ADDIS ABEBA UNIVERSITY

COLLAGE OF HEALTH SCIENCE

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF NURSING

ASSESSMENT OF POSTNATAL WEIGHT GAIN AND ITS PREDICTORS AMONG PRETERM LOW BIRTH WEIGHT NEONATES ADMITTED IN NEONATAL INTENSIVE CARE UNIT AT SELECTED PUBLIC HOSPITALS: RETROSPECTIVE STUDY, ADDIS ABABA ETHIOPIA, 2023

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A RESEARCH THESIS SUBMITTED TO THE SCHOOL OF GRADUATE PROGRAM OF ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN NEONATAL NURSING

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ADDIS ABEBA, ETHIOPIA

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APPROVAL SHEET

I, hereby declare that this thesis my original work carried out under the supervision of s/r Emebet Berhane and Mr. Mekonnen Admasu at Addis Ababa University, Department of nursing. I affirm that this thesis is not submitted to any other university whether in part or full thesis for the award of any degree, all ethical principles of a scholarly prepared document during data collection, analysis, interpretation and completion of the thesis. I affirm that also all materials used in the thesis have been given recognition through citation, and serious efforts have been made to avoid plagiarism.

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EVALUATION

The thesis Entitled “Assessment of Postnatal Weight Gain And Its Predictors Among Preterm Low Birth Weight Neonates Admitted In Neonatal Intensive Care Unit At Selected Public Hospitals: Retrospective Study, Addis Ababa, Ethiopia, 2023” presented by Afomia Temesgen is Approved by the member of the examiner to be accepted in its present form as satisfying the thesis requirement for the degree of masters in neonatal nursing

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List of Abbreviations and Acronyms

AAP----------American Academy of Pediatrics

AAU----------Addis Ababa University

AGA----------Appropriate for Gestational Age

ANC---------- Antenatal Care

AOR----------Adjusted odds ratio

BSc----------Bachelor of Science

COR----------crudes odds ratio

CS----------Caesarean section

CL----------confidence interval

GA----------Gestational Age

HC----------Head Circumference

Hrs---------- Hours

IVH----------Intra Ventricular Hemorrhage

KCMC----------Kilimanjaro Christian Medical Centre

LBW----------Low Birth Weight

LGA----------Large for Gestational Age

NEC----------Necrotizing Enterocolitis

NICU----------Neonatal Intensive Care Unit

PGF----------Postnatal 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

Background: Preterm low birth weight is often challenging in developing countries. Implementing specialized care including proper feeding practice is essential for treating neonates to bring them into a normal range of weight. However, there is a lack of resources for alternative feeding practices in low-income countries which results in poor postnatal weight gain at discharge. There is also little or no evidence of postnatal weight gain and the influencing factors in Ethiopia

Objective: the aim of this study was to assess the postnatal weight gain and its predictors among Preterm Low Birth Weight neonates admitted in neonatal intensive care unit at selected public hospitals unit, 2023

Method: A Retrospective study was conducted on 242neonates who were admitted in neonatal intensive care unit in the last 5 years, in Addis Ababa selected public hospitals. The calculated sample size for each hospital was assigned proportionally. The data were collected through structured data abstraction checklist and descriptive and inferential analysis were computed. Using descriptive statistical analysis the data were summarized in mean and standard deviation (SD) for continuous variables, and percentages for categorical variables.A binary logistic regression was used to see the relationship between dependent and predictors variables. Significance is declared at P-value <0.05, and reported using AOR with 95% CI

Result

The 242 sample was analyzed 83.5% of the had poor postnatal weight gain with the average weight gain of 9.77 ±5.602 g/kg/day after regain of birth weight. Neonates without RDS [AOR = 4.155% CI (1630-10.590)], neonates received feeding on the first day of life [AOR = 3.292 % CI (1308-8.300)], neonates born Via SVD [AOR =8.082 (2.414-27.259)], neonates prolonged stay of hospital [AOR=.754% CI (.662-.839)] show statistical significance with adequate postnatal weight gain.

Conclusion

According to the findings of this study indicates that postnatal weight gain for preterm low birth weight neonates was lower than standard weight gain. Mode of delivery,

initiation time of first feeding, and respiratory distress syndrome length of hospital stay were factors associated with postnatal weight gain. Therefore health professionals should be able to put the neonate in trophic feeding in the first day, prevent prolonged hospital stay, encourage mother to deliver via spontaneous vigainal delivery, prevent respiratory distress syndrome.

Key words: low birth weight, preterm, postnatal weight gain, gestational age

1 INTRODUCTION

1.1 Background

A very popular anthropometric measurement of size at delivery is weight at the time of birth. Weight of a neonates indicated more than just a weight it addresses several information such as the neonates' growth, development and as well it is useful indicator of the mother's conditions such as her nutritional status, health, genetic makeup, socioeconomic status, and quality of antenatal services(1). Measurements alter throughout the newborn period, which aids in assessing growth. A consistent weight gain indicates adequate growth. While postnatal weight increase that is below the norm is a sign of poor postnatal growth(2).

Low birth weight (LBW) of preterm neonate as defined world health organization is referring to those neonates weighing less than 2500 grams at birth and prior to 37 weeks of gestational age (3). Very low birth weight (<1500 gm) and extremely low birth weight (<1000 gm) (4) are categories with in LBW.

