ADDIS ABEBA UNIVERSITY

COLLAGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF PEDIATRICS AND CHILD HEALTH NURSING AND MIDWIFERY

THE ASSESSMENT OF POSTNATAL WEIGHT GAIN PATTERN AND ITS PREDICTOR AMONG VERY LOW BIRTH WEIGHT PRETERM NEONATES ADMITTED TO NEONATAL INTENSIVE CARE UNIT OF SELECTED PUBLIC HOSPITALS, ADDIS ABABA, ETHIOPIA, 2025.

Investigator: Simeneh Tsegaye, BSc

Advisors: Dr.Fekadu Aga(PhD, Associate Professor)

Mr .Teshome Habte(MSc, Assistance Professor)

A Research Thesis Submitted to Addis Ababa University, College Of Health Sciences, School of Nursing and Midwifery, Department of Pediatrics and Child Health Nursing and Midwifery for Partial Fulfillment of The Requirements for Master's Degree in Neonatal Nursing.

JUNE, 2025

ADDIS ABABA, ETHIOPIA

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Name of investigator	Simeneh Tsegaye(BSc)
Name of advisors	Dr.Fekadu Aga(PhD, Associate Professor) Email:fiqaaduuagaa@yahoo.com Mr .Teshome Habte(MSc, Assistance Professor) Email: teshomeh497@gmail.com
Full title of the paper	Assessment of Postnatal Weight Gain Pattern And Its Predictor Among Very Low Birth Weight Preterm Neonates Admitted To Neonatal Intensive Care Unit of Selected Public Hospitals, Addis Ababa, Ethiopia, 2025.
Study period	Feb 20 – April,1 /2025
Study area	Saint Paulo's hospital millennium medical college, Ghandhi memorial hospital and Yekatit 12 hospital.
Address of Investigator	Simeget2260@gmail .com +251924343040

Signed approval sheet by the board of examiner

Addis Ababa University

College of health science

School of Nursing and Midwifery

Department of pediatrics and child health nursing and midwifery

The undersigned, certify that the thesis entitled assessment of postnatal weight gain pattern and its predictors among very low birth weight preterm neonates admitted in Addis Ababa selected Public hospitals in 2025, is my own work that have not been addressed in the study area as far as my knowledge touched and all the sources I used has been indicated and acknowledged as complete reference. The final approval was approved by the Examining Board of the department after evaluating the fulfillment of the requirements.

Investigator: Simeneh Tsegaye, BSc _____ _____

Signature **date**

EXAMINER:

Name: Mr.Tigistu Gebreyohannis (MSc**,** Assistance Professor) _____ _____

Signature date

RESEARCH ADVISORS

Name: Dr. Fekadu Aga (PhD, Associate Professor _____ _____

Signature date

Name: Mr.TeshomeHabte (MSc, Assistance Professor) _____ _____

Signature date

DEPARTMENT HEAD

Name _____ Signature Date_____

ACKNOWLEDGMENT

I am grateful to acknowledge Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery, Department of Pediatrics and Child health nursing and Midwifery for providing me with the opportunity to carry out this research project work. I would like to sincerely thank and appreciate my advisors, Dr. Fekadu.Aga, and Mr. Teshome.Habte, for their dedicated oversight, guidance, and support throughout the creation of this study project. My gratitude also extends to the hospital staff at Saint Paul's Hospital, Gandi Memorial Hospital, and Abebech Gobena Maternity and Child Health Hospital and also the study participants. Lastly, I want to express my gratitude to St. Paul's Hospital for the opportunity to pursue my Master's program at Addis Ababa University.

Abbreviation and acronyms

AAP……American Academy of Pediatrics

AAU…….……....Addis Ababa University

AGA…….Appropriate For Gestational Age

AOR…….….Adjusted Odds Ratio

BSc…….…...Bachelor of Science

CS…….Caesarean Section

CI……..……Confidence Interval

ETB……..…….Ethiopian Birr

GA……...Gestational Age

HC……Head Circumference

Hrs…….……..Hours

IVH……..Intra Ventricular Hemorrhage

KMC……Kangaroo Mother Care

LBW……...……..Low Birth Weight

LGA……..Large For Gestational Age

NEC…….……..Necrotizing Enter Colitis

NICU…….Neonatal Intensive Care Unit

PGF……..……..Post Natal Growth Failure

RDS…….Respiratory Distress Syndrome

SGA…….Small For Gestational Age

SVD……..Spontaneous Vaginal Delivery

VLBW…….…..Very Low Birth Weight

WHO…….…….World Health Organization

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ABSTRACT

Introduction: very low birth weight preterm neonates are birth weight less or equal to 1500gram at birth and delivered before 37 week of gestation. It is strong predictors of new born death during the neonatal period, which is the 1st 28 days after delivery. Despite advancements in neonatal care, addressing the poor growth of very low birth weight preterm neonates remains challenging and needs to be unraveled.

Objective: To assess the pattern of post natal weight gain and identify its predictor among very low birth weight preterm neonates admitted in neonatal intensive care units of selected public hospital in Addis Ababa, 2025.

Methods: An institutional based retrospective study was conducted among 422 very low birth weight preterm neonates from Jan 1,2022 to Dec 30, 2024. The sample size was calculated by using single proportion formula with prevalence of 50%. Proportional allocation was done. Data were collected, coded and entered using kobo toolbox then export to Statistical package of social science Version.27 for analysis. Variable with p-value<0.25 used for bivariate analysis and entered in a multivariate logistic regression analysis and $p < 0.05$ were declared statistically significant. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) and p-values was used.

Results: a total of 413 sample was analyzed and 78.2% exhibited adequate postnatal weight gain and the average weight gain was 19.6g/kg/d. Very low birth neonates delivered via SVD[AOR=2.56(1.402-4.69], age at regain birth weight within 14 days[AOR=4.906(1.28-18.75)],frequency of feeding every two hour [AOR=3.3(1.79-6.097], neonates in kangaroo mother care[AOR=4.42(2.38-8.205)], and neonates who use oxygen less than 9 days[AOR=2.75(1.299-5.843)], had statistical significant association with adequate postnatal weight gain pattern.

Conclusion and recommendations: from this result postnatal weight gain in very low birth weight neonates exceeded the recommended weight gain outlined in the Ethiopian neonatal intensive care unit

guidelines. Based on these we recommend that implementing enhanced care protocols for very low birth weight preterm neonates, prioritizing early detection and management of comorbidities and encouraging feeding practice.

Keywords: Very low birth weight, preterm, postnatal weight gain, z-score, gestational age.

1. INTRODUCTION

1.1 Back Ground

According to the World health organization definition very low birth weight premature neonates are birth weight less or equal to 1500 grams at birth and before 37 weeks of gestation(1). Preterm birth is the leading cause of neonatal death and is linked with extensive physical, neurodevelopmental and socioeconomic consequences. In 2020, 13·4 million newborn babies were born preterm (<37 weeks; 9·9% of all live births) compared with 13·8 million (9·8% of all live births) in 2010 (95%CI 12·7-15·5 million; appendix) worldwide (2). Approximately 90% of VLBW infants are classified as growth restricted when their postnatal weight gain has not exceeded 15 g/kg/day by 36 weeks gestation, reflecting growth retardation and labels them less than or equal to the 10th percentile on a standardized intrauterine growth curve(3).

It is still very difficult to address VLBW newborns' poor growth, even with advancements in neonatal care, these difficulties can be brought on by immune system weakness, metabolic and gastrointestinal immaturity, and other health issues like sepsis, polycythemia, respiratory distress syndrome , and necrotizing entero colitis(4).

The pattern of early postnatal weight loss, the degree of intrauterine growth restriction, and the level of care practitioners take to ensure proper weight increase that all affect a baby's postnatal weight gain.(5). Growth is a natural and expected physical process for infants and children that happens concomitantly with rapid advancements in neurodevelopment. As true for all infants, preterm and small infants must grow appropriately to achieve optimum outcomes. Neonatal expert groups agree that the best goal for preterm infant growth is to grow similar to the fetus (6).There is increasing recognition of the unique care required for VLBW infants in light of advancements in neonatal and prenatal medicine. However, putting this specialist care into practice is still challenging in developing countries. In order to reduce the incidence of neonatal death, VLBW premature newborns should get adequate care, which includes feeding, keeping their body temperature within a normal range, and monitoring and assessing their growth (7).

