SHORT-TERM OUTCOMES OF EXTREMELY LOW BIRTH WEIGHT NEONATES AT A TERTIARY HOSPITAL IN JOHANNESBURG

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Medicine in the branch of Paediatrics.

SEPTEMBER 2025

DECLARATION

I, GARI KHAMWANA MAKONYOLA, declare that this research report is my own work. It is being submitted for the degree of Master of Medicine in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

On 29th day of September 2025

ABSTRACT

Introduction

The Sustainable Development Goals seek to decrease the under-5 mortality rate (U5MR) to a maximum of 25 per 1,000 live births by 2030. In South Africa, the Under-5 Mortality Rate experienced a significant fall from 2002 to 2015, peaking at 80 per 1,000 during the AIDS epidemic from 2003 to 2005, decreasing to 41 per 1,000 in 2012, and subsequently declining gradually to 37 per 1,000 live births by 2015.The newborn mortality rate has persistently persisted between 11 to 12 per 1,000 live births from 2012 to 2022. The neonatal mortality rate constitutes one-third of the under-five mortality rate; South Africa must enhance its neonatal mortality rate to attain the Sustainable Development Goals. Enhancing the care of extremely low birth weight (ELBW) infants will facilitate this objective.

Objectives

To describe short-term outcomes of ELBW neonates at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) from 2015 to 2018.

Methods

This was secondary analysis reviewing available records of ELBW neonates admitted to CMJAH within 48 hours of birth during the study period.

Results

There were 607 ELBW neonates admitted to CMJAH during the study period of which 466 met the inclusion criteria. The survival rate was 41.6%.

Conclusion

This study showed a lower survival rate than one study done at the same hospital in 2013, despite having introduced mechanical ventilation for ELBW neonates from 800 grams and exogenous surfactant and non-invasive ventilation to ELBW neonates from 500 grams onwards in 2015.

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ABBREVIATION

ANC: Antenatal care

BPD: Bronchopulmonary dysplasia.

CMJAH: Charlotte Maxeke Johannesburg Academic Hospital

ELBW: Extremely Low Birth Weight

HIV: Human immunodeficiency virus

IVH: Intraventricular haemorrhage

MDR: Multidrug-resistant

NCPAP: Nasal continuous positive airway pressure

NEC: Necrotizing enterocolitis

NICU: Neonatal Intensive Care Unit

PDA: Patent ductus arteriosus

PVL: Periventricular leukomalacia.

RDS: Respiratory distress syndrome.

REDCap: Research Electronic Data Capture

ROP: Retinopathy of prematurity

SD: Standard deviation

VLBW: Very low birth weight

SUBMISSIBLE PAPER

SHORT-TERM OUTCOMES OF EXTREMELY LOW BIRTH WEIGHT NEONATES AT A TERTIARY HOSPITAL IN JOHANNESBURG

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ABSTRACT

Introduction

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1.0 INTRODUCTION

The Sustainable Development Goals of 2015 target to stop preventable deaths of newborns and under-five children. The goal is for all countries to reduce the under-five deaths to less than 25 per 1000 live births by the year 2030.(1, 2, 3)

Globally in 2010, 7.6 million deaths occurred in children less than 5 years. This declined from 9.6 million in 2000. Of these 7.6 million deaths, 40.3% (3.072 million) occurred in neonates.(4) In 2013, the neonatal deaths worldwide was approximately 45 % of deaths in children under five.(4) There has been a further drop in the total number of under-5 deaths to 4.9 million in 2022.(4)

On the other hand neonatal mortality has shown a slow decline from 5.2 million in 1990 to 2.3 million in 2022 with roughly 6 300 newborn deaths occurring daily which is estimated to be 47 % of all under-5 mortality.(5)

The Lancet's Every Newborn Series indicated that whereas under-five child deaths has decreased over the last twenty years by 50 %, advancements in reducing neonatal deaths has been lagging, with roughly three million neonates still dying annually. The target is to have ten or less deaths per 1 000 births in every country by 2035.(6, 7)

In South Africa from 2002 to 2015 the under-five mortality rate plummeted from a height of 80 per 1 000 due to peak the AIDS epidemic in 2003 – 2005, to 41 per 1 000 in the year 2012, following a slow decline in 2015 to 37 per 1 000 live births. Thereafter neonatal mortality rate plateaued at 11 – 12 per 1 000 live births between 2012 and 2022(8) . The neonatal fatalities contributed 44% of the infant mortality rate (27 per 1 000 live births) and 32% of the under-5 mortality rate (37 per 1 000 live births).(8)

According to 2016 Perinatal Problem Identification Program data, the leading causes of all neonatal mortalities were complications of prematurity (47.9%); intrapartum-related events – predominantly intrauterine hypoxia (24.3%); and infections (including pneumonia) at 11.6%. Sixty percent of the premature deaths were attribute to ELBW neonates who predominantly succumbed of severe organ immaturity.(9)

Developments in perinatal care, namely antenatal steroids, surfactant replacement therapy and mechanical ventilation, have resulted in a higher survival rate of ELBW neonates particularly in affluent countries. Notwithstanding advancements in perinatal medicine and neonatal technology, survival of ELBW neonates remains poor in many low and middle class countries partially due to resource scarcity.(10,11,12)

A study done in 2013 at CMJAH in South Africa, which compared morbidity and mortality in very low birth weight (VLBW) neonates between 2006/2007 and 2013, showed survival in neonates who weighed 750-900 grams had considerably increased from 20.4 % in 2006/2007 to 52.4% in 2013.(13) This can be further compared to another study done at the same hospital showing a survival rate amongst ELBW neonates 26.5 % between the years 2006 and 2010.(14)