LBW is a main reason for newborn death and when combined with prematurity, it is a strong predictor of newborn death during the neonatal period, or the first 28 days after delivery. Results shows that preterm LBW newborns have a about 13-fold higher mortality rate than newborns with a normal birth weight. (5).

With regard to developments in neonatal and prenatal medicine, there is a growing awareness of the particular care needed for LBW neonates on a global scale. But in developing nations, implementing this specialized care is still difficult (6). LBW preterm neonates should receive sufficient care, including feeding, maintaining a normal body temperature, and following and evaluating growth that lower the prevalence of newborn death (7).

For LBW neonates, An initial drop of 8–15% of birth weight within the one week following birth is what characterizes the shift in weight during the newborn period, gain of lost weight within two weeks (3). weight loss in the first week of life is higher in VLBW and ELBW neonates, although significant variation is seen from neonate-to-

neonates in the first 7 days(8).And when comparing Africa and Europe on the prevalence of preterm LBW Europeans exhibited double result than Africa, even though documentation gap in Africa may influence the result, and it is estimated approximately 14.3% in Europe (9).

Appropriate and sufficient preterm weight gain is 15–20 gm/kg/day until the neonate weighted 2 kg, then after they will gain 20–30 gm/kg/day (10). And in case of neonates who are unable to go through the standard postnatal weight gain or delay regaining birth weight can happen for a variety of reasons, primarily due to postpartum care procedures and/or other causes, that includes nutritional, environmental and medical concern(8). Although it has decreased over time in preterm infants, the intensity of the illness is still a significant factor in growth. (11).

A study reveals that feeding in terms of type, quantity, and frequency throughout the initial hospital stay have a major contribution for preterm neonate postnatal weight gain(5). Often prematurity comes along with major problem to feeding, co morbid diseases such as respiratory distress (RD), hypothermia, necrotizing Enterocolitis (NEC) and many other (12).

Maternal characteristics, including as educational background, socioeconomic level, age, and health condition, are among the factors that affect postnatal weight gain, along with neonatal factors. (13).

12. Statement of the problem

An increased prevalence of LBW neonates is observed in the developing and non-developed countries. They are linked to higher chances of negative health consequences (5). owing to a shortfall of resources including the mothers' inadequate dietary intake and their inability to use alternate feeding techniques (14).

Due to their medical fragility and frequent sluggish introduction to enteral feeding, LBW a larger chance of postnatal growth failure exists in premature newborns (15).

Premature birth and low birth weight are significant indicators of inadequate maternal nutrition, health, and healthcare, all of which are strongly correlated with poverty. When comparing neonates with normal birth weight and those with low birth weight, the mortality risk is more than 20 times higher.(4). Low birth weight caused 27,243 fatalities in Ethiopia in 2014, accounting for 4.53% of all deaths (16).

In accordance with this, a study from Ethiopia reveals that the mortality rate for preterm neonates in neonatal intensive care units was 29%. Among those preterm who survived 86.2% neonates who were discharged from the NICU, had growth restriction as a result of being premature and LBW (17).

Preterm LBW are more likely to experience developmental changes due to preventable factors, including time spent away from their mothers, extended time in incubators, pharmacological side effects, mechanical ventilation, and stress brought on by repetitive manipulation, in addition to their increased susceptibility to disease (18).

Because of many of their body systems are immature such as the immune system, respiratory system, gastrointestinal system, the likelihood of low postnatal weight gain is increased in neonates with severe comorbidities such as NEC and sepsis, according to a study done in Ethiopia is experience 2.25 times and 3.55 times, respectively, compared to normal preterm newborns. Therefore Giving special attention to premature LBW neonates with comorbidities is essential to prevent growth failure (17).

Studies carried out in developing countries also imply that lowering the prevalence of low birth weight could have generated substantial benefits for the healthcare system as well as for individuals.(4).

Early nutritional support prevents excessive postnatal weight loss and ensures that favorable postnatal weight gain and, consequently, development, are promptly reached after the strategy is implemented (10).

LBW neonates continue to have difficulty growing properly despite advancements in neonatal care because their digestive and metabolic systems are immature, their immune systems are weakened, and they suffer from numerous medical issues(19).

According to several studies, There has been seen a difference among countries in the average of days to recover from the lost weight in India was within 12 days and in south Africa it was recorded as 21 days, and those who were on prolonged oxygen treatment needs 28 days to regain birth weight(14,20,21). And also there was a difference seen on the amount of average Postnatal weight gain, 16.1g/kg/d in south African neonates and 8.2 g/kg in Nigerian neonates (11).This illustrates that the regaining birth weight time and the amount of postnatal weight gain for preterm LBW infants are not the same, so using the average growth rate to determine the ideal growth in preterm LBW neonates is a major gap and in my knowledge there is no much of research done in this case.

There is a big challenge has been seen in knowing and identifying an early postnatal growth failure. In developing countries such as Ethiopia, there is an observable challenge on postnatal weight gain in preterm LBW newborns, and on monitoring the neonates' weight. The monitoring and documenting neonatal weight helps to know the progress of the neonates' weight and to provide action according to the result. If the problem is left unaddressed it will expand and causes a huge burden over individuals as well as the community. And also there is a noticeable poor postnatal weight gain but not supported by studies so it has be to supported by research to know the magnitude. This is why the research was carried out in the public hospitals of Addis Ababa, which will help to the health practitioners and other concerned bodies to step forward in order to fill the gap.

