale indicates how the mother has felt ***during the previous week***. In doubtful cases it may be useful to repeat the tool after 2 weeks. The scale will not detect mothers with anxiety neuroses, phobias orpersonality disorders.

Women with postpartum depression need not feel alone. They may find useful information on the web sites ofthe National Women's Health Information Centre <www.4women.gov> and from groups such as Postpartum Support International <www.chss.iup.edu/postpartum> and Depression after Delivery <www.depressionafterdelivery.com>.

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SCORING

QUESTIONS 1, 2, & 4 (without an *)

Are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.

QUESTIONS 3, 5-10 (marked with an *)

Maximum score: 30
Possible Depression: 10 or greater Always look at item 10 (suicidal thoughts)

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Instructions for using the Edinburgh Postnatal Depression Scale:

1. The mother is asked to check the response that comes closest to how she has been feelingin the previous 7 days.
2. All the items must be completed.
3. Care should be taken to avoid the possibility of the mother discussing her answers with others. (Answers come from the mother or pregnant woman.)
4. The mother should complete the scale herself, unless she has limited English or has difficulty with reading.

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Annexure F: Generalised Anxiety Disorder Scale

GAD-7
Anxiety

Over the last 2 weeks, how often have you been bothered by the following problems? *(Use "✓" to indicate your answer"*	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awfulmight happen	0	1	2	3

Column totals: ____ + ____ +_____ + ____

= Total Score _____

If you checked off any problems, how difficult have these problems made it for you todo your work, take care of things at home, or get along with other people?

Not difficult at all	**Somewhat difficult**	**Very difficult**	**Extremely difficult**
☐	☐	☐	☐

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Annexure G: Patient Health Questionnaire 9

PHQ-9 Depression

Over the last 2 weeks, how often have you been bothered by any of the following problems? *(Use "✓" to indicate your answer"*	**Not at all**	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things.....	0	1	2	3
2. Feeling down, depressed, or hopeless.....	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much.....	0	1	2	3
4. Feeling tired or having little energy.....	0	1	2	3
5. Poor appetite or overeating.....	0	1	2	3
6. Feeling bad about yourself — or that you are a failureor have let yourself or your family down.....	0	1	2	3
7. Trouble concentrating on things, such as reading thenewspaper or watching television.....	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving .around a lot more thanusual.....	0	1	2	3
9. Thoughts that you would be better off dead or of hurtingyourself in some way.....	0	1	2	3

Column totals_____ **+__+_____+** _____

= *Total Score* _____

Scoring notes.

PHQ-9 Depression Severity

Scores represent**: 0-5 = mild 6-10 = moderate 11-15 = moderately severe16-20 = severe depression**

***GAD-7 Anxiety Severity*.**

This is calculated by assigning scores of 0, 1, 2, and 3, to the response categories of "not at all," "several days," "more than half the days," and "nearly every day," respectively. GAD-7 total score for the seven items ranges from 0 to 21.

Scores represent: **0-5 mild 6-10 moderate 11-15 moderately severe anxiety15-21 severe anxiety.**

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Annexure H: Informed consent

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

Please see Section 8 of our Health Research Ethics Committee (HREC) Standard Operating Procedures (SOPs) for more detailed information about requirements for Informed Consent (IC). You will find the SOPs here: http://www.sun.ac.za/english/faculty/healthsciences/rdsd/Pages/Ethics/SOP.aspx.
(Please delete this paragraph before submitting your Informed Consent Form (ICF) to the HREC)

TITLE OF RESEARCH PROJECT:	
Outcomes of Low Birth Weight and premature infants, from the KBH drainage area, admitted to hospital risk stratified by Maternal Mental Health	
DETAILS OF PRINCIPAL INVESTIGATOR (PI):	
Title, first name, surname: **Dr Cordelia Ely**	**Ethics reference number:** **S19/10/212**
Full postal address: **Tygerberg Hospital** **Cordelia.fredericks@gmail.com**	**PI Contact number:** **0741178772**

We would like to invite you to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff or doctor any questions about any part of this project that you do not fully understand. It is very important that you are completely satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary,** and you are free to decline to participate. In other words, you may choose to take part, or you may choose not to take part. Nothing bad will come of it if you say no: it will not affect you negatively in any way whatsoever. Refusal to participate will involve no penalty or loss of benefits or reduction in the level of care to which you are otherwise entitled to. You are also free to withdraw from the study at any point, even if you do agree to take part initially.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University.** The study will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, the South African Guidelines for Good Clinical Practice (2006), the Medical Research Council (MRC) Ethical Guidelines for Research (2002), and the Department of Health Ethics in Health Research: Principles, Processes and Studies (2015).