Studies in other South African hospitals show similar results. One at Chris Hani Baragwanath Academic Hospital (CHBAH) between the year 2000 and 2002 which looked at survival of VLBW neonates according to birth weight and gestational age showed a survival rate of 32% among ELBW neonates. This cohort of neonates was not offered ventilation due to the unit's resource limitations at the time.(15)

A study conducted at Tygerberg Children's Hospital in South Africa from 1 June 2007 to 31 May 2009 revealed a survival percentage of 62.9% among extremely low birth weight infants. This cohort received exogenous surfactant and nasal continuous positive airway pressure (NCPAP), with mechanical ventilation available as a backup for those unable to tolerate NCPAP.(16) This showed that ELBW neonates can have improved short-term outcomes if offered exogenous surfactant and forms of ventilation.

To attain the target set out by the Sustainable Development Goals, South Africa needs to improve its neonatal mortality rate. An improvement in the care of ELBW neonates will have a significant effect on this. For these reasons, the current study evaluated the short-term outcomes of ELBW neonates at CMJAH from 2015 to 2018.

2.0 METHODS

This was a secondary analysis reviewing records of ELBW neonates admitted at CMJAH from 1st January 2015 to 31st December 2018. Neonates admitted beyond 48 hours of life and those with insufficient documentation were eliminated. The outcome was classified as either death or survival to discharge, which encompassed patients transported to other institutions for continued care.The neonatal database at CMJAH was reviewed to identify all ELBW neonates who were admitted from 1 January 2015 to 31 December 2018. At discharge, data was gathered and input into an electronic database. Research Electronic Data Capture (REDCap), a safe online application maintained by the University of the Witwatersrand that facilitates data collection for clinical audit and quality improvement, was used to handle the data.(17, 18). Invasive ventilation and surfactant was offered to only ELBW with weight above 800grams whilst surfactant and NCPAP was offered to those more than 500gram.

The short -term outcomes included the need for resuscitation at birth, need for mechanical or non mechanical ventilation, being anaemic or jaundiced or having had sepsis among others

2.1 DATA BASE

The data that was acquired was entered onto a prepared data document from the REDCap database. The data document captured demographic information, maternal information during antenatal care and labor, neonatal information at birth and during stay in the ward including clinical diagnoses and clinical management including their complications. Data was entered into the REDCap database when patients were released. At several points along the data collection process, the information was confirmed.

Inclusion criteria

All ELBW neonates admitted to CMJAH from 01 January 2015 to 30 December 2018 including those who died in labor ward.

Exclusion criteria

Neonates with insufficient documentation,these included those who had essential variables missing for example, gestational age, birth weight and the outcomes.

All neonates less than 500grams.

ELBW neonates admitted beyond 48 hours of life.

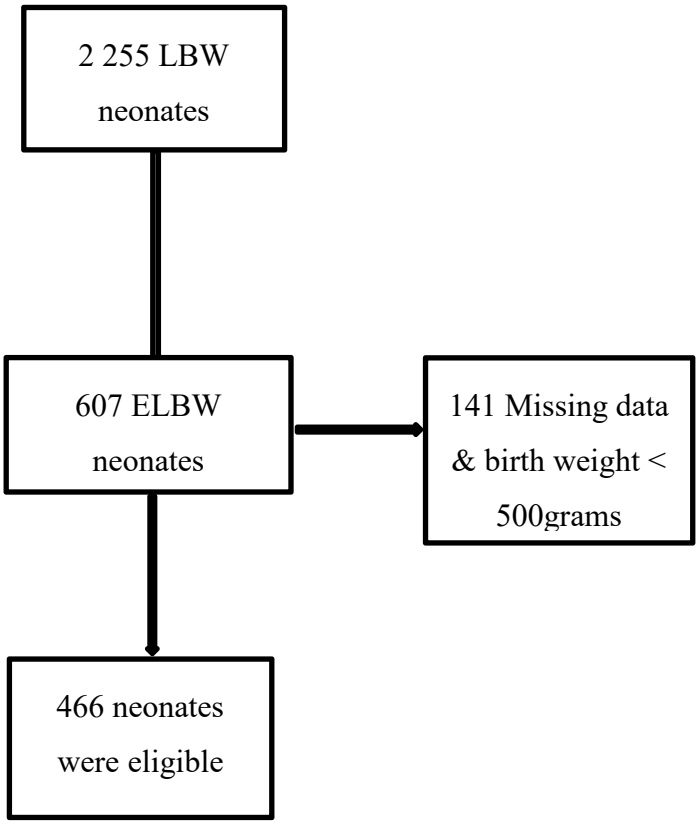
2.2 STATISTICAL ANALYSIS

The data was entered into an MS Excel version 2019 spreadsheet (Microsoft, USA) and subsequently imported into the statistical software application SPSS version 28 (IBM, USA). The data was described using appropriate statistical methodologies. The mean and standard deviation were employed to describe continuous variables with a normal distribution, whereas the median and range were employed to report variables with an asymmetrical distribution. Frequency tables and percentages, along by a 95% confidence range, were employed for categorical variables. To compare the ELBW survivors and non-survivors, normally distributed continuous variables were analyzed using the unpaired t-test, whereas the Mann-Whitney U test was employed for variables with skewed distributions. Categorical variables were analyzed using Chi-Square analysis. Univariate analysis was conducted utilizing cross tabulations with the chi-square test to compare categorical variables.