13. Significance of the study

Results from this study will help to determine postnatal weight gain and preparing a weight gaining mechanisms. And by proving the preexisting knowledge about lower postnatal weight gain and it's predictors by research to step forward towards achieving proper weight gain.

This study results will also help the healthcare provider to design appropriate solutions by working on the predictors of postnatal weight gain. Perfect intervention for Preterm low birth weight neonates is very crucial for the rapid development of effective intervention strategies. The result also will be useful for interested organizations governmental and, NGOs these engaged in neonatal health improvement and for other researchers and serve as a starting point.

2. LITERATURE REVIEW

LBW is defined by WHO as a neonate's birth weight that is less than 2,500gm. Premature birth, intrauterine growth restriction, or both may contribute to the case. (22). Approximately 30 million low birth weight neonates are delivered each year, according to the WHO and the likelihood of them to suffer immediate and long-term health repercussions is higher (23).

2.1 Weight gain in preterm low birth weight neonates

The findings of a longitudinal study conducted in Korea, A higher incidence of inadequate development of height and weight was seen in the LWB neonates. It was also discovered that there is a major variation in the outcome of inadequate weight and height development in line with the gestational age. And when comparing neonates with normal birth weight (>2500 g) with those with LBW, there was a noticeable variation in weight and length at age of health checkup(24).

As Vermont Oxford Network's 2013 data reported, 50.3% of VLBW at the time of discharge, their body weights were beneath the 10th percentile. In keeping with the earlier studies, a study done in Korea shows Poor postnatal weight gain was 45.9% (25).

Different scholars strived to determine the level of weight gain in preterm low birth weight neonates. For instance, a prospective cohort study was conducted among 227 preterm neonates. According to this study, the average weight gain was 5.07 g/kg/day. Overall, there was a higher rate of poor postnatal weight gain (26).

Similarly, another study was conducted in South India. Based its report, the postnatal weight gain until discharge was 16.24 g/kg/day which is an indication of good weight gain(14). Another study conducted in Tanzania, by using a primary data the average weight gain in preterm LBW is shown as 12.7 g/kg/day(27).

2.2. Predictors of postnatal weight gain

2.2.1 Socio-demographic

Different researcher strived to investigate the relationship among socio-demographic factors and post-natal weight gain. For instance, in relation to birth weight 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 than 1500 g than for those with birth weights over 1500 g(28).

A prospective cohort study in South African, premature LBW neonates experienced a birth weight decrease of approximately 8% (21). In similar to this, a study done in Tanzania estimates that early preterm neonates lost an average of more than (3.37%) pounds in their first week of life (26).

Additionally, a study of Uganda's capital, Kampala, by the age of 21days, nearly 50% of the LBW newborns tested at the Mulago Hospital in Kampala do not gained their birth weight. However, LBW babies should catch up to their original weight between 10 to 21days following birth. (5).

Numerous researchers attempt to determine how gender affects the effect of sex on postpartum weight increase in those Sex can influence postnatal weight increase in preterm and for all gestational ages (GA) because for many biological differences between boys and girls, including hormonal variances and the rapid cell division of male embryos (29).

As a result, Boys were heavier than girls at birth and gained more weight by the time they were 14 days old, according to a study conducted in England and Wales on preterm VLBW infants whose data were taken from the United Kingdom data repository (11).In contrast with the previous result, a study done in America by University of Louisville reveal that weight gain by Males were more slower than females (30).

2.2.2. Obstetrics characteristics

2.2.2.1 Mode of delivery

A study conducted in Northern California hospitals had revealed the mode of delivery has an influence on the neonate's postnatal weight gain when doing a comparison between neonates who are born through spontaneous vaginal delivery (SVD)and those who are born by cesarean section (CS) the weight loss by 48 hours after delivery is 2.9% and 3.7% respectively(31).

The mode of birth has an impact on the pattern of neonatal weight gain, according to a prospective study conducted in Iran found that neonates delivered via C-section (CS) gain less weight than those delivered via vaginal delivery (VD) because of neonates who deliver through CS will face problem of breastfeeding difficulties, delayed lactogenesis(32).

2.2.2.2. Gestational age

As mentioned in Neonatal Intensive Care Unit (NICU) Training Participants' Manual size for gestational age classified into three Birth weights between 10% and 90% are considered appropriate for gestational age (AGA), birth weights above 90% are considered large for gestational age (LGA), and birth weights beneath ten percent are considered small for gestational age (SGA) (10), with this classification some study show that postnatal weight gain is affected by size for gestational age, according to cohort study done in Singapore shows the result of postnatal weight gain is 3.6% , 73.4%, 23.0% in SGA, AGA, LGA respectively (33). According to a prospective cohort study in Dar es Muhimbili Salaam hospital, Early preterm newborns lost more weight than older neonates during the first week of life, with the average weight loss being about 3.37% (26).

In accordance with a New York research, it illustrates that there is a difference on postnatal weight gain among neonates which differ in size for gestational age; which is SGA shows a better weight gain than those who are AGA (30). According to cohort study done in Shanghai, China The majority of term SGA newborns demonstrated noticeably quick weight gain, which compensated for intrauterine limitation, (34).

2.2.3. Co morbidity

As many scholars narrates about the relation between postnatal weight gain and the co morbid illnesses the neonates had, they stated that co morbid illnesses affect the postnatal weight gain. A prospective study done at According to research from Tanzania, 49.2% of preterm newborns with low weight growth had several medical conditions, which can pertain to more than one condition. neonatal sepsis (10.7%), Respiratory distress syndrome (26.4%), neonatal jaundice (8.1%), and other diagnoses were frequently co-morbid disorders (26).