Despite the high prevalence of low birth weight infants in sub-Saharan Africa and the associated poor outcomes, weight change during the newborn period has not been well characterized for this population and a cross sectional study was conducted in Kampala, Uganda shows that Of the 235 VLBW infants, 113 (48.1%) had not regained their birth weight by 21 days who attending the Kangaroo clinic, due to this Failure to regain birth weight among VLBW infants by 21 days of age is a common problem in Mulago Hospital(8).A retrospective follow-up study conducted in Jimma found that 29% of preterm infants admitted to neonatal intensive care units (NICUs) in Ethiopia did not survive. Among those who were discharged, 86.2% experienced growth restrictions by the time of discharge from hospital (9).

The study emphasizes the scarcity of data on postnatal weight gain patterns and key predictors in very low birth weight (VLBW) preterm infants in Ethiopia. Addressing this gap could enhance current management guidelines and reinforce early nutritional interventions, which are crucial for minimizing postnatal weight loss and promoting optimal weight gain(10).

1.2. Statement of the problem

Very low birth weight neonates are risk for multiple health complications, including difficulties in achieving adequate postnatal weight gain(11). These neonates often face challenges related to immature organ systems, especially the gastrointestinal tract, which can impair their ability to absorb nutrients and grow at an appropriate rate. Postnatal weight gain is a crucial indicator of nutritional status and overall health, influencing both short term survival and long term developmental outcomes for these vulnerable neonates(12).

In developing countries, very low birth weight preterm infants who survive the neonatal and infancy periods face substantial health challenges. Studies estimate that 21.4% experience some form of neurodevelopmental impairment, while 16.3% develop cognitive impairment, and 11.2% are diagnosed with cerebral palsy(13).The risk of neonatal mortality for VLBW preterm neonate is increasing from 25-30 compared to neonates with birth weight greater than 2.5kg and the risk increase as the birth weight decrease (14).

A cross-sectional study conducted at Aider Comprehensive Specialized Hospital found that neonates with a birth weight below 1500 grams faced significantly higher odds of mortality. Specifically, their risk of death was 49% greater compared to those weighing 1500–2449 g, 70% higher than those in the 2500–3999 g range, and 80% greater than infants weighing more than 4000 g(15). An observational study conducted in Jimma reported that the prevalence of very low birth weight (VLBW) neonates was 14.6%, while prematurity affected 10.2% of newborns(16).

While there have been numerous studies on the weight gain patterns in preterm neonates, limited research has focused specifically on VLBW preterm neonates, a group that may have distinct needs and challenges. Understanding the trajectory of weight gain, the factors that predict successful postnatal growth, and the interventions that can support this growth is crucial for reducing morbidity and mortality among this high-risk group (17). The purpose of the study was to assess pattern of post natal weight gain and its predictor among VLBW preterm neonate admitted to NICU of selected public hospital, Addis Ababa.

1.3. Significance of the study

The study was examine pattern of post natal weight gain and its predictors for VLBW preterm neonates, providing insights relevant to both clinical care and public health. These infants, born before 37 weeks of gestation and weighing less than 1500 grams, are at high risk of morbidity and mortality due to their underdeveloped organ systems. Postnatal weight gain serves as a critical marker of overall health, nutritional status, and the quality of neonatal intensive care unit (NICU) management. By identifying modifiable factors influencing weight gain, this study highlights opportunities for clinical interventions that support improved growth and development.

By identifying and understanding the key predictors of postnatal weight gain, healthcare providers can make evidence-based decisions that optimize growth, reduce complications, and ultimately improve survival and neurodevelopmental outcomes. Finally the significance of this study lies in its potential to enhance both immediate neonatal care and long-term health outcomes for very low birth weight (VLBW) preterm neonates. The findings will contribute to reducing the burden of preterm birth and refining neonatal care practices in Ethiopia, offering insights that can inform clinical protocols and public health interventions.

2. LITERATURE REVIEW

The World Health Organization (WHO) estimates that more than 20 million very low birth weight neonates are born annually, accounting for 15–20% of all births worldwide. These infants often encounter both short- and long-term health challenges, requiring specialized medical care and nutritional support to improve survival rates and developmental outcomes (18). A study conducted in United States low birth weight rate (the percentage of infants born weight less than 2500g) is 8% and the percentage of very low birth weight (< 1500gm is 1.39% in 2015)(19).According to a study done in South Africa Chris Hani Baragwaneth Hospital, VLBW infants represented 21% of total admissions to the neonatal unit and 3% of total live births(20).

2.1. Postnatal weight gain in very low birth weight (VLBW) preterm neonates

Preterm delivery remains a major global public health concern and is the leading cause of neonatal morbidity and mortality (21). Poor postnatal weight gain, a key risk factor for neonatal death, is influenced by feeding practices, medical complications, and the overall quality of neonatal care provided to these vulnerable neonates(22). A study conducted in South India reported an average postnatal weight gain of 16.2 g/kg/day, indicating favorable growth outcomes among very low birth weight (VLBW) preterm neonates(23). In contrast, a study from Tanzania found a lower average weight gain of 12.7 g/kg/day, based on primary data collected from a tertiary hospital setting(24).A study conducted in South Africa included 69 infants, reporting a mean growth velocity (GV) of 13.2 g/kg/day. The median weight loss among these neonates was 7.69%, while the median time to regain birth weight was 16 days. Notably, 73.9% (51 infants) achieved their birth weight by or before 21 days post-birth(25).

2.2. Predictors of post natal weight gain pattern in very low birth weight preterm neonates.

2.2.1. Socio demographic factors

A study conducted in America by the University of Louisville found that male neonates exhibited slower postnatal weight gain compared to female neonates. Specifically, males gained weight at an average rate of 14.2 ± 3.9 g/kg/day, while females gained 15.2 ± 3.1 g/kg/day, indicating a measurable difference in growth patterns(26). According to a study conducted in England and wales on VLBW preterm neonates whose data were taken from United Kingdom data repository that male neonates were more weighing than female neonates at birth and gained more weight by

the time of 14 days old(5). A study conducted in Kampala, Uganda found that nearly 50% of very low birth weight (VLBW) newborns at Mulago Hospital had not regained their birth weight by 21 days. Typically, VLBW infants are expected to recover their birth weight within 10 to 21 days after birth(27). A prospective cohort study done in Tanzania estimates that early preterm neonates lost an average of more than (3.37%) pound in their first week of life(24).

A study done in Ethiopia by using a primary data demonstrates that postnatal weight gain is 4.9 times worse for neonate with birth weights less than1 500g than for those with birth weights >1500 g and Patterns of fetal growth are largely influenced by environmental, nutritional, and socioeconomic factors(28).

2.2.2. Obstetric related predictors

2.2.2.1 Mode of delivery

According to a prospective study conducted in Iran found that neonates delivered via C-section gain less weight than those delivered via vaginal delivery (29). A prospective study done in America, the effect of delivery type on neonatal weight gain pattern shows there is poor weight gain by the neonate who delivered through C-section (30).

2.2.2.2 Gestational age

The study conducted in England and Wales that the average weight gain velocity increases from 16gm per day to 23gm per day when the gestational age is increased from 23 to 31 weeks (5). A study conducted by the American Academy of Pediatrics Committee on feeding practices and postnatal growth failure found that neonates born after 31 weeks of gestation exhibit better postnatal weight gain compared to those born before 31 weeks. This growth trend is positively correlated with birth weight, showing a 0.11 kg increase per additional week of gestation, as well as weight at three months of age, with a 0.08 kg increase per gestational week(31). A study conducted at Muhimbili Hospital in Dares Salaam found that early preterm newborns experienced greater weight loss than term neonates during their first week of life, with an average weight loss of 3.37%. This highlights the vulnerability of preterm infants and underscores the importance of specialized nutritional and medical interventions to support their growth(24).

A cohort study conducted in Singapore found variations in postnatal weight gain among neonates based on their gestational age classification. The study reported 3.6% postnatal weight gain in small for gestational age (SGA) neonates,73.4% in those classified as appropriate for gestational age (AGA), and 23.0% in large for gestational age (LGA) neonates(32). A study conducted in Rio de Janeiro on 570 very low birth weight (VLBW) preterm neonates found that small for gestational age (SGA) birth increased the risk of poor postnatal weight gain by 2.1 times. Additionally, each extra day spent in the hospital by SGA neonates was associated with a 4.33 times higher likelihood of experiencing growth restriction at discharge (33).