3.0 RESULTS

During the research duration, 2 255 LBW newborns were admitted to CMJAH, of these 607 were ELBW: 466 neonates fulfilled the inclusion criteria.

Figure 1: Study subjects involved in the analysis of short-term outcomes of extremely low birth weight neonates admitted to CMJAH from 01 January 2015 to 31 December 2018



The survival rate was 41.6% (194/466). The median birth weight was 820.0 (IQR 730–900) grams. The average gestational age in weeks was 26.9 (SD ± 2). More neonates were female 245 (52.6%). The majority were inborn 449 (96.4%). Attendance at antenatal care was 78.8%. Of the 466 neonates, 49.1% received steroids antenatally.

Most of the neonates (86.9%) required some form of resuscitation at birth. Further features are represented in Table 1.

Table 1. Attributes of extremely low birth weight neonates at CMJAH from 01 January 2015 to 31st December 2018.

Characteristic	**N = 466**
Gestational age (mean, SD)	26.9 (2)
Birth weight (median, IQR)	820 (730 – 900)
Female (%)	245 (52.6)
Place of birth (inborn %)	449 (96.4)
Attended antenatal care (%)	367 (78.8)
Antenatal steroids (yes %)	229 (49.1)
Mode of delivery (CS %)	255 (54.7)
5-minute APGAR score (median, IQR)	7 (6 – 9)
Resuscitation at birth n (%)	405 (86.9)

The maternal and neonatal disease profiles are as shown in Tables 2 and 3 respectively.

Table 2. Maternal disease profile of extremely low birth weight neonates at Charlotte Maxeke Johannesburg Academic Hospital from 1 January 2015 to 31 December 2018.

DISEASE PROFILE	**N=466**
Maternal HIV (%)	138 (29.6)
Maternal syphilis (%)	6 (1.29)
Maternal hypertension (%)	148 (31.8)
Chorioamnionitis (%)	14 (3.0)

Table 3. Disease profile of extremely low birth weight neonates at CMJAH from 1 January 2015 to 31 December 2018.

DISEASE PROFILE	N=466
Early-onset sepsis	26 (5.6)
Late-onset sepsis	194 (41.6)
Necrotising enterocolitis GRADE 2+	35 (7.5)
Pneumothorax	11 (2.4)
Patent ductus arteriosus	55 (11.8)
Gram-negative infection	55 (11.8)
Gram-positive infection	18 (3.8)
MDR- gram positive sepsis	32(6.9)
MDR-gram negative sepsis	73(15.7)
Respiratory distress syndrome	434 (93.1)
Neonatal jaundice	249 (53.4)
Blood transfusion	244 (52.4)

MDR -Multi drug resistance

Respiratory distress syndrome was the most common disease diagnosed among 93.1% of ELBW neonates with pneumothorax being the least as shown in Table 3 above.

Table 4. Continuous factors relating to outcome of extremely low birth weight neonates at CMJAH from 1 January 2015 to 31 December 2018

VARIABLE	SURVIVED N=194	DIED N=272	P-VALUE
Birthweight in gram, median (IQR)	890 (820-940)	780 (680-860)	<0.001
Gestational age in weeks, mean (SD)	27.6(1.8)	26.4(2)	<0.001
Length of stay in days, median (IQR)	63 (52-77)	3 (1-10)	<0.001
Apgar score at 5minutes (IQR)	8 (7-9)	7 (5-8)	<0.001
Age of mother in years, mean (SD)	28.3 (6.44)	29.4 (6.34)	0.057

Lower birth weight was significantly associated with mortality, as was having a lower Apgar score at 5 minutes. Although the mothers of ELBW neonates who died were slightly older, maternal age was not a statistically significant association with mortality.

Table 5. Categorical factors relating to outcome of extremely low birth weight neonates at CMJAH from 1 January 2015 to 31 December 2018.

VARIABLE	SURVIVED n/N (%)	DIED n/N (%)	P-VALUE
Place of birth - inborn	188/194 (96.9)	261/272 (96.0)	0.59
Mode of delivery: - CS - NVD	130/194 (67.0) 64/194 (33.0)	125/272 (46.3) 145/272 (53.3)	<0.001
Early onset sepsis	11/194(5.6)	15/272 (5.5)	0.943
Late onset sepsis	113/194 (58.2)	79/272 (29.0)	<0.001
MDR-gram pos	14/194(7.2)	18/272(6.6)	0.801
MDR-gram neg	34/194(17.5)	39/272(14.3)	0.351
MDR LOS	47/194(24.2)	52/272(19.1)	0.184
Surfactant given at any time	161/194 (83)	228/272 (83.8)	0.811
Necrotising enterocolitis (grade 2 or 3)	18/194 (9.3)	17/272 (6.3)	0.221
Sex (male)	83/194 (42.8)	138/272 (50.7)	0.090
Patent ductus arteriosus	33/194 (17.0)	22/272 (8.1)	0.003
Chorioamnionitis	10/194 (5.2)	4/272 (1.5)	0.022
Retinopathy of Prematurity	129/194 (66.5)	7/272 (2.6)	0.358

- 1 - 2	21/194 (10.8)	0/272 (0)	
Non-invasive ventilation	165/194 (85.1)	211/272 (77.6)	0.44
Invasive ventilation	40/194 (20.6)	55/272 (20.2)	0.916

* LOS-Late onset sepsis

Categorical variables relating to outcome are shown in Table 5 above. The majority of the ELBW babies were inborn (449/466, 96.4%), however the place of birth showed no significance with the outcome (p= 0.59). Most of the babies were delivered via Caesarean section (55%), which was associated with survival (p < 0.001).