Similarly the data obtained from the Korean Neonatal Network database VLBW infants shows among neonates admitted to NICU with respiratory distress syndrome (RDS) is 88.9 %, bronchopulmonary dysplasia is 35.2%,, intraventricular hemorrhage (IVH) is 5.5% and retinopathy of prematurity (ROP) is 14.1%. In addition, among neonates admitted to the NICU for invasive ventilation for long period of time and on prolonged oxygen treatment, there is a 23.03% and 13.96% will face poor postnatal weight gain (35).

2.2.3.1 Length of Hospital stay

Preterm low birth weight Neonatal patients are substantially less likely to regain their birth weight if they stay in the hospital for a prolonged period of time. But a protracted hospital stay can be required for a number of issues, such as co-morbidities and for improving feeding practice (5).based on an Ethiopian study done on postpartum nutrition and intrauterine development found that infants who had prolonged stay in hospital had three times to have growth restriction than those who had shorter duration of stay (10).

On the time of hospital stay practicing Kangaroo mother care (KMC) will be a good factor for gaining postnatal weight and also recover from different comorbidities. In accordance with this, a study done in Egypt reveals that the average daily weight increase was noticeably higher in neonates who receive KMC in comparison to neonates who did not receive KMC (36).

2.2.4. Feeding practice

According to the WHO recommendation initiation of feeding within the first hour of life is a very essential for growth and weight gain in all neonates. However, a delay in the commencement of first feeding on the right time can be difficult due to several reasons, such as the mother and neonate being separated, the institution's setup, or being in a developing country(5).

In Southeast Wisconsin's study result showed that among their newborn critical care units, a retrospective descriptive analysis found that enteral feeding with increasing volumes of breast milk was started as early as in the first day of life (37). newborns weighing 1500 g were fed breast milk enriched with 0.8 g of protein per 100 ml. the newborn was gradually introduced over a week until it reached a weight of about 2 kg. (32,38).

The recommended feeding protocol for preterm VLBW newborns was at intervals of 2 -3 hours in increments of 10 ml/kg of body weight, for those who are able to suck will be put on direct breast feeding both for those who are unable to suck will take their feeding by NG tube. Other newborns weighting 1500-2499 were often put on gavage feeding at intervals of 2-3 hours in increments of 20 ml/kg (39). A study done about initiation of the first feeding many scholars including WHO, suggested that the first 24hrs of life are the most preferred time to initiate the first feeding, similarly study in South Carolina reported that VLBW neonates fed within the first 24 hours gained more adequate weight and take less days of parenteral nutrition (40).

Preterm neonate who received their first feeding within 48 hours compared to those who start feeding late showed a significant difference in growth velocity, according to a prospective cohort, hospital-based study at Northeastern Tanzania. Neonates who began feeding within the first 2 days of life grew noticeably faster than those who began feeding after that time (27).

Early trophic feeding on the first day was associated with a shorter hospital stay, a shorter parenteral feeding period, and acceptable weight gain, according to a cohort research on conducted in Iran. (41)