2.2.2.3 Kangaroo mother care practice

Kangaroo Mother Care (KMC) has been shown to significantly improve growth outcomes in very low birth weight (VLBW) infants while also boosting breastfeeding rates. By promoting skin-to-skin contact, KMC enhances thermal regulation, reduces stress, and fosters stronger maternal bonding, leading to improved nutritional intake and weight gain.(34). In the Kangaroo Mother Care (KMC) group, the mean age of regaining birth weight was significantly shorter at 15.68 days, compared to 24.56 days in the control group. Additionally, average daily weight gain was notably higher at 22.09 g, compared to 10.39 g in non-KMC infants. These findings highlight the positive impact of KMC on neonatal growth and recovery(35). Providing Kangaroo Mother Care (KMC) for more than three hours daily in preterm neonates during their first two weeks of life has been shown to significantly reduce neonatal blood cortisol levels, indicating lower stress, while also enhancing weight gain. The extended skin-to-skin contact fosters thermoregulation, improves feeding efficiency, and strengthens maternal-infant bonding, all contributing to better neonatal outcomes (36).

2.2.3. Factors related to feeding practice in very low birth weight preterm neonates

The feeding protocol for VLBW preterm neonates consisted of feeding increments of 10 ml/kg of body weight given via nasogastric tube feedings at 2–3-h intervals and other VLBW preterm neonates were generally fed gavage with increments of 20 ml/kg at 2–3-h intervals (37). A study conducted in Southeast Wisconsin found that enteral feeding with breast milk was introduced early, between 2 to 48 hours after birth. For infants with a birth weight of 1500 grams, the amount

of breast milk provided gradually increased over one week, starting at 10 days of age, until the infant reached approximately 2000gram (38).

According to time of initiation of eternal feeding, a study conducted at the Medical University of South Carolina in the United States found that VLBW preterm neonates feed within the first 24 hours gained significantly more weight and required fewer days of parenteral nutrition (10 vs 18 days)(39). A cohort study conducted in Iran found that on the first day initiation of trophic feeding for very low birth weight (VLBW) preterm neonates was associated with a shorter hospital stay, reduced duration of parenteral feeding, and have adequate weight gain(40).

2.2.4. Factors related to comorbidity

The relationship between postnatal weight gain and comorbid illnesses plays a critical role in neonatal growth outcomes. Studies show a highly significant reduction in body weight by the end of the first week of life, with respiratory distress syndrome (RDS) neonates losing more weight (7.6%) compared to healthy neonates (3.7%)(41).

According to the study conducted in Korea on 2799 VLBW preterm neonates admitted to the NICU with RDS and necrotizing enter colitis had 88.9 % and 6.1% growth failure respectively and those who were on oxygen use for longer than 9 days had 13.96% growth failure and VLBW infants admitted to NICU with respiratory distress is 88.9%, Broncho pulmonary dysplasia is 35.2%, intra ventricular hemorrhage is 5.5% and retinopathy of prematurity is 14.1%. In addition, among neonates for invasive ventilation for long period time and on prolonged oxygen treatment, there is a 23.03% and among those 13.96% was face poor post natal weight gain(16).

According to case control study done at Assaf Harofeh and Sheba Medical Centers health facility of Israel on the pattern of weight gain was different that the NEC group gained 5.1% while the control group gained 1.2% but None of the infants in the NEC group lost weight(42).

A study conducted in a tertiary care center in Southern India among 40 neonates found that 18 (45%) regained their birth weight within 14 days, while 22 (55%) experienced delays. Among the 22 neonates who reached full feed within 7 days, 15 (68.2%) regained birth weight within 14 days. However, among the 22 neonates with delayed weight gain, 11 (50%) had sepsis (confirmed by blood culture). Additionally, 24 neonates developed neonatal hyperbilirubinemia, and 17 (77.3%)

of those with delayed weight gain experienced hypoglycemia at some point during their NICU stay(43). A study conducted in Bahirdar suggests that supplemental oxygen is both beneficial and potentially harmful for very low birth weight (VLBW) preterm infants. While oxygen therapy is crucial for neonatal survival, prolonged use beyond 9 days has been linked to poor postnatal weight gain, often falling below the expected rate of 15 g/kg/day. This inadequate weight gain is associated with respiratory distress syndrome (RDS) and other medical complications(44).

2.3. Conceptual frame - work

Postnatal weight gain VLBW preterm infant is affected by socio-demographic factors of the mother and the newborn, obstetric characteristics, feeding practice and major co morbid problems of the neonates. By reviewing different litterateurs and books (5, 45, 46). The conceptual frame work was developed as shown in the figure below.

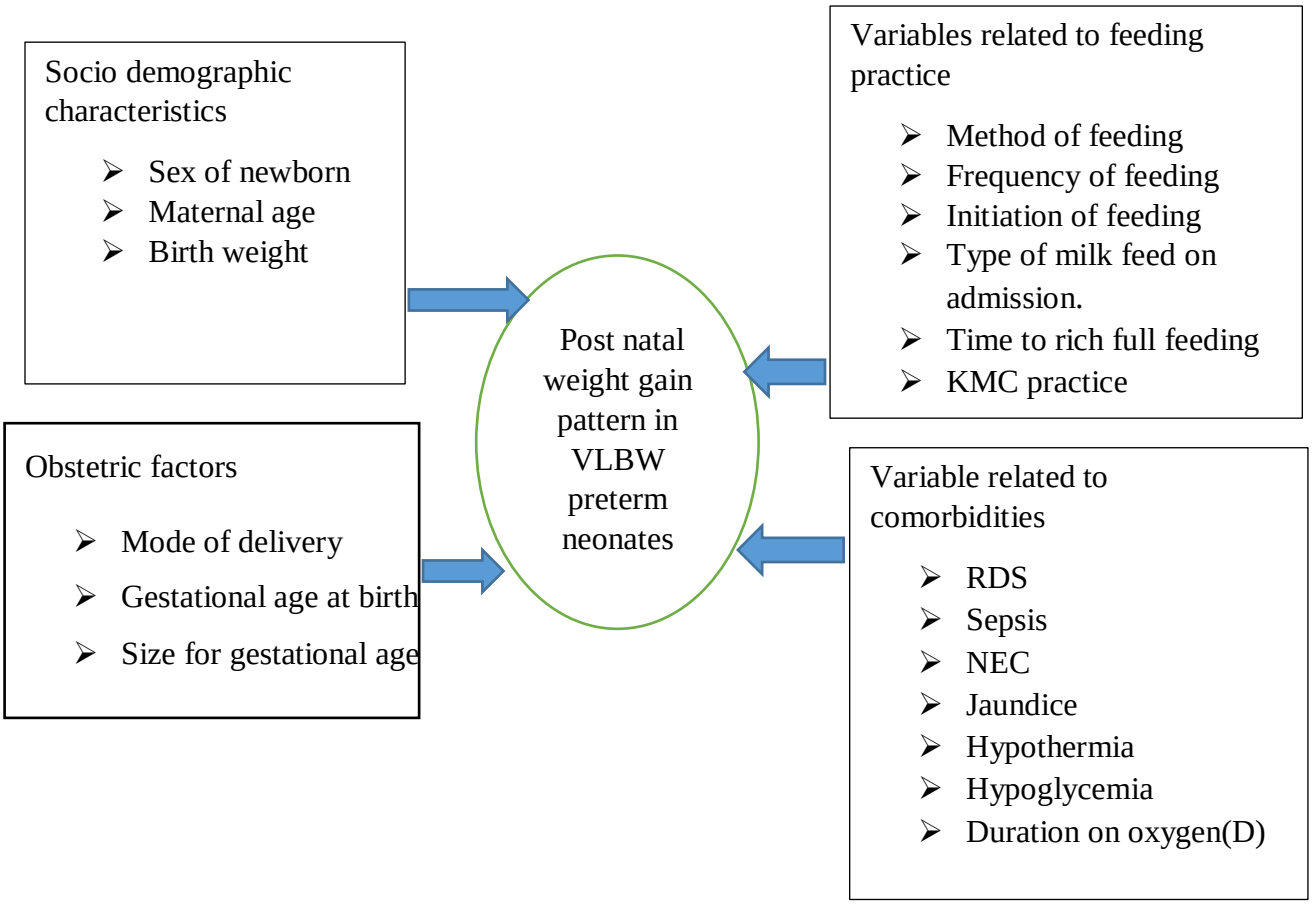


Figure 1: A conceptual framework tailored to postnatal weight gain patterns and its predictors among very low birth weight (VLBW) preterm neonates admitted to NICUs in Addis Ababa, 2025.