Early onset sepsis did not have any significance with regards to the outcome of the ELBW babies (p= 0.943). However, survival was significantly associated with late onset sepsis (p < 0.001); 58.2% of neonates who survived developed late-onset sepsis during their admission. The result still remained significant after calculating the logistic regression for confounding factors as shown in table 6. On the other hand both gram negative and positive MDR infections were associated with mortality (p= 0.184).

This study showed that giving surfactant at any given time did not have any significance on the outcome (p= 0.315). Similarly, whether or not the neonate received non-invasive ventilation (p =0.44) or invasive ventilation (p=0.916) were not statistically significant between the outcome(lived or died).The sex of the ELBW neonate, a diagnosis of necrotising enterocolitis (grade 2 or 3), or later retinopathy of prematurity had no significant outcome as well.

The presence of chorioamnionitis appeared to have a significance on the outcome (p= 0.022), but the number of cases were small in both groups. The diagnosis of PDA was significantly associated with survival (p= 0.003)

Table 6. Logistic regression results showing 5 variables that were significantly associated with survival

Characteristic	Crude Estimates		Adjusted Estimates	
	COR (95% CI)	P-Value	AOR (95% CI)	P-Value
Mode of delivery	0.457(0.319-0.655)	<0.001	0.709(0.350- 1.435)	0.339
Late onset sepsis	0.293(0.199- 0.432)	<0.001	3.456(1.591-7.517)	0.002
Gestation age	1.387(1.241-1.532)	<0.001	1.061(0.875-1.286)	0.547
Length of stay	1.089(1.075-1.105)	<0.001	1.095(1.078-1.113)	<0.001
Apgar score at 5 mins	0.062(1.260-1.561)	<0.001	1.223(1.019-1.46	0.030

4.0 DISCUSSION

The survival rate of ELBW infants in the present study was 41.6%, which is lower than the 52.6% reported from the same unit in 2013.(13).This could have been likely because of a number of files were not analysed due to missing signficant data.There a need for improved documentation.Our results demonstrate the need to improve neonatal care especially for ELBW neonates even though the CMJAH neonatal unit has offered NCPAP and exogenous surfactant to ELBW infants above 500 grams since 2015.

On the other hand, a study done at a similar hospital between 2000 and 2002 showed a lower survival rate of 32% this could have been because this cohort of neonates was not offered mechanical ventilation at that given time.(15)

In the current study it was noted that only 78.8% of the women attended antenatal care,which is of concern since antenatal care is an important factor in reducing neonatal mortality rates, as this helps to identify complications and lifesaving information and for both mother and child. Although this study did not look at the number of antenatal visits, the WHO recommends a minimum of 8 visits.(22) . In a recent study some of the factors that prevent pregnant mothers from attending antenatal care include cultural notions of keeping pregnancy a secret, fear of HIV testing, long waiting lines, high cost of transportation, verbal abuse from nurses among others.(23)

The present study found that the majority of ELBW neonates required some form of resuscitation, which is not surprising as this cohort of neonates has immaturity of all systems and are prone to hypothermia, hypoxia and hypoglycemia. The frequent requirement for resuscitation also highlights the need for improved care of ELBW neonates around time of delivery to reduce the risks .Future research could explore ways to improve the care of ELBW neonates, such as by providing better antenatal care, improving neonatal resuscitation techniques, and enhancing the training of healthcare workers.

Our results did not show any impact on survival with exogenous surfactant treatment or the provision of non-invasive or mechanical ventilation. This is in contrast to previous reports from the same unit (13). A retrospective study done in Ile-Ife, south-western Nigeria showed a 50% decline in the mortality among very low birth weight neonates with the introduction of NCPAP

and surfactant introduction, however no similar effect was found in the ELBW and they reasoned it was because of the absence of invasive ventilation.(19).

Early onset sepsis did not have any significance on survival in ELBW neonates in the present study.However, late onset sepsis was significantly associated with improved survival. Late onset sepsis caused by multi-drug resistant organisms was not significantly different between survivors and those ELBW neonate who died. Another study done in Nigeria which compared the outcome of EOS and LOS showed that prematurity was found to be associated with early onset neonatal sepsis whilst another study in another hospital in Nigeria showed similar results to this study.(20, 21)The present study included ELBW infants who died in labour ward and the median time of death was om the third day of life. Therefore, complications of prematurity including LOS, ROP and PDA would be associated with prolonged hospital stay and survival and these diagnoses would not have been made in the first 3 days of life which was the mean length of stay of non-survivors.

Overall, the study provides valuable insights into the short-term outcomes of ELBW neonates at CMJAH. The study also highlights the importance of improved care of ELBW neonates. Future research could explore ways to improve the care of ELBW neonates, such as by providing better antenatal care, improving neonatal resuscitation techniques, and enhancing the training of healthcare workers.

5.0 STUDY LIMITATIONS

Being a secondary investigation of a pre-existing data, certain data were not captured or were missing from the database. This study only showed an association with the survival; there is need for a prospective study to determine the impact of the measure.This was a single centre study so results cannot be generalised.

6.0 CONCLUSION

In conclusion, this study showed a survival rate of 41.6% which was higher than previous two studies done at the same hospital between the years 2006 and 2010 but lower than one in 2013 which had a survival rate of 52.3 %, despite having started to offer mechanical ventilation for ELBW neonates from 800 grams and exogenous surfactant and NCPAP to ELBW neonates from 500 grams onwards in 2015. Giving exogenous surfactant or any form of ventilation did not have significant effect on the outcome. There is a need for further research to explore the decline in the survival rate and other associated factors.