2.4. Conceptual Framework for postnatal weight gain and it's predictors among preterm LBW neonates (26).

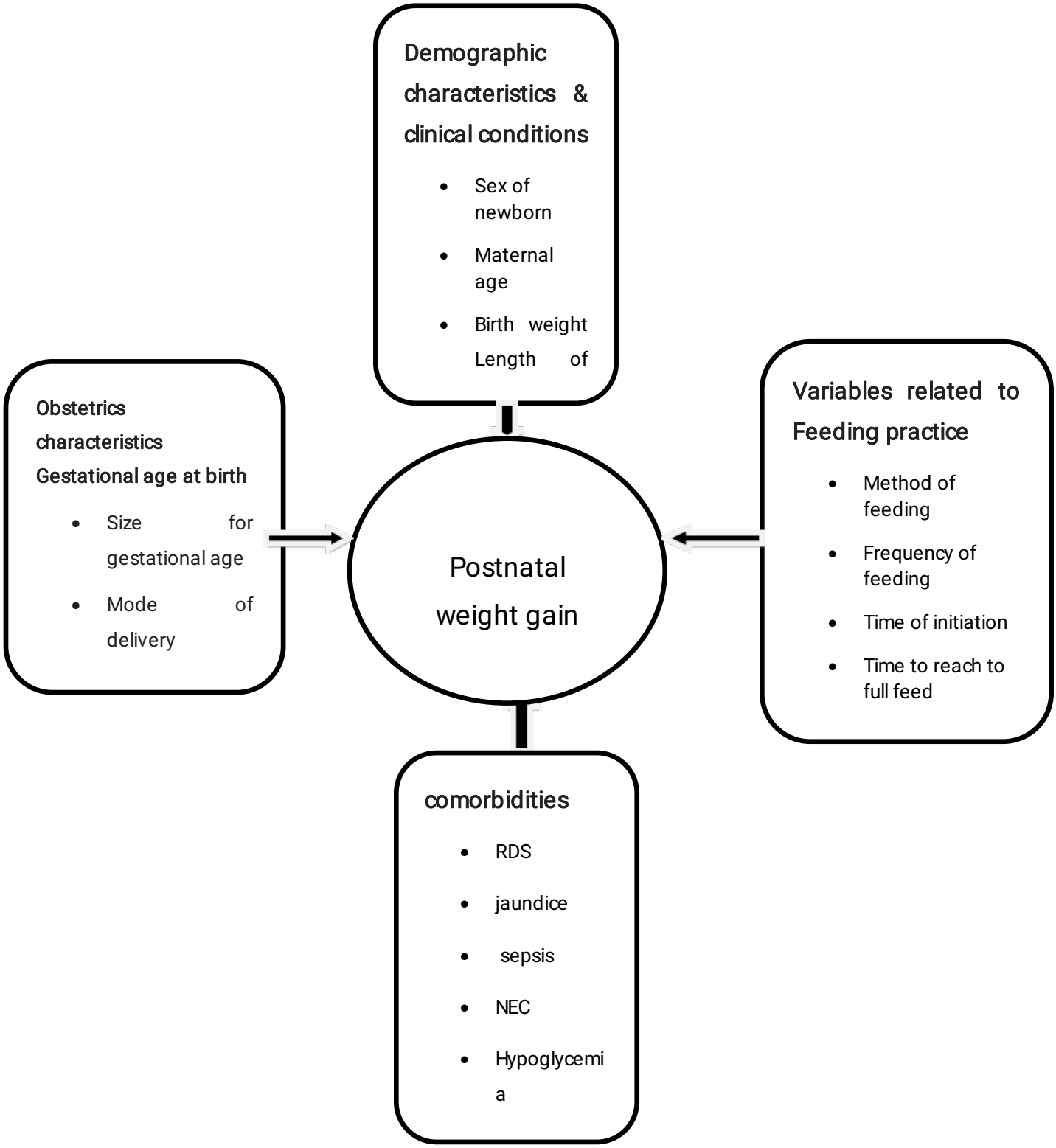

Figure 1conceptual framework for postnatal weight gain and its predictors among preterm LBW neonate

3. OBJECTIVES

3.1 General objective

- The aim of this study was to assess the postnatal weight gain and its predictors among Preterm Low Birth Weight neonates admitted in neonatal intensive care unit at selected public hospitals, 2023

3.2. Specific objective were:

- To identify the postnatal weight gain among preterm low birth weight neonates admitted in neonatal intensive care unit at selected public hospitals, 2023
- To Determine predictors of weight gain in preterm low birth weight neonates admitted in neonatal intensive care unit at selected public hospitals, 2023

4. METHOD AND MATERIAL

4.1 Study area and study period

The Study takes place in Addis Ababa the capital city of Ethiopia, from Nov 2022 to Jun 2023. The city has more than 52 hospitals, of which there are 14 public hospitals(42) . Thus, by using lottery method among the 14 public hospitals Tikur Anbessa Specialized hospital (TASH), menelik II referral hospital, Gandhi memorial hospital and Yekatit 12 hospital medical college were chosen. These facilities have a resuscitation, radiant warmer, phototherapy, incubators and equipment which are essential for NICU there 1815 in TASH,1581in menelik II referral hospital,1665 in Gandhi memorial hospital,1540 in yekaktit12 hospital medical college admission by 5years a total of 6601admission 5 years.

4.2. Study design and period

A facility-based cross sectional study was conducted on the neonates' medical records those who were admitted in the four selected hospital's neonatal intensive care unit from Nov 2022 to Jun 2023.

4.3. Population

4.3.1 Source population

All neonates admitted into NICU at the selected four public hospitals from Dec2018 to Dec 2022.

4.3.2. Study population

Preterm LBW neonates who were admitted to the neonatal intensive care unit at the selected four public hospitals from Dec 2018 to Dec 2022

4.3.3. Study unit

Each preterm LBW neonates, those who were admitted to the neonatal intensive care unit at selected public hospitals from Dec 2018 to Dec 2022.

4.4. Inclusion and Exclusion criteria

4.4.1 Inclusion criteria

All preterm LBW neonates who were admitted in NICU and those medical records were complete with essential variables.

4.4.2. Exclusion criteria

Neonates who had congenital malformations, were twins or triplets, and neonates who died/discharged within 7 days before will be excluded from the study

4.5. Sample size determination

By using single population proportion formula the sample size was generated

$X = Z_{\alpha/2}^2 \neg * p * (1-p) / d^2$

Where,

$Z_{\alpha/2}$ = the critical value of the Normal distribution at α/2

d = the margin of error

p = The prevalence of LBW from previous study which is 17.3%(43).

n= (196)2*0.173*0.827/ (0.05)2 =219.85=220

Ten percent of the sample (22) was added and final sample size became 242

4.5.1 Sampling procedure

Systematic random sampling technique was used to select cards of preterm LBW neonates from each hospital. The total number admission in NICU during data was estimated from each hospital registration book. The number of cards to be included in study from each hospital was calculated by using the Proportional allocation technique.

ni= (n/N) Ni, where

ni=sample size of each hospital

n=total sample size

Ni=population of each hospital N= total population of four hospitals

So based on the above formula sample size from each hospital is calculated as;

TASH= (242/6601)*1815= 67, Gandhi= (242/6601)*1665= 61, Menelik= 242/6601)*1581= 57

Yekatit 12= (242/6601)*1540= 57.