3. OBJECTIVES

3.1. General objective

- To assess the pattern of post natal weight and identify its predictors for very low birth weight preterm neonates admitted to the neonatal intensive care unit of selected public hospitals in Addis Ababa, 2025.

3.2. Specific objectives

- To determine pattern of post natal weight gain in VLBW preterm neonates admitted in neonatal intensive care unit of selected public hospital in Addis Ababa, 2025.
- To identify predictors of postnatal weight gain in VLBW preterm neonates admitted in neonatal intensive care unit of selected public hospital in Addis Ababa, 2025.

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted at selected public hospitals in Addis Ababa, Ethiopia, a city with more than 52 hospitals, including 12 public hospitals. Using a lottery method, three hospitals were selected. The selected hospital were saint Paulo's, Gahndi memorial hospital and Yekatit 12 hospital. From these Saint Paul's Hospital Millennium Medical College, which handles over 2,500 deliveries annually, Gandhi Memorial Hospital, providing 40–50 daily deliveries, Yekatit 12 Hospital Medical College (Abebech Gobena Maternity and Child Health Hospital).Those hospitals, recognized for their diverse patient populations and comprehensive neonatal care, offer valuable insights into post natal weight gain patterns after birth and its predictors among (VLBW) preterm neonates. Their NICU facilities include resuscitation units, radiant warmers, phototherapy equipment, incubators, and Kangaroo Mother Care (KMC) wards, making them well-suited for this research. The study involved chart reviews spanning three years from January 1, 2022, to December 30, 2024 and data collection was conducted from February 20 to April 1, 2025.

4.2 Study design

A facility-based retrospective chart review was conducted among very low birth weight (VLBW) preterm neonates who is in the neonatal intensive care units (NICUs) of selected public hospitals in Addis Ababa.

4.3 Source population

All medical records of VLBW preterm neonates in neonatal intensive care unit of Addis Ababa selected public hospitals.

4.4. Study population

The study population was medical records of VLBW preterm neonates admitted to the neonatal intensive care units (NICUs) of selected public hospitals in Addis Ababa over a three-year period, from January 1, 2022 to December 30, 2024.

4.6. Eligibility criteria

4.6.1. Eligible criteria

All medical records of VLBW preterm neonates admitted in NICU in the first day of birth was included.

4.6.2. Non eligible criteria

Medical records of neonates who were born as twins or triplets, had congenital malformations or chromosomal disorders diagnosed at birth, died or discharged within 7 days, before physiological weight gain could begin, and had incomplete medical charts.

4.7. Sample size determination

To determine the sample size single population formula was used to assess the post natal weight gain pattern for very low birth weight preterm neonates.

n=$z\frac{\alpha}{2} * p * (1-p)/d^{2}$ where: n= determine sample size

$z\frac{\alpha}{2}$= critical value at95%CI, which is 1.96

P= estimated prevalence of postnatal weight gain in very low birth weight preterm neonates (50%)

D = margin of error which is 0.05

Then the sample size become 384, and to account for non- response rate 10% of the sample (n=38) was added, gives a final sample size of 422.

4.8. Sampling procedures

To select medical records VLBW preterm neonates from each hospitals systematic random sampling technique was used. The total number of VLBW preterm neonates admitted to the NICUs during collection period was approximated from hospital management information system (HMIS) records The average number of VLBW preterm neonates admitted over three years (January 2022 to December 2025) in each selected hospital was from Saint Paulo's Hospital Millennium Medical College 460 neonates, fromYekatit 12 Hospital Medical College 295 neonates, and from Gandhi Memorial Hospital 340 neonates. To determine the number of records included from each hospital, proportional allocation was applied using the formula: ni= (n/N) Ni, where ni = sample size of each selected public hospital.

n=total sample size

Ni=population of each selected public hospital

N= total population of three selected public hospitals

SPHMMC= 422/1095*460=177

Yekatit hospital=422/1095*295=114

Gandi memorial hospital= 422/1095*340=131

Totally gives the sample size of 422.

Table 1: The schematic presentation of sampling procedures among very low birth weight preterm neonates admitted in NICU from January, 2022 to December, 2024 in selected public hospitals of Addis Ababa, 2025.

Selected Public hospital in Addis Ababa	Total number of VLBW preterm neonates	By proportional allocation	Total
Saint.paulos hospital	460	177	422
Gahndi memorial hospital	340	131	
Yekatit 12 hospital	295	114	

To get the individual sample units (cards of VLBW preterm neonates) systematic random sampling technique was used with K = (N/n) which is 1095/422=2.59 ~ 3.

4.9. Variables of the study

4.9.1. Dependent variable

- ✓ Post natal weight gain pattern of VLBW preterm neonates.

4.9.2. Independent variable

- ❖ **Socio demographic factors**
- ✓ Sex of newborn
- ✓ birth weight of the neonate
- ✓ Maternal age
- ❖ **Obstetric characteristics**
- ✓ Gestational age
- ✓ Size for gestational age
- ❖ **Variables related to comorbidities**
- ✓ RDS
- ✓ Necrotizing enter colitis
- ✓ Neonatal sepsis
- ✓ Neonatal jaundice
- ✓ Hypoglycemia
- ✓ Hypothermia
- ✓ Duration on oxygen
- ❖ **Variables related to feeding practice**
- ✓ Method of feeding
- ✓ Type of milk feed on admission
- ✓ Frequency of feeding
- ✓ Time of initiation
- ✓ Time to reach to full feeds (in days)

4.10. Operational definition

- Birth Weight: The first weight of the newborn measured within the first hour of life, before the onset of significant postnatal weight loss, using a calibrated standard weighing scale(45).
- Very Low Birth Weight (VLBW**)**: Newborns who are born weighing less than 1,500 grams (1.5 kilograms), regardless of gestational age(45).
- Preterm Birth: The birth of a baby before 37 completed weeks of gestation, regardless of birth weight.
- Adequate postnatal weight gain: - average weight in (g/kg/day) which is ≥ 15g/kg/d (23).
- Poor postnatal weight gain: - average weight in (g/kg/day) < 15 g/kg/day (23, 24, 45).
- Co morbidity- very low birth weight neonates who have other medical problems in addition to the prematurity.

4.11. Data collection tools and procedures

The actual data collection was carried out from February 20 to April 1, 2025 by 3 trained BSc nurses to record the data and masters in neonatology to supervise the data quality. The cheek list was adapted from different litterateurs and validated by two neonatology expert to collect data from cards of very low birth weight preterm neonates (24, 28, 47,48). The data extraction cheek list was structured into four key sections to ensure comprehensive collection of relevant information. These are socio-demographic Characteristics – including maternal age, residence, education level, and marital status, feeding Practices – covering timing of first feed, type of feeding (breast milk, formula, KMC), and method of administration, obstetric characteristics – such as mode of delivery, gestational age, neonatal Comorbid Conditions – documenting the presence of conditions such as respiratory distress syndrome (RDS), necrotizing enterocolitis (NEC), hypoglycemia, and sepsis.

4.12. Data quality assurance

To maintain data integrity throughout the study, quality assurance measures were implemented during data collection, coding, entry, and analysis. All data collectors and supervisors received structured training prior to the initiation of data collection to minimize bias and ensure consistency. Continuous supervision was conducted during the collection period, and each medical chart was reviewed for completeness, accuracy, and proper documentation before data entry. Additionally, a pretest was conducted at Tikur Anbessa Specialized Hospital two weeks before the actual data collection. This pretest included 5% of the sample size (n=21) to assess the clarity, applicability, and availability of the data collection instruments, ensuring their effectiveness before full implementation. To ensure data accuracy and consistency, supervisors conducted direct observations of data collectors during the data collection process. Data collectors were instructed to record the corresponding medical record (card) number on each checklist. Completed checklists were reviewed on a daily basis by data collectors, supervisors, and the principal investigator to ensure completeness, consistency, and accurate documentation. Any discrepancies or challenges encountered during data collection were promptly addressed through team discussions and resolved to maintain high standards of data integrity.