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APPENDICES

Appendix A: Instructions for authors

SOUTH AFRICAN JOURNAL OF

CHILD HEALTH

Official Journal of the South African Paediatric Association (SAPA)

Author Guidelines

Author Guidelines

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Conflicts of interest

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If the study was carried out using data from provincial healthcare facilities, or required active

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• An anonymous version should not contain any author, affiliation or particular institutional details

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• Please remove title page, acknowledgements, contact details, funding grants to a named person, and any running headers of author names.

• Mask self-citations by referring to your own work in third person.21

General article format/layout

Submitted manuscripts that are not in the correct format specified in these guidelines will be returned to the author(s) for correction prior to being sent for review, which will delay publication.

General:

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• The manuscript must be in Microsoft Word or RTF document format. Text must be 1.5 line spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes). Pages and lines should be numbered consecutively.

• Please make your article concise, even if it is below the word limit.

• Qualifications, ***full*** affiliation (department, school/faculty, institution, city, country) and contact details of ALL authors must be provided in the manuscript and in the online submission process.

• Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.

• Scientific measurements must be expressed in SI units except: blood pressure (mmHg) and haemoglobin (g/dL).

• Litres is denoted with an uppercase L e.g. 'mL' for millilitres).

• Units should be preceded by a space (except for % and ºC), e.g. '40 kg' and '20 cm' but '50%' and '19ºC'.

• Please be sure to insert proper symbols e.g. µ not u for micro, a not a for alpha, b not B for beta, etc.

• Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160.

• Quotes should be placed in single quotation marks: i.e. The respondent stated: '...'

• Round brackets (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.

If you wish material to be in a box, simply indicate this in the text. You may use the table format –this is the *only* exception. Please DO NOT use fill, format lines and so on.

SAJCH is a Journal on child health, therefore for articles involving genetics, it is the responsibility of authors to apply the following:

- Please ensure that all genes are in italics, and proteins/enzymes/hormones are not.

- Ensure that all genes are presented in the correct case e.g. TP53 not Tp53.

** NB: Copyeditors cannot be expected to pick up and correct errors wrt the above, although they will raise queries where concerned.

- Define all genes, proteins and related shorthand terms at first mention, e.g. '188del11' can be glossed as 'an 11 bp deletion at nucleotide 188.'

- Use the latest approved gene or protein symbol as appropriate:

• Human Gene Mapping Workshop (HGMW): genetic notations and symbols

• HUGO Gene Nomenclature Committee: approved gene symbols and nomenclature

• OMIM: Online Mendelian Inheritance in Man (MIM) nomenclature and instructions

• Bennet et al. Standardized human pedigree nomenclature: Update and assessment of the recommendations of the National Society of Genetic Counselors. J Genet Counsel 2008;17:424-433: standard human pedigree nomenclature.

Preparation notes by article type

Research

Guideline word limit: 3 000 words (excluding abstract and bibliography)

Research articles describe the background, methods, results and conclusions of an original research study. The article should contain the following sections: introduction, methods, results, discussion and conclusion, and should include a structured abstract (see below). The 22 introduction should be concise – no more than three paragraphs – on the background to the research question, and must include references to other relevant published studies that clearly lay out the rationale for conducting the study. Some common reasons for conducting a study are: to fill a gap in the literature, a logical extension of previous work, or to answer an important clinical question. If other papers related to the same study have been published previously, please make sure to refer to them specifically. Describe the study methods in as much detail as possible so that others would be able to replicate the study should they need to. Where appropriate, sample size calculations should be included to demonstrate that the study is not underpowered. Results should describe the study sample as well as the findings

from the study itself, but all interpretation of findings must be kept in the discussion section, which should consider primary outcomes first before any secondary or tertiary findings or post-hoc analyses. The conclusion should briefly summarise the main message of the paper and provide recommendations for further study.

• May include up to 6 illustrations or tables.

• A max of 20 - 25references

Structured abstract

• This should be no more than 250words, with the following recommended headings:

o **Background:** why the study is being done and how it relates to other published work.

o **Objectives:** what the study intends to find out

o **Methods:** must include study design, number of participants, description of the intervention, primary and secondary outcomes, any specific analyses that were done on the data.

o **Results:** first sentence must be brief population and sample description; outline the results according to the methods described. Primary outcomes must be described first, even if they are not the most significant findings of the study.

o **Conclusion:** must be supported by the data, include recommendations for further study/actions.

o Please ensure that the structured abstract is complete, accurate and clear and has been approved by all authors. It should be able to be intelligible to the reader without referral to the main body of the article.

o Do not include any references in the abstracts.

Here is an example of a good abstract.

***Scientific letters*/short reports**

These include case reports, side effects of drugs and brief or negative research findings.

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• Abstract: unstructured, of about 100-150 words

• May include only one illustration or table

• A maximum of 6 references

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Please make clear the type of evidence that supports each key statement, e.g.:23

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• observational studies

• trials

• systematic reviews.

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Review articles should always be discussed with the Editor prior to submission.

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These are welcome, but should be either commissioned or discussed with the Editor before submission. A review article should provide a clear, up-to-date account of the topic and be aimed at non-specialist hospital doctors and general practitioners. They should be aligned to practice in South and/or sub-Saharan Africa and not a precis of reviews published in the

international literature

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• When writing: clarify the evidence you used for key statements and the strength of the evidence. Do not present statements or opinions without such evidence, or if you have to, say that there is little or no evidence and that this is opinion. Avoid specialist jargon and abbreviations, and provide advice specific to southern Africa.