Totally gives the sample size 242

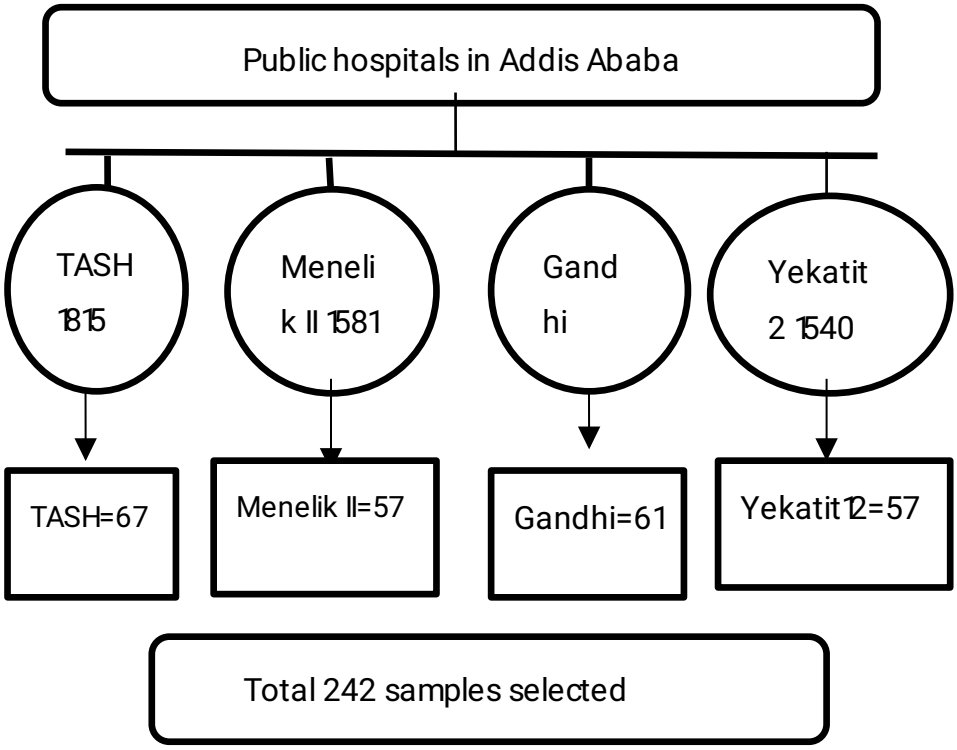

Figure 2schematic presentation of sampling procedures

To determine the K value (cards of preterm LBW neonates) a systematic random sampling technique was used. is calculated by K = ni*(n/N) that was equal 9

TASH=67*(242/1815) =9

Gandhi=61*(242/1665) =9

Menelik II=57*(242/1581) =9

Yekatit 12=57*(242/1540) =9

Therefore, the preterm LBW neonates' medical record a card was selected every 9th cards from TASH, Gandhi, and Yekatit-12, Menelik II hospitals NICU the registration

book. The first card was selected by lottery method.

4.6. Variables of the Study

4.6.1 Dependent Variables

➤ Postnatal weight gain

4.6.2. Independent Variables

➤ Socio demographic characteristics

Gender of neonate, Birth weight of the neonate, maternal age

➤ Obstetrics characteristics

Gestational age at birth, Size for gestational age, No of children

➤ Variables related to co morbidities

RDS, Necrotizing Enterocolitis, Neonatal sepsis, Neonatal jaundice, Hypoglycemia, Hypothermia, Length of stay, Duration on oxygen

4.7. Operational definition

- Regain birth weight- beginning recovering and gaining of the birth weight after the physiological losing of weight from the date of birth until 7-10 days
- Growth velocity- the calculated weight gain from the regaining day until discharge date GV= [1000*(wn-w1)]

  [(dn-d1)*(wn+w1)½]

  Where w= weight in grams, D= day, 1= beginning of time interval and n= end of time interval in days (44).
- Co morbid – low birth weight neonates who have other medical problems in addition to the prematurity and low body weight
- Low birth weight- a preterm neonates weighting < 2500gm
- Very low birth weight- a preterm weighting < 1500gm

- Postnatal weight gain- the weight that the neonate gain after regaining their birth weight
    - Adequate postnatal weight gain: - refers to an average weight gain a neonate recorded with ≥15 g/kg/day (26).
    - Poor postnatal weight gain: - refers to an average weight gain of the neonate recorded with < 15 g/kg/day (26).

4.8. Data Collection tools and procedures

4.8.1Data Collection tools

The Data was collected by using structured checklist used to review chart. It was adapted from previous related studies with modifications (17,19,26,45). The checklist has four parts: part-1t assess socio-demographic characteristics of the neonate, part-2 is mother's conditions, part-3 co morbid condition of the neonates and part-4 Neonatal feeding

4.8.2. Data collection procedure

Data was collected by BSc Nurse and Supervisors. The supervisor and data collectors were given training for half a day regarding data collection procedures including eligibility criteria in selecting the neonate's medical records. The supervisor was checking the collected data for completeness in daily base.

4.8.3. Data quality control

For checking clarity and consistency of the questions five percent of the checklist was pretested on non-selected public hospitals zewditu memorial hospital a week prior to the actual data collection time. Based on the result of the pre-test, some ambiguous questionnaire was modified for clarity and consistency. The reliability of the tool was also determined based on the analysis result of the pre-test which was 0.79 (Cronbach's alpha=0.81). Data completeness was checked on daily basis of the data collection period by the data collector itself, supervisor and principal investigators.