4.13. Data management and analysis

Kobo toolbox was used for collection, coding and entry, then exported to SPSS V.27 for further analysis. Data cleaning was performed to ensure accuracy. Categorical variables were analyzed using frequency and percentage, continuous variables were assessed using mean and standard deviation. Binary logistic regression analysis was conducted to examine associations between dependent and independent variables. The outcome variable (average weight gain (g/kg/day)) was dichotomized into adequate weight gain which is (>15 g/kg/day) and poor weight gain which is (<15 g/kg/day) and bivariate logistic regression was performed to analyze individual variable associations with the outcome variable. Variables with p-value <0.25 were selected as candidates for multivariate logistic regression, which accounted for potential confounding factors. Significant associations with postnatal weight gain were determined at p-value<0.05, and results was presented using adjusted odds ratio with 95% CI and p-values. To test model goodness-of-fit, the Hosmer-Lemeshow test was applied. A p-value > 0.05 indicated acceptable model fit, with the final p-value yielding 0.492.

4.14. Ethical clearance and consent to participate

Ethical clearance for this study was obtained from the Institutional Review Board (IRB) of Addis Ababa University (AAU), College of Health Sciences, School of Nursing and Midwifery, Department of Pediatrics and Child Health Nursing and Midwifery, under protocol number SNM/17/2025. A formal letter of cooperation was submitted to the Addis Ababa Health Bureau, which subsequently issued authorization letters to the heads of NICU departments of selected public hospitals to access and utilize relevant medical records.

To uphold participant confidentiality, no personal identifiers (such as names or contact details) were collected. All data were anonymzed and stored in a secure, password-protected database, accessible only to authorized members of the research team. During data analysis, only aggregated results were used to prevent identification of individual participants. Physical documents were kept in locked storage, and electronic files were encrypted to safeguard against unauthorized access.

4.16. Dissemination plan

The result of the study will be submitted and presented to Addis Ababa University College of Health Sciences, School of Nursing and Midwifery department of pediatrics and child health nursing and midwifery. In addition, results will be provided to Saint. Paul's hospital, Gahndi Memorial hospital and Yekatit 12 hospital in order to take effective measurements to correct the existing health problem. The findings will be presented on scientific conferences and published on reputable journal in the field.

5. RESULTS

5.1 socio demographic and obstetric factors for very low birth weight preterm neonates

A total of 413 participants was included in the final analysis with 97.8% response rate and the remaining 2.2% medical charts was excluded due to missing data. Among the included neonates, 220 (53.3%) were male. A total of 227 (54.9%) were delivered via spontaneous vaginal delivery (SVD), and 55.2% received care in the Kangaroo Mother Care (KMC) unit during admission. The mean gestational age was 31.7 ± 2.48 weeks. Of these, 262 neonates (63.4%) were classified as very low birth weight (VLBW), and 309 (74.8%) were identified as early preterm. The mean birth weight was 1266.7 ± 165 grams, and the average maternal age at delivery was 27.3 ± 5 years.for more informaton see the table below(table 1).

Table 2: Socio-demographic and Obstetric Characteristics of Very Low Birth Weight (VLBW) Preterm Neonates and Their Mothers in Selected Public Hospitals of Addis Ababa, 2025 (N=413).

Variables	Categories	Weight gain pattern		Frequency(N)	Percentage (%)
		Adequate (>15g/kg/d)	Poor(<15g/kg/d)		
Sex	M	166	54	220	53.3%
	F	157	36	193	46.7%
Maternal age	18-30	244	66	310	75.1%
	>30	79	24	103	24.9%
Birth weight in gram	<=1000	19	27	46	11.1%
	1000-1100	34	12	46	11.1%
	1100-1200	62	19	81	19.6%
	1200-1300	58	13	71	17.2%
	1300-1400	78	9	87	21.1%
	1400-1500	72	10	82	19.9%
Mode of delivery	Svd	194	33	227	54.9%
	c/s	129	57	186	45.1%
Gestational age	Early preterm	266	84	350	84.7%
	Late preterm	57	6	63	15.3%
Size for GA	AGA	205	57	262	63.4%
	SGA	118	33	151	36.6%
Number of children the mother has (parity)	<=1	142	40	182	44.1%
	2	102	27	129	31.2%
	>=3	79	23	102	24.7%

GA= Gestational age, AGA= Appropriate for Gestational Age, SGA=Small for gestational age, C/S= Ceseran section, SVD= Spontaneous vaginal delivery.

5.2. Average postnatal weight loss, time to regain birth weight, and Z score at discharge of VLBW preterm neonates.

Among the study participants, 270 (65.4%) experienced an average weight loss of less than 10% during the first week of life. Additionally, 401 (97.15%) of the neonates had regained their birth weight within two weeks of life.

Table 3: Postnatal Weight Loss and Z-Score in VLBW Preterm Neonates in Selected Public Hospitals, Addis Ababa, 2025 (N = 413).

Variables	Categories	Postnatal weight gain		N	Percentage (%)
		Adequate	Poor		
Average weight loss in the first week	<=10%	219	51	270	65.4%
	>10%	104	39	143	34.6%
Time to regain birth weight in the second week	<=14 days	316	85	401	97.1%
	>14 days	7	5	12	2.9%
Z score at birth	<=1.29	120	52	172	41.9%
	>1.29	203	38	241	58.1%
Z score at discharge	<=1.29	42	47	89	21.5%
	>1.29	281	43	324	78.5%

From this study very low birth weight preterm neonates time to regain their birth weight in two weeks was 401(97.09%) which is higher than those neonates who regain their birth weight longer than two weeks which is 12(2.91 %) see **fig 2.**