• Personal details: Please supply your qualifications, position and affiliations and MP number (used for CPD points); address, telephone number and fax number, and your e-mail address; and a short personal profile (50 words) and a few words about your current fields of interest.

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• May include only one illustration or table

• Must include a correspondence address.

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• Figures must be numbered in Arabic numerals and referred to in the text e.g. '(Fig. 1)'.

• Each figure must have a caption/legend: Fig. 1. Description (any abbreviations in full).

• All images must be of high enough resolution/quality for print.

• All illustrations (graphs, diagrams, charts, etc.) must be in PDF form.24

• Ensure all graph axes are labelled appropriately, with a heading/description and units (as necessary) indicated. Do not include decimal places if not necessary e.g. 0; 1.0; 2.0; 3.0; 4.0 etc.

• Scans/photos showing a specific feature e.g. *Intermediate magnification micrograph of a low malignant potential (LMP) mucinous ovarian tumour. (H&E stain).* –include an arrow to show the tumour.

• Each image must be attached individually as a 'supplementary file' upon submission (not solely embedded in the accompanying manuscript) and named Fig. 1, Fig. 2, etc.

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• Citations should be inserted in the text as superscript numbers between square brackets, e.g.

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• Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al.

• Volume and issue numbers should be given.

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o Look for the correct, matching article in the list of results.

o Click Actions > Cite

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• *Journal references:* Price NC, Jacobs NN, Roberts DA, et al. Importance of asking about glaucoma. Stat Med 1998;289(1):350-355. http://dx/doi.org/10.1000/hgjr.182

• *Book references:* Jeffcoate N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975:96-

101.

• *Chapter/section in a book:* Weinstein L, Swartz MN. Pathogenic Properties of Invading Microorganisms. In: Sodeman WA, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974:457-472.

• *Internet references:* World Health Organization. The World Health Report 2002 - Reducing Risks, Promoting Healthy Life. Geneva: WHO, 2002. http://www.who.int/whr/2002 (accessed 16 January 2010).

• Legal references

• Government Gazettes:

National Department of Health, South Africa. National Policy for Health Act, 1990 (Act No. 116 of 1990). Free primary health care services. Government Gazette No. 17507:1514. 1996.

In this example, 17507 is the Gazette Number. This is followed by :1514 - this is the notice number in this Gazette.

• Provincial Gazettes:

Gauteng Province, South Africa; Department of Agriculture, Conservation, Environment and Land Affairs. Publication of the Gauteng health care waste management draft regulations. Gauteng Provincial Gazette No. 373:3003, 2003.

• Acts:

South Africa. National Health Act No. 61 of 2003.

• Regulations to an Act:

South Africa. National Health Act of 2003. Regulations: Rendering of clinical forensic medicine services. Government Gazette No. 35099, 2012. (Published under Government Notice R176).

• Bills:

South Africa. Traditional Health Practitioners Bill, No. B66B-2003, 2006.

• Green/white papers:

South Africa. Department of Health Green Paper: National Health Insurance in South Africa. 2011.

• Case law:26

Rex v Jopp and Another 1949 (4) SA 11 (N)

Rex v Jopp and Another: Name of the parties concerned

1949: Date of decision (or when the case was heard)

(4): Volume number

SA: SA Law Reports

11: Page or section number

(N): In this case Natal - where the case was heard. Similarly, (C) wood indicate Cape, (G) Gauteng, and so on.

NOTE: no . after the v

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From submission to acceptance

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3. The text complies with the stylistic and bibliographic requirements in **Author Guidelines**.

4. The manuscript is in Microsoft Word or RTF document format. The text is single-spaced, in 12-point Times New Roman font, and contains no unnecessary formatting.

5. Illustrations/figures are high resolution/quality (not compressed) and in an acceptable format (preferably TIFF or PNG). These must be submitted as 'supplementary files' (not in the manuscript).29

6. For illustrations/figures or tables that have been published elsewhere, the author has obtained written consent to republication from the copyright holder.

7. Where possible, references are accompanied by a digital object identifier (DOI) and PubMed ID (PMID)/PubMed Central ID (PMCID).

8. An abstract has been included where applicable.

9. The research was approved by a Research Ethics Committee (if applicable)

10. Any conflict of interest (or competing interests) is indicated by the author(s).

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South African Journal of Child Health | Online ISSN: 1999-7671 | Print ISSN: 1994-3032 |

African Journal of HIV Medicine | South African Journal of Obstetrics and Gynaecology |Strenghtening Health Systems

Appendix B: Research Protocol

Research Protocol:

SHORT-TERM OUTCOMES OF EXTREMELY LOW BIRTH WEIGHT NEONATES AT A TERTIARY HOSPITAL IN JOHANNESBURG

INVESTIGATOR:

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MBBS (MALAWI)

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DEGREE:

MMED (PAEDIATRICS)

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MBBCh, FCPaed, MMed (Paeds)

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1. INTRODUCTION

The Sustainable Development Goals (following on from the Millennium Developmental Goals in 2015) have set a target to end preventable deaths of newborns and children under-five. The goal is for all countries aiming to reduce the under-five mortality to at least as low as 25 per 1000 live births by the year 2030. (1)

Globally in 2010, 7.6 million deaths occurred in children younger than 5 years. This was a decrease from 9.6 million in 2000. Of these 7.6 million deaths, 64.0% (4.879 million) were attributable to infectious causes and 40.3% (3.072 million) occurred in neonates. In 2013, the neonatal mortality accounted for almost 45 % of deaths in children younger than 5 years. (2)