4.9. Data analysis

Data was collected, coded and entered with kobo toolbox and exported to SPSS V.26 and data cleaning was carried out further analysis. Frequency and percentages were computed for categorical variables and for continuous variables the means and standard deviations were used. Binary logistic regression analysis was conducted to test the association of dependent and independent variables. Primarily, bivariate logistic regression analysis was undertaken to examine each individual variable's relationship with the outcome variable. And those variables with p-value < 0.25 was selected as a candidates then moved to Multivariate logistic regression is used to compensate for potential confounding factors and, in the end, significant association with postnatal weight gain was identified at p-value <0.05. The results were presented with adjusted odds ratio (AOR), with 95%CI and p-value.

4.10. Ethical consideration

Ethical clearance was obtained from school of nursing and midwifery, Addis Ababa University Health Science College Institutional Research Ethical Review Board (IRERB). After ethical clearance, permission letter was obtained from School of Nursing and Midwifery to Addis Ababa health bureau. Preceding this Addis Ababa health bureau wrote a letter to respective hospitals, then again a permission letter was obtained from each hospital. Since the study is a medical records review, and is risk free for individual patients and no consent will be obtained from the mothers or caregivers of the study subjects. Sensitive issues that identify and put the neonate in risk will not be mentioned such as name, address of the neonates and all the information that will be collect from the medical chart will not be shared with third party and the information taken is only used for this study only therefore confidentiality was maintained.

4.11 Dissemination plan

This study result will be submitted to Addis Ababa University, school of nursing. Efforts such as manuscript preparation (according the publisher’s requirement) will be made for facilitation of the publication of the study in a journal. Presentation of the research

finding in professional conference will be considered.

5. RESULT

5.1 Socio demographic characteristic of preterm low birth weight neonates and their mothers

A total of 242 medical records were enrolled in the end analysis with 100 % response rate. Among these neonates the percentage for male neonates was 53.3%, neonates who weighted ≥1500grams was 73.1%, of them who were born before 34 weeks of gestation was 72.3% and these 220 (90.9%) were AGA. from the mothers 72.7% under the age of 30 years, most mothers were Para-II and above which is 60.3%, and 58.3% of them gave birth by SVD, 181 (74.8%) of the mothers ANC follow up, details are explained in table1

Table 1Socio demographic characteristic of postnatal weight gain and it's predictor among preterm low birth weight neonates admitted in neonatal intensive care unit at selected public hospitals (n= 242)

Variables	Categories	Frequency	Percent
Sex	female	113	46.7
	male	129	53.3
Birth weight	<1500g	65	26.9
	≥1500g	177	73.1
GA	<34wks	175	72.3
	≥34wks	67	27.7
Size for GA	AGA	220	90.9
	SGA	22	9.1
Age of regaining birth weight	≤14days	99	40.9
	>14days	143	59.1
Postnatal weight gain	Adequate weight gain	40	16.5
	Poor weight gain	202	83.5
Mother's age	<30	176	72.7
	≥30	66	27.3
Parity	<2	96	39.7
	≥2	146	60.3
Mode of delivery	SVD	141	58.3
	C/S	101	417
Antenatal care visit	Yes	181	74.8
	No	61	25.2

Number of Antenatal care visit	<4times	38	15.7
	≥4times	143	59.1

5.12 Distribution of Comorbidities and Hospitalization variables of preterm low birth weight neonates

All neonates were diagnosed at least for one of the following conditions among the neonates. Respiratory distress syndrome, Sepsis, Hypothermia, Jaundice diagnosis were observed being highly dominant with 58.7%, 65.3%, 43.8%, 36.0% respectively. Among these neonates majority of them had a prolonged hospital stay for more than 24 days and prolonged oxygen use for more than 9 days and 22(9.1%) death after the 7 day of life were recorded. Further details are provided in the table below Further information are explained in details in the table below (see table 2)

Table 2distribution of comorbidities and hospitalization of postnatal weight gain and it's predictor among preterm low birth weight neonates admitted in neonatal intensive care unit at selected public hospitals (n= 242)

variables	Categories	Frequency	Percent
RDS	No	100	413
	Yes	142	58.7
sepsis	No	84	34.7
	Yes	158	65.3
Hypothermia	No	136	56.2
	Yes	106	43.8
Jaundice	No	155	64.0
	Yes	87	36.0
Hypoglycaemia	No	231	95.5
	Yes	11	4.5
NEC	No	232	95.9
	Yes	10	4.1
Anemia	No	237	97.9
	Yes	5	2.1
Others	No	214	88.4
	Yes	28	116
Days of oxygen use	<9 days	88	36.4
	≥9 days	154	63.6
Outcome at discharge	Death	22	9.1
	discharged	220	90.9
Length of hospital stay	Mean± SD	23.87±3.61	

5.13 Description of the preterm low birth weight neonate's feeding practice

Among these neonates 70.7% of them were feeding breast milk weather by tube or breast feeding , majority of them were feed by tube, neonates which began their first on the ≥ 2nd days of live were high (67.8%), 70.7% were feed every 3hrs , 48.3% were on Kangaroo mother care. Further information are shown below (see table5)

Table 3Description of the preterm low birth weight neonate's feeding practice of postnatal weight gain and it's predictor among preterm low birth weight neonates admitted in neonatal intensive care unit at selected public hospitals (n= 242)