What is this research study all about?
This study will describe baby's hospital experience namely the current illness or medical condition causing hospitalisation and will also investigate mommy's mental well-being while caring for their babies in the first three months after delivery. The babies who will be included in this study are those born too early before 37weeks or who weighed less than 2.5kg before birth. Mommy will complete a form asking about levels of loneliness, sadness, and anxiety as we understand the difficulties in caring for these babies and would like to provide support to both mommies and their babies who remain a unit until baby is 2years old.
Mental illness is quite common after delivery of baby internationally it is thought that one out of every 5 mommies will struggle with mental illness and nation this number has grown to 2 out of every 5mommies.

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This study will be conducted over a 4month period in 2020/2021. We will follow up baby's wellness at month 3 after discharge from hospital. Follow up will be done with a telephone call by Dr Ely to find out how baby is doing. Your baby will be referred to the Community Based Care workers who live in your community and they will come to visit your home once you are discharged to offer additional support to you and baby.

Why do we invite you to participate?
We are interested in the mental health of mothers in this ward and especially of mothers who have babies who are low in birth weight. You are included in this study because your baby is in this ward There will be posters of the study in the ward where baby will be admitted with more information of why we are doing this study. I, Dr Ely will visit the various ward 3 times a week to chat to you about taking part in this study.

What will your responsibilities be?
You will fill in 3 forms which ask questions about your stress and anxiety levels, which will help us to find out more about your mental well-being.

Will you benefit from taking part in this research?
You will not directly benefit from this study, but by taking part in this study you will help future moms by improving the service that is provided to them when their babies are admitted to hospital.
If you as the mother of the baby that is admitted require medication or emotional support, we will refer you to a mental health practitioner and they will assist with further management.

Are there any risks involved in your taking part in this research?
There are no risks involved. You may be distressed by answering some questions about your emotions, if so, we will offer you a referral to a counsellor in the hospital. If you are suffering from a mental illness, we will also refer you to a mental health practitioner and this will not include social worker referral unless you request it.

If you do not agree to take part, what alternatives do you have?
Participation is entirely voluntary your care and that of your baby will not be affected if you do not agree to take part in this study. You can still request that you be referred to a mental health care service if you are feeling emotionally unwell without taking part in this study.

Who will have access to your medical records?
Any information that I collect for this study will be treated as confidential and protected. The information collected will be used for my thesis and your identity will remain anonymous. The results will be anonymised and deidentified and will appear in a scientific article to be shared with other health professionals. You however will not be identified.

Will you be paid to take part in this study and are there any costs involved?
No, you will not be paid to take part in this study. However, for your time and effort while you are in the ward should you be willing to participate and answer the questions in the forms, we will offer you some refreshments for your time. You will also not be inconvenienced to travel to the hospital or anywhere else, I Dr Ely will come to you at your bedside and fill in the study forms at a time and private room in the ward that suits you.

Is there anything else that you should know or do?

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- You can phone the Health Research Ethics Committee at 021 938 9677/9819 if there still is something that your study doctor has not explained to you, or if you have a complaint.
- You will receive a copy of this information and consent form for you to keep safe.

Declaration by participant

By signing below, I ……. agree to take part in a research study entitled (Outcomes of low birth weight and premature infants stratified by Maternal Mental Health).

I declare that:

- I have read this information and consent form, or it was read to me, and it is written in a language in which I am fluent and with which I am comfortable.
- I have had a chance to ask questions and I am satisfied that all my questions have been answered.
- I understand that taking part in this study is **voluntary,** and I have not been pressurised to take part.
- I may choose to leave the study at any time and nothing bad will come of it – I will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan that we have agreed on.

Signed at (*place*) ……. on (*date*) ……..…… 2021.

……. …….

Signature of participant **Signature of witness**

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Declaration by investigator

I *Cordelia Ely* declare that:

- I explained the information in this document in a simple and clear manner to …….
- I encouraged him/her to ask questions and took enough time to answer them.
- I am satisfied that he/she completely understands all aspects of the research, as discussed above.
- I did/did not use an interpreter. (*If an interpreter is used then the interpreter must sign the declaration below.)*

Signed at (*place*) ..... on (*date*) ……..……2021.

....

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Annexure I: Child Assent Form

	STELLENBOSCH UNIVERSITY **FACULTY OF HEALTH SCIENCES**	

PARTICIPANT INFORMATION LEAFLET AND ASSENT FORM

TITLE OF THE RESEARCH PROJECT: *What happens to small babies – born too early or too small -l after discharge and screening their moms for mental illness while in hospital.*

RESEARCHERS NAME(S): Dr Cordelia Ely

ADDRESS: Tygerberg Hospital, Paediatric Department

CONTACT NUMBER: 0741178772

What is RESEARCH*?*

Research is something we do to find new knowledge about the way things (and people) work. We use research projects or studies to help us find out more about disease or illness. Research also helps us to find better ways of helping or treating children who are sick.