The Lancet of Every Newborn Series shows that despite a halving of under-five child deaths in the past two decades, progress in reducing newborn deaths has been slower, with about three million neonates still dying every year. The target is to have ten or fewer neonatal deaths per 1000 births in every country by 2035. (3)

In South Africa from 2002 to 2015 the under-five mortality rate rapidly declined from a peak of 80 per 1 000 at the height of the AIDS epidemic in 2003 - 2005, to 41 per 1 000 in 2012, with a slow decrease thereafter to 37 per 1 000 live births in 2015. The neonatal mortality rate has remained the same, at 11 - 12 per 1 000 live births between 2012 and 2015. (2) In South Africa in 2015, the neonatal mortality rate accounted for 44% of the infant mortality rate (27 per 1 000 live births), and 32% of the under-5 mortality rate (37 per 1 000 live births), respectively. (4)

The 2016 Perinatal Problem Identification Program (PPIP) data showed that the main causes of all neonatal deaths were complications of prematurity (47.9%); intrapartum-related events – mainly intrauterine hypoxia (24.3%); and infections (including pneumonia) at 11.6%. A total of 60% of the premature deaths was accounted for by extremely low birth weight (ELBW) neonates who died primarily of extreme organ immaturity. (4)

Due to advances in perinatal care such as antenatal steroids, surfactant replacement therapy and mechanical ventilation, there has been an increased survival rate of ELBW neonates particularly in developed countries. Despite the progress of perinatal medicine and neonatal technology, survival of extremely low birth weight neonates remains low in most developing counties partly due to lack of resources. (5, 6, 7, 8)

A study done in 2013 at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) South Africa, which compared morbidity and mortality in very low birth weight (VLBW) neonates between 2006/2007 and 2013, showed survival in neonates who weighed 750-900 had significantly improved from 20.4 % in 2006/2007 to 52.4% in 2013. This can be further compared to another study done at the same hospital showing a survival rate amongst ELBW neonates of 26.5 % between the years 2006 and 2010. (9, 10)

Studies done in other South African hospitals show similar results. A study done at Chris Hani Baragwanath Academic Hospital (CHBAH) between the year 2000 and 2002 which looked at survival of VLBW neonates according to birth weight and gestational age showed a survival rate of 32 % among ELBW neonates. This cohort of neonates was not offered ventilation due to the unit's resource limitations at the time.

Another study done at Tygerberg Children's Hospital between 1 June 2007 to 31 May 2009 in the Western Cape showed a survival rate of 62.9 % among ELBW neonates. This cohort was offered exogenous surfactant and nasal continuous positive airway pressure (NCPAP) and had as a backup mechanical ventilation for those who did not cope on NCPAP. (11, 12) This shows that ELBW neonates can have improved short-term outcomes if offered exogenous surfactant and forms of ventilation.

It is clear that to attain the goals set out by the sustainable development goals, South Africa needs to improve its neonatal mortality rate. An improvement in the care of ELBW neonates will have a significant effect on this. For these reasons, the current study will evaluate the short-term outcomes of ELBW neonates at CMJAH from 2015 to 2018.

2. JUSTIFICATION FOR THE STUDY

CMJAH, where this study will be conducted, and is a high-risk obstetric unit. There is a combined pediatric/neonatal intensive care unit with15 beds, and a neonatal high care unit with 35 beds. The large number of patients requiring admission to the neonatal intensive care unit places a burden on limited resources. This has been the justification for setting weight cutoffs for ventilation in the past.

Since 2015, CMJAH neonates are offered ventilation from 800 grams and above whilst NCPAP and exogenous surfactant are offered to all neonates whose weight is above 500 grams. In view of the increasing survival of ELBW neonates in other settings adjustment in management and protocols might be needed.

3. AIM

To determine the short-term outcomes of ELBW neonates at CMJAH.

4. OBJECTIVES

1. To describe the demographics, disease profile of ELBW neonates at CMJAH from 2015 – 2018.
2. To determine the survival to discharge of ELBW neonates between 01 January 2013 and 31 December 2018.
3. To describe the factors associated with the survival of ELBW neonates between 01 January 2013 to 31 December 2018.

5. DEFINITIONS

Extremely-low-birth-weight – birth weight less than 1000 grams.

Very-low-birth-weight – birth weight between 1000 and 1500 grams

Neonate – a child presenting within the first 28 days of life. A preterm infant will be classified as a neonate according to their chronological age corrected for gestational age.

Neonatal mortality rate – the number of deaths per 1000 live births of children under one month of age.

Infant mortality rate – the number of deaths per 1000 live births of children under one year of age.

Under-five mortality rate – the number of deaths per 1000 live births of children between birth and five years of age.

RDS – respiratory distress syndrome.

NEC – necrotizing enterocolitis.

BPD – bronchopulmonary dysplasia.

ROP – retinopathy of prematurity.

IVH – intra-ventricular hemorrhage

PVL – peri-ventricular leukomalacia.

PDA – patent ductus arteriosus.

6. METHOD

Study Design

This will be a retrospective cross sectional descriptive study reviewing an existing database.

Sample Population

The sample population includes all neonates admitted to CMJAH within 48 hours of birth. An estimation of 400 will be the sample size based on previous admission per year in the department.

Inclusion criteria

All ELBW neonates admitted to CMJAH from 01 January 2015 to 30 June 2018.

Exclusion criteria

Neonates with missing records.

Procedure/Data Collection

The neonatal database at CMJAH will be reviewed to identify all ELBW neonates with who were admitted from 1 January 2015 to 31 December 2018. Information was collected on discharge and entered into a computerized database. The data was managed using Research Electronic Data Capture (REDCap) which is hosted by the University of the Witwatersrand (12).