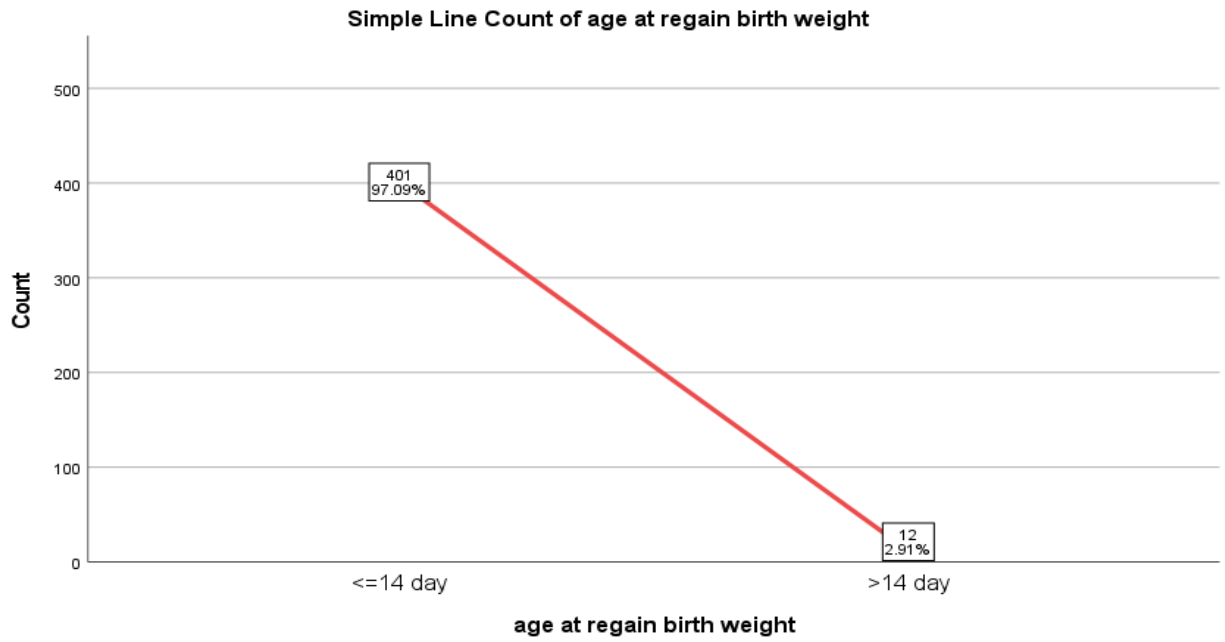
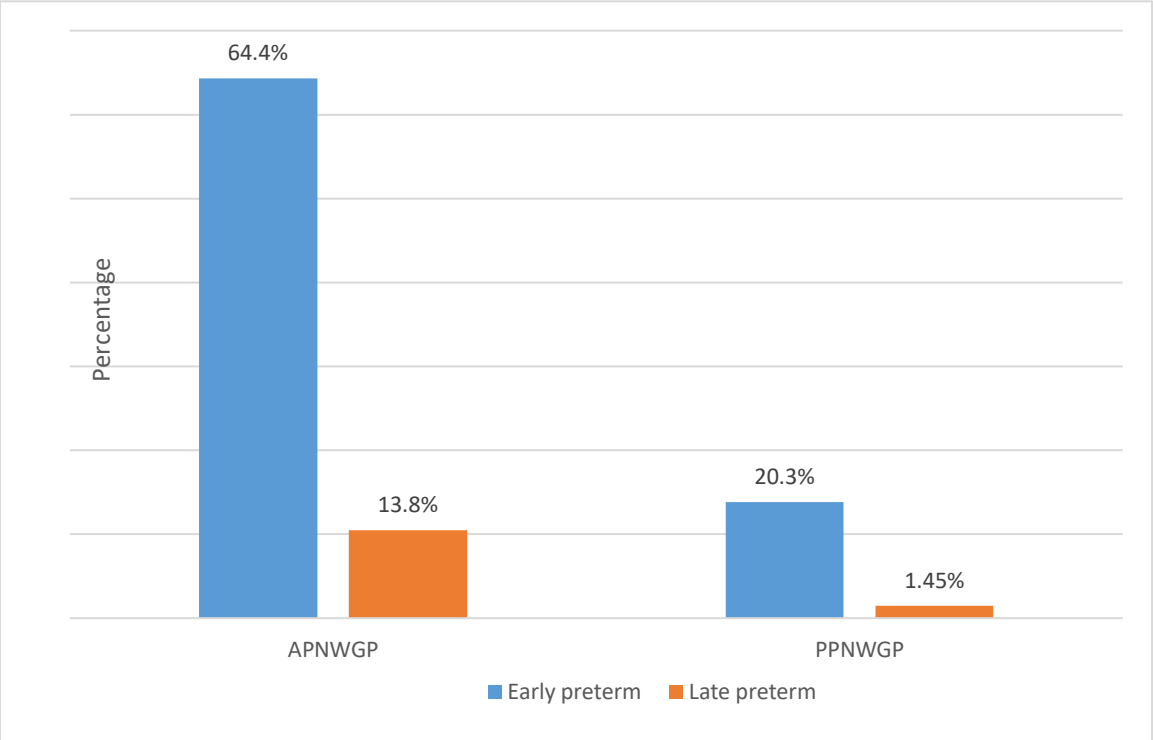


Figure 2: Line graph of time to regain birth weight for VLBW preterm neonates in selected public hospitals, Addis Ababa, 2025 (N=413).

Out of the total 413 neonates included in the study, 323 (78.2%) achieved adequate postnatal weight gain, with a 95% confidence interval of 73.4% to 86.7%. Among those with adequate weight gain, 64.3% were early preterm very low birth weight neonates. Adequate weight gain was observed more frequently among early preterm neonates compared to those born late preterm (fig 3).



APNWGP = Adequate Postnatal Weight Gain Pattern; PPNWGP = Poor Postnatal Weight Gain Pattern

Figure 3: Percentage with postnatal weight gain among early preterm and late preterm neonates in Addis Ababa selected public hospitals, 2025 (n= 413).

5.3. Clinical Characteristics and Comorbidities among VLBW Preterm Neonates

Among the total very low birth weight (VLBW) preterm neonates included in the study, 182 (44.1%) had a hospital stay of more than 22 days, with a mean length of stay of 23.9 ± 12.9 days. A total of 244 (59.1%) required oxygen therapy for more than nine days. Neonatal mortality after the first week of life was observed in 80 (19.4%) cases. Among neonates with poor postnatal weight gain**,** 90 out of 413 (21.6%) presented with multiple comorbidities (i.e., more than one clinical diagnosis). The most commonly documented comorbid conditions were respiratory distress syndrome (RDS**)** 367 (88.9%), hypothermia 354 (85.7%), sepsis 274 (67.3%), necrotizing enterocolitis (NEC) 265 (64.2%), and Jaundice 261 (63.2%).

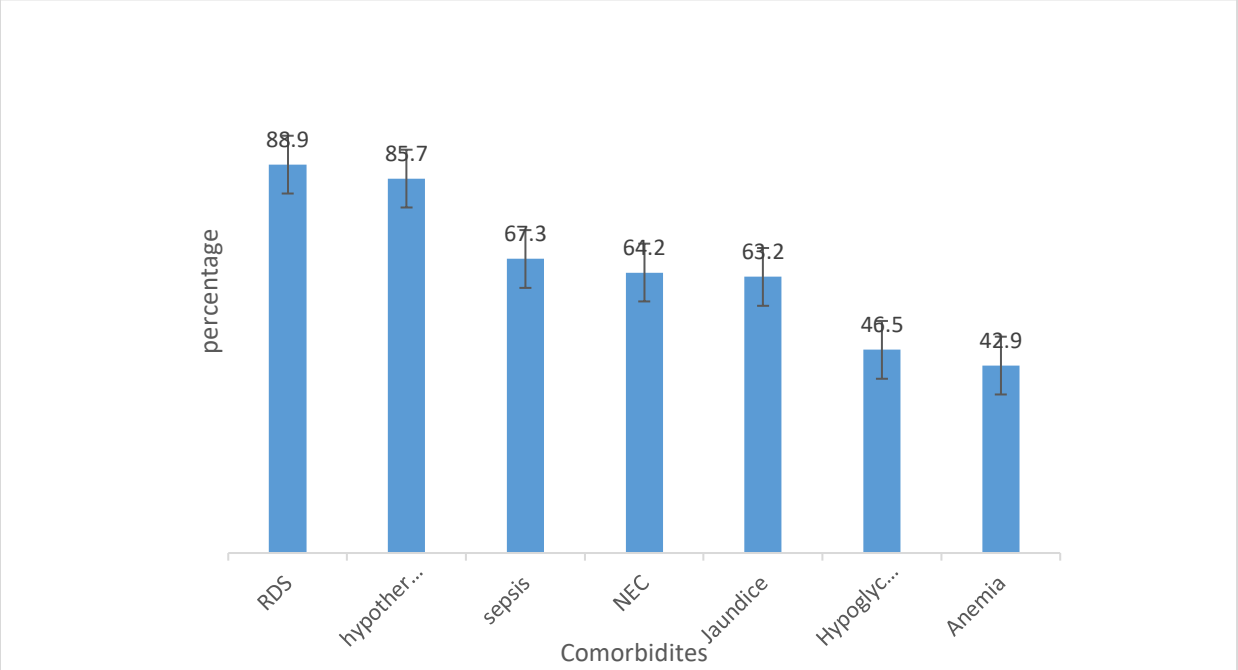


Figure 4: comorbidity condition among very low birth weight preterm neonates with poor post natal weight gain pattern admitted in neonatal intensive care unit of selected public hospital Addis Ababa, 2025(n=413).

5.4 Description of very low birth weight preterm neonate feeding practice and kangaroo mother care practice

From this study most very low birth weight preterm neonates start feeding on the 1st day of life was 266(64.4%) and majorly the preferable milk 226(54.7%) was breast milk with NG-tube feeding every 2hr and kangaroo mother care was practiced which is 228(55.2%), and the majority of very low birth weight preterm neonates 232(56.2%) was rich their full feeding within seven days.

Table 4: Feeding Practices Among Preterm Very Low Birth Weight (VLBW) Neonates in Selected Public Hospitals of Addis Ababa, 2025 (N = 413).