What is this research project all about?

This study will describe baby's hospital experience namely the current illness or medical condition causing hospitalisation and will also investigate mommy's mental well- being while caring for their babies in the first three months after delivery. The babies who will be included in this study are those born too early before 37weeks or who weighed less than 2.5kg before birth. Mommy will complete a form asking about levels of loneliness, sadness, and anxiety as we understand the difficulties in caring for these babies and would like to provide support to both mommies and their babies who remain a unit until baby is 2years old.
Mental illness is quite common after delivery of baby internationally it is thought that one out of every 5 mommies will struggle with mental illness and nation this number has grown to 2 out of every 5mommies.
This study will be conducted over a 4month period in 2020/2021. We will follow up baby's wellness at month 3 after discharge from hospital. Follow up will be done with a telephone

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call by Dr Ely to find out how baby is doing. Your baby will be referred to the Community Based Care workers who live in your community and they will come to visit your home one you are discharged to offer additional support to you and baby.

Why have I been invited to take part in this research project?

We are interested in the mental health of mothers in this ward and especially of mothers who have babies who are low in birth weight. You are included in this study because your baby is in this ward. There will be posters of the study in the ward where baby will be admitted with more information of why we are doing this study. I, Dr Ely will visit the various ward 3 times a week to chat to you about taking part in this study.

Who is doing the research?

I, Dr Cordelia Ely will be conducting the study as a part of my research project for my postgraduate Paediatric studies.

What will happen to me in this study?

You will fill in 3 forms which ask questions about your stress and anxiety levels, which will help us to find out more about your mental wellbeing.

Can anything bad happen to me?

There are no risks involved. You may be distressed by answering some questions about your emotions, if so, we will offer you a referral to a counsellor in the hospital. If you are suffering from a mental illness, we will also refer you to a mental health practitioner and this will not include social worker referral unless you request it.

Can anything good happen to me?

You will not directly benefit from this study, but by taking part in this study you will help future moms by improving the service that is provided to them when their babies are admitted to hospital.
If you as the mother of the baby that is admitted require medication or emotional support, we will refer you to a mental health practitioner and they will assist with further management.

Will anyone know I am in the study?

Any information that I collect for this study will be treated as confidential and protected. The information collected will be used for my thesis and your identity will remain anonymous. The results will be anonymised and deidentified and will appear in a scientific article to be shared with other health professionals. You however will not be identified.

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Who can I talk to about the study?

You can call Dr Ely at 0741178772

You can phone the Health Research Ethics Committee at 021 938 9677/9819 if there still is something that your study doctor has not explained to you, or if you have a complaint.
You will receive a copy of this information and consent form for you to keep safe.

What if I do not want to do this?

Participation is entirely voluntary your care and that of your baby will not be affected if you do not agree to take part in this study. You can still request that you be referred to a mental health care service if you are feeling emotionally unwell without taking part in this study.

Do you understand this research study and are you willing to take part in it?

YES	NO

Has the researcher answered all your questions?

YES	NO

Do you understand that you can pull out of the study at any time?

YES	NO

_____ _____

Signature of Child Date

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Annexure J: Study budget

Budget	
Period October 2019 – November 2021	
Travel	
Fuel costs @ R16,20/L (8 visits/month over 10 months)	6480
Refreshments	
Tea/ coffee and biscuit/ recruitment @ R15 / contact	7500
Telephone, cellphone (internet and email)	3000
Measuring tape	20
Printing and copying	6000
Total	23000

Travel

PI (Principal Investigator) will travel to Karl Bremer Hospital twice a week over a 10month period to recruit eligible mother-infant dyads, obtain consent and facilitate completion of the three self - administered mental health screening questionnaires. Eight visits per month over 10months, Karl Bremer Hospital is within 15kms from the PI's resident hospital.

Refreshments

As not to inconvenience patients who are recruited while they complete the self-administered questionnaire tea/ coffee will be offered with biscuits at R15/ recruitment.
R15 x 500 = 7500

Telephone/ Airtime and data for internet services

Over 10month period communication with Karl Bremer health care professionals, supervisor and Community Care Workers regarding recruitment and follow up feedback. Liaising with relevant referral pathways regarding positively screened mothers.

Printing and copying

3x questionnaire consists of 6pages for sample of 300 moms = 1800 copies = at R2 per page = 1800 x 2 = R3600.
Appendix for infant 2 x 300 x R 2 per page = 1200
Appendix for mother 2 x300 x R2 per page = 1200