The data will be collected and entered onto a prepared data sheet (Appendix A) from the REDCap database. The data sheet will capture demographic information (maternal age, parity,

and infants' gestational age, birth weight and gender), maternal attendance at antenatal care, antenatal steroid administration, whether inborn or out born, age on admission, clinical diagnoses, use of surfactant and mode of ventilation, duration of stay, complications of prematurity (ROP, BPD), and died or survived.

Data Analysis

Data will be described using standard statistical methods. Continuous variables will be described using mean and standard deviation for those variables with normal distribution, and median and range for those variables with a skewed distribution. Frequency tables and percentages with 95% confidence interval will be used for categorical variables. Continuous variables which are normally distributed will be compared using unpaired t-test and the Mann-Whitney U test will be used to compare discrete variables and those with skewed distribution. Categorical variables will be compared using Chi Square analysis. Univariate analysis will be performed using cross tabulations with the chi square test to compare categorical variables. Multivariate analysis will be performed with survival as the primary outcome.

7. SIGNIFICANCE

The findings of this study will be shared with the neonatal unit at CMJAH to highlight any improvements that can be made to the care of ELBW neonates admitted to CMJAH. This will be done by presenting at local research days and conferences. By identifying the currents outcomes of ELBW neonates at our institution, and comparing such to previous studies conducted in the same unit, the improvements and pitfalls in the care of ELBW neonates can be assessed. This may lend support to adjustment in management and protocols if this is needed. Furthermore, this information can be used to rally for the requisition of improved resources for these neonates.

8. LIMITATIONS

Being a secondary analysis of an existing database, some data is not captured or may be missing from the database. The study will only explore the associations with survival, there is need for a prospective study to determine impact of measure. The study will look at variables until discharge or death, patients will not be followed up after discharge to assess further outcomes.

9. ETHICAL CONSIDERATION

The proposal for this study will be submitted to the University of the Witwatersrand Protocol Review Committee and Human Research Ethics Committee (HREC) of the University of the Witwatersrand for approval.

Being a retrospective study, consent will not be needed from parents/guardians. The study will not put patients at risk and there will be no breech in privacy and confidentiality. Data sheets will only contain a study number. The patients name, hospital number and date of birth admission will be stored in a separate database at a different, secure location.

The study will only be commenced after receiving approval from the ethics and hospital committee.

10. TIME LINE

	FEB 2019	MAR 2019	APR 2019	MAY 2019	JUN 2019	JUL 2019	AUG 2019	SEP 2019	OCT 2019	NOV 2019	DEC 2019	JAN 2020	FEB 2020
Literature review													
Protocol preparation													
Protocol assessment													
Ethics approval													
Post grad approval													
Data collection													
Data analysis													
Write up report													
Write up Paper													

11. COST/FUNDING

This is a self-funded research. The budget estimate is R500 which will be used for stationery and printing.

12. REFERENCE LIST

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3. Bhutta ZA, Das JK, Bahl R,Lawn JE,Salam R, Paul VK et al. Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? 2014;384(9940):

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13. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009; 42(2):377-81.

APPENDIX A: DATA COLLECTION SHEET

STUDY NO:

MATERNAL DATA

AGE…….. PARITY……. GRAVIDITY…….. RACE…….

HIV STATUS

HYPERTENSION

CHORIOAMNIONITIS

ANTENATAL CARE Y/N

ANTENATAL STEROIDS Y/N

MODE OF DELIVERY C/S… VAGINAL …

PLACE OF BIRTH INBORN OUTBORN

NEONATAL DATA

GESTATIONAL AGE

BIRTH WEIGHT

GENDER

5 MINUTE APGAR SCORE

PRIMARY OUTCOME

SURVIVED

DIED

SECONDARY OUTCOMES

LENGTH OF STAY

RESUSCITATION REQUIRED in delivery room Y/N

NCPAP

START DATE

END DATE

SURFACTANT AT ANY TIME

MECHANICAL VENTILATION

START DATE

END DATES

HYPOTHERMIA

NEC GRADE 2+

ROP GRADE 2 +

IVH GRADE 3/4

BPD (> 28 DAYS)

EARLY ONSET SEPSIS

LATE ONSET SEPSIS

PDA

PNEUMOTHORAX

SPONTANEOUS INTESTINAL PERFORATION

CYSTIC PVL

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I GARI KHAMWANA MAKONYOLA (Student number: 1820255) am a student registered for the degree of MMED (PAEDS) in the academic year 2025.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: [signature] Date: 29 SEPT 2025

Appendix D: Ethics Clearance Certificate

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL) CLEARANCE CERTIFICATE NO. M190642

NAME:	Dr GK Makonyola
(Principal Investiqator)	
DEPARTMENT:	School of Clinical Medicine
	Department of Paediatrics and Child Health
	Charlotte Maxeke Johannesburg Academic Hospital
PROJECT TITLE:	Short-term outcome of extremely low birth weight neonates at a tertiary hospital in Johannesburg
DATE CONSIDERED:	2019/06/28
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Professor D Ballot and Dr R Saggers

APPROVED BY: Dr CB Penny, Chairperson, HREC (Medical)

DATE OF APPROVAL: 2020/01/31

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and ONE COPY returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

l/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and l/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, l/we undertake to submit details to the Committee. I agree to submit a yearly progress report. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in June and will therefore reports and re-certification will be due early in the month of June each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

_____ _____

Principal Investigator Signature Date

PLEASE QUOTE THE CLEARANCE CERTIFICATE NUMBER IN ALL ENQUIRIES