Variables	Categories	weight gain pattern		N	Percentage (%)
		Adequate(>15 g/kg/d	Poor(<15g /kg/d		
Types of milk	Breast milk	169	57	226	54.7%
	Formula	30	7	37	9%
	Mixed	124	26	150	36.3%
Method of feeding	Breast feeding	64	5	69	16.7%
	NG tube feeding	259	85	344	83.3%
Time of first feeding	1st day	121	45	266	64.4%
	>=2nd day	102	45	147	35.6%
Initial volume of feeding	<=20ml/kg	197	64	261	63.2%
	>20ml/kg	126	26	152	36.8%
Frequency of feeding	<=every 2hr	270	39	309	74.8%
	>every 2hr	53	51	104	25.2%
Kangaroo mother care	Yes	196	32	228	55.2%
	No	127	58	185	44.8%
Time to rich full feeding	<=7daays	170	62	232	56.2%
	8-14 days	110	18	128	31%
	15- <21days	35	6	41	9.9%
	>22 days	8	4	12	2.9%

5.5. Postnatal weight gain pattern among very low birth weight preterm neonates

The postnatal weight gain pattern was rapid after regain their birth weight and majority of the neonate was between 10th and 90th percentile and 262(63.4%) neonates are appropriate for gestational age and 151(36.6%) neonates was small for gestational age.

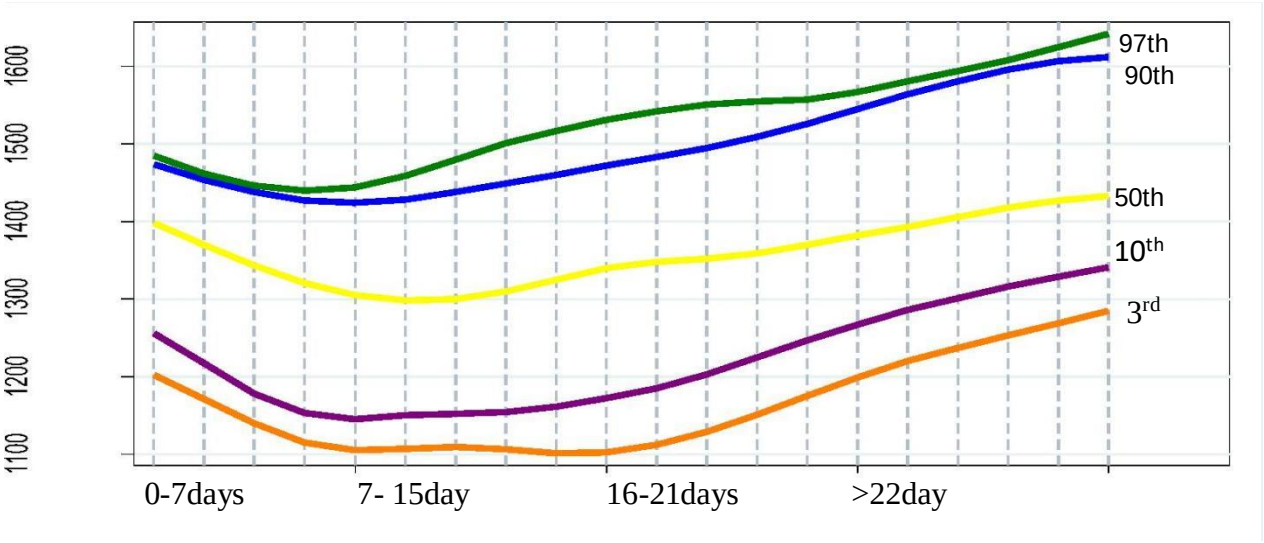


Figure 5 post natal growth curve for very low birth weight preterm neonates admitted to neonatal intensive care unit of selected public hospital in Addis Ababa, 2025.

5.6. Predictors of postnatal weight gain among very low birth weight (VLBW) preterm neonates

To test the relationship between individual independent variables with dependent variables a bivariate logistic regression were used and p value less than 0.25 were taken as a statistical significant in bivariate regression. This analysis highlights several key factors influencing weight gain in (VLBW) preterm neonates. It appears that spontaneous vaginal delivery, early birth weight recovery, limited oxygen use, frequent feeding, and kangaroo mother care all play significant roles in promoting better weight gain outcomes.

Neonates who were delivered through spontaneous vaginal delivery were 2.5 times more likely to have adequate postnatal weight gain than those neonates born with cesarean delivery {AOR=2.56, 95%CI (1.402-4.69}, neonates who regained their birth weight within two weeks of life were 4.9 times more likely to achieve adequate postnatal weight gain compared to those who regained it after 14 days (AOR = 4.906; 95% CI: 1.28–18.75**)**, and VLBW Preterm neonates who use oxygen less than 9 days had 2.75 times more likely adequate postnatal weight gain than those who use oxygen more than 9 days{AOR=2.75,95% CI (1.299-5.843)}.Neonates who feed every two hour was 3.3 adjusted odds of more likely enough weight gain than those who feed more than every two hour [AOR=3.3,95% CI (0.1.79-6.097)], and VLBW preterm neonates who were in kangaroo mother care 4.4 times more likely to have adequate post natal weight gain than those who were not in kangaroo mother care [AOR=4.42,95% CI (2.38-8.205)].for more detail information see table 5.

Table 5:bivariate and multivariate logistic regression on post natal weight gain pattern for very low birth weight preterm neonate, Addis Ababa selected public hospital, 2025(N=413).

Variables	category	Weight gain pattern		COR(95%CI)	AOR(95%CI	**P**
		adequate(> 15g/kg/d	poor(<15g/ kg/d			
Sex of neonate	Male	166	54	0.705(0.438-1.133	1.247(0.69-2.24)	0.460
	Female	157	36	1	1	
Gestational age	Early preterm	266	84	0.33(0.139-0.801)	0.611(0.23-1.599)	0.315
	Late preterm	57	6	1	1	
Mode of delivery	SVD	194	33	2.598(1.602-4.21)	2.56(1.402-4.69)	**0.002**
	C/S	129	57	1	1	
Age atregain birth weight	<14 D	316	85	2.655(0.82-8.57)	4.906(1.28-18.75)	**0.020**
	>14D	7	5	1	1	
Z- score at birth	>1.29	203	38	2.31(1.439-3.723)	1.39(0.78-2.484)	0.26
	<1.29	120	52	1	1	
Sepsis	Yes	204	74	0.371(0.206-0.66)	0.637(0.321-1.264)	0.197

	No	119	16	1	1	
NEC	Yes	106	42	0.558(0.347-0.89)	1.05(0.58-1.901)	0.873
	No	217	48	1		
Hypoglycemia	Yes	140	52	0.559(0.348-0.89)	0.66(0.373-1.191)	0.175
	No	183	38	1		
Duration of oxygen use	<9days	153	16	4.162 (0.134-0.43)	2.75(1.299-5.843)	**0.008**
	>9days	170	74	1	1	
Time to initiate feeding	1st day	102	45	0.462(0.287-0.74)	0.57(0.312-1.042)	0.068
	2nd day	221	45	1	1	
Frequency of feeding	Every 2 hr	270	39	6.66(3.99-11.09)	3.3(0.1.79-6.097)	**<0.001**
	>every2 hr	53	51	1	1	
Kangaroo mother care	Yes	196	32	2.79(1.721-4.547)	4.42(2.38-8.205)	**<0.001**
	No	127	58	1	1	

Note: A Hosmer- Lemeshow test with 413 observations and a chi-square statistic of 7.422 (p = 0.492), indicating an acceptable model fit.

6. Discussion

The study provides valuable insights into postnatal weight gain pattern among very low birth weight (VLBW) preterm infants. The high proportion of adequate weight gain (78.2%) compared to the South African study (73.9%) suggests strong neonatal care practices in the selected hospital in Addis Ababa. Exceeding the national guideline threshold of ≥15g/kg/day reinforces the effectiveness of interventions such as feeding strategies, oxygen management, and kangaroo mother care. Understanding these predictors can help refine neonatal care approaches to further improve outcomes(25).this is due consider differences in sample size, methodology, and criteria for defining adequate postnatal weight gain.

From this study an impressive postnatal weight gain rate was 19.9 ± 6.05g/kg/day and higher than expected post natal weight gain which is 15g/kg/day. This suggests effective neonatal care practices in the selected hospital. The findings are also in line with the South Indian study, which reported 16.24g/kg/day. This higher-than-expected growth could indicate optimized feeding protocols, improved neonatal management, or environmental factors influencing better outcomes. It's a significant result that contributes valuable knowledge to neonatal care strategies(23). Another study conducted in Tanzania, by using primary data the average weight gain in VLBW preterm neonates shows poor postnatal weight gain (12.7g/kg/day), this is contrary to the finding of this study (24). A study finding of an 8.5-day average time to regain birth weight is notably shorter compared to studies from India (12 days) and Amhara Regional State (18 days). This difference likely reflects various influences, such as environmental conditions, socio-demographic factors, hospital protocols, and feeding practices unique to each setting. A shorter recovery time could indicate effective neonatal care, optimized feeding strategies, or differences in hospital documentation and monitoring approaches(49).

Neonates who regained their birth weight within two weeks were 4.9 times more likely to achieve adequate postnatal weight gain compared to those who took longer than 14 days and the result consistent with the South African study. This reinforces the critical role of early and efficient feeding strategies, neonatal care, and intervention protocols in optimizing weight gain outcomes (25).

Neonates delivered via spontaneous vaginal delivery (SVD) were 2.5 times more likely to achieve adequate weight gain compared to those delivered via cesarean section (C-section) a finding consistent with research conducted in Iran. This difference may be attributed to fluid retention in C-section neonates, as intravenous fluids given to mothers before surgery can cause newborns to be more hydrated at birth, leading to greater initial weight loss and a longer recovery period. This insight reinforces the importance of considering delivery methods when evaluating neonatal growth and recovery (30). The finding of these study found a significance association between frequency of feeding and adequate weight gain, from those neonates who took their feeding in every two hour was 3.3 times more likely to gain adequate weight gain than the neonate who feed more than every two hour. The finding was alien with the study conducted in Asia which is 2.3 times more likely to gain adequate weight than those who feed more than two hour (37). The possible explanation for this finding is feeding every two hours enhances caloric intake, which supports faster growth. Additionally, colostrum, the early milk rich in antibodies and nutrients, plays a crucial role in gut health. By introducing normal flora, colostrum helps protect neonates from necrotizing enterocolitis (NEC), a serious intestinal condition, while also aiding in immune defense against other comorbidities like hypoglycemia. This reinforces the significance of early and consistent feeding practices in neonatal care, ensuring optimal weight gain and reducing risks of complications(50).

Neonates receiving KMC were 4.4 times more likely to achieve adequate weight gain compared to those who did not. This is aligning with findings from a similar study in Pakistan. The positive effect of KMC on growth is well-documented, as it promotes skin-to-skin contact, regulates body temperature, enhances metabolic efficiency, and fosters stronger breast-feeding rates. Increased breast-feeding frequency ensures optimal nutrient intake, further supporting steady weight gain (34).

Neonates who required oxygen for less than 9 days were 2.75 times more likely to achieve adequate weight gain compared to those receiving oxygen therapy for longer periods. This aligns with findings from a Korean study on 2,799 VLBW neonates, where prolonged oxygen use beyond 9 days was associated with 13.96% poor postnatal weight gain. Prolonged oxygen therapy can sometimes contribute to oxidative stress, affecting metabolism and potentially slowing weight gain. Understanding this relationship is vital for optimizing neonatal care strategies, ensuring better outcomes for preterm infants(16). The possible explanation was neonates who use oxygen more than 9 days was due to other comorbidities like respiratory distress syndrome for this reason very low birth weight preterm neonates use oxygen for prolonged time(44).

6.1. Conclusion and recommendation

Conclusion

The finding from this study presents strong evidence that very low birth weight (VLBW) preterm neonates admitted to selected public hospitals in Addis Ababa achieved higher-than-expected postnatal weight gain compared to the national standard of ≥15g/kg/day. Key predictors of adequate postnatal weight gain include, early recovery of birth weight (before 14 days),spontaneous vaginal delivery, limited oxygen use (less than 9 days),frequent feeding (every two hours),and kangaroo Mother Care (KMC).These findings reinforce the importance of early intervention, optimized feeding strategies, and enhanced neonatal care practices in ensuring better weight gain outcomes

Recommendation

For Healthcare Providers and Hospital Management:

- Promote Early Weight Recovery: Focus on interventions that support neonates to regain birth weight within the first 14 days.
- Support Spontaneous Vaginal Delivery When Possible: Encourage and facilitate spontaneous vaginal deliveries, where medically appropriate, as they are associated with better weight gain outcomes.
- Optimize Oxygen Therapy: Minimize the duration of oxygen therapy to less than 9 days when clinically feasible, to support better growth.
- Implement and Promote KMC as standard practice for eligible preterm neonates to enhance weight gain and overall health.
- Ensure Frequent Feeding: Maintain feeding schedules every two hours to support optimal weight gain.

For Neonatal Care Teams and Caregivers:

- Monitor Growth and Weight Gain Closely: Regularly track weight trajectories to identify and address growth faltering early.
- Educate Mothers and Caregivers: Provide training on the importance of early weight gain, proper feeding frequency, and kangaroo mother care practice.

For Researchers:

- Conduct studies to explore ways to optimize delivery methods and oxygen therapy practices to improve neonatal growth outcomes.

6.2. Strength and limitations

Strength

This study including neonates from the past 3 years and this gives information on the care system like mode of delivery, feeding practice and kangaroo mother care practice due to this since the VLBW preterm neonates had a longer time to recover from their postnatal weight loss, the true weight gain could be determined objectively.

Limitation of the study

Retrospective nature of the study; lack of data pertaining some information related to daily weight gain measurement, antenatal care follow up and income of the family. In addition to this limitation of this study is its reliance on secondary data. This introduces potential biases and inaccuracies inherent in the original data collection process, which are beyond the control of this research. Furthermore, secondary data may not perfectly align with the specific research questions, potentially limiting the depth of analysis.

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8. ANNEX

Annex 1: Extracting Cheek List

This extracting cheek list was adopted from the previous research which was done from Bahirdar and other African countries like Tanzania, dareselam.

MRN……..			
Part 1:socio demographic cheek list			
No	Question	Possible answer	Skip pattern
101	Maternal age……..		
102	Number of children that the mother has	1. One 2. .two 3. 3. three	
103	Sex of the neonates	1. Male 2. 2. Female	
104	Birth weight(gm)		
105	Minimum weight recorded		
106	Age at minimum weight record		
107	% of weight loss in average		
108	Age at regain birth weight(day)		
109	Average weight gain (GV) in g/kg/day		
110	Net weight gain until discharge		
111	Discharge weight in gram		
112	Z score at birth	1 <1.29 2 >1.29	
113	Z score at discharge	1 <1.29 2 >1.29	
Part 2: obstetric characteristics			
201	Mode of delivery	1 SVD 2 C/S	
202	Gestational age in week……		
203	Size for gestational age	1 SGA 2 AGA 3 LGA	

Part 3: variables related to comorbities				
301	Does the neonate diagnosis with	RDS	1 yes 2 no	
302		Sepsis	1 yes	

			2 no	
303		Jaundice	1 yes 2 no	
304		NEC	1 yes 2 no	
305		Hypothermia	1 yes	
306		Hypoglycemia	No	
307		Anemia	1 yes 2 no	
308		Others	1 yes 2 no	
309	Duration of oxygen use in days…….		1 less than 9 days 2 greater than 9 days	
310	Duration of hospital stay in days ……..			
311	Outcome of the neonate		1 death 2 discharge	
Part 4	**Feeding practice related question**			
401	Type of milk fed on admission		1 breast milk 2 formula milk 3 mixed	

402	Initial volume of feeding in ml/kg———		1. ml/kg 2. other	
403	When to start the first feed		1. 1st day 2. 2nd day and beyond	
404	Initial method of feeding		1. NG tube 2. breast feeding	
405	Frequency of feeding		1. every 2 hr 2. >every 2 hr	
406	When to reach full feeding 150ml/kg/day		1. 0-7 2. 8-14 3. 15-21 4.22+	
407	Does the neonate in KMC?		1. Yes 2. No	

Annex 2: Declaration Sheet

I declare that this Thesis Research entitled "assessment of post natal weight gain of pattern and identify its predictors among very low birth weight preterm neonates admitted in neonatal intensive care unit of Addis Ababa selected public hospitals " is my own work that have not been addressed in the study area as far as my knowledge touched and all the sources I used has been indicated and acknowledged as complete reference.

Name of investigator	Signature	Date
Simeneh Tsegaye (Bsc)	_____	_____

Name of adviser/s

1. Dr. Fekadu Aga(Phd,Associated professor)	_____	_____
2. Mr. Teshome Habte(Msc, Assistance professor)	_____	_____

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