Variable	Categories	Frequency	Percent
Type of milk	Breast milk	171	70.7
	Formula milk	71	29.3
Method of feeding	Breast feeding	66	27.3
	Tube feeding	176	72.7
Initiation of the first feeding	1st day	78	32.2
	2nd and more	164	67.8
Initial volume of feeding	>2ml	56	23.1
	≤2ml	120	49.6
Frequency of feeding	< every 3 hours	42	17.35
	> every 3 hours	29	12.0
	Every 3 hours	171	70.7
Kangaroo mother care	No	125	517
	Yes	117	48.3

5.14 Proportion of postnatal weight gain

Among the 242 neonates in this study majority of them showed poor postnatal weight gain

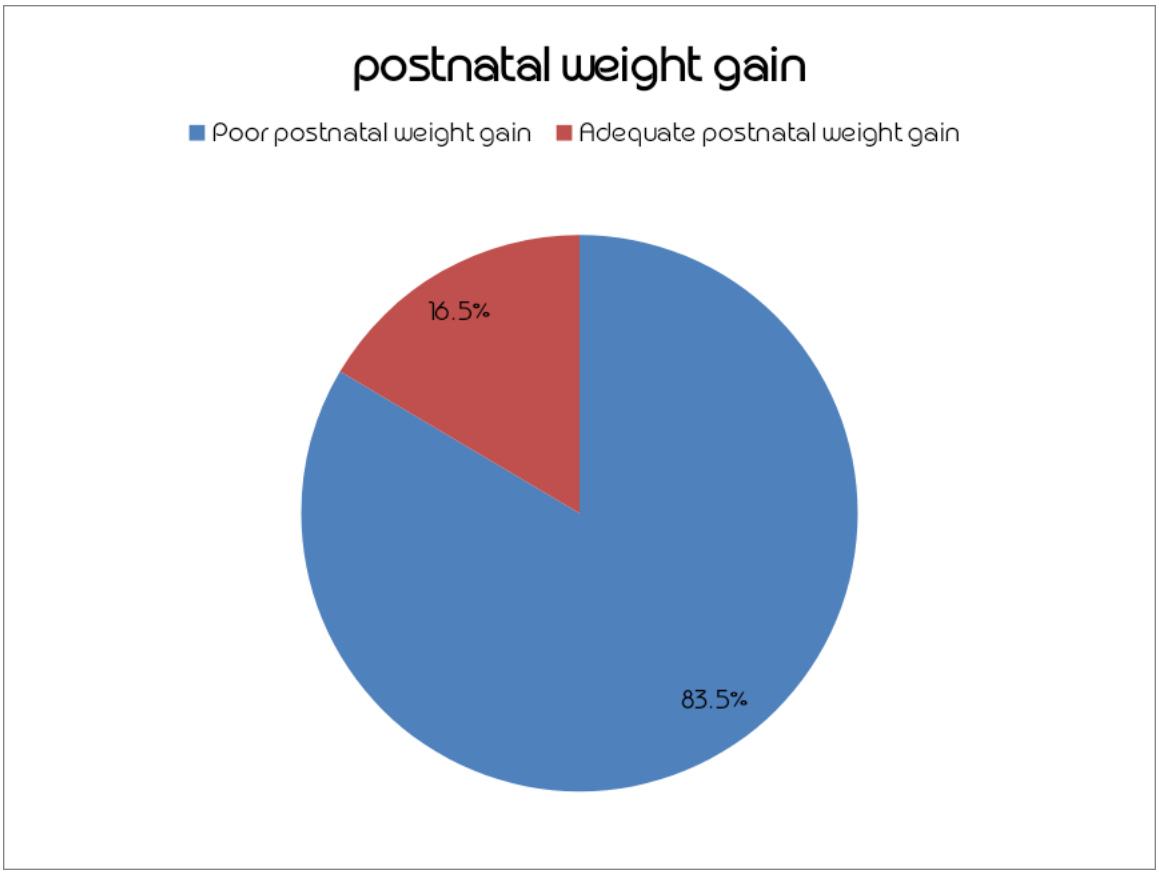

Figure 3proportion of postnatal weight gain neonates admitted in neonatal intensive care unit at selected public hospitals (n= 242)

5.2 predictors associated with postnatal weight gain among preterm low birth weight neonate

To test the relationship between individual independent variables with dependent variable a bivariate logistic regression were used. Variables with p-value less than 0.25 were taken as statistical significant in the bivariate regression. Gender of the neonate, birth weight, age of regaining birth weight, respiratory distress syndrome, neonatal hypothermia, Mode of delivery, Length of hospital stay, Antenatal care visit, time of initiating the first feed, KMC, minimum weight recorded and gestational age are the variables which have association with the outcome variables.

Then these significantly associated variables were nominated for multivariate logistic regression. Among those respiratory distress syndrome, mode of delivery, length of stay, time to initiate first feeding show statistical significant relationship with dependent variable with p-value <0.05.

Neonates that were not diagnosed with RDS are 4 times more likely to gain adequate postnatal weight than their encounter parts [AOR = 4.155% CI (1630-10.590)] .
Neonates who were delivered through SVD were 8 time more likely to gain adequate postnatal weight than those Caesarean section delivery [AOR =8.082 (2.414-27.259)].

Preterm LBW Neonates who start their first feeding with in the first 24 hours were 3 times more likely to gain adequate postnatal weight than those who start feeding on ≥2nd day [AOR = 3.292 % CI (1308-8.300)]. And length of stay, a one day increases in staying in hospital decrease the possibility of gaining adequate postnatal weight by 24.6% [AOR=.754% CI (.662-.839)]. Further detail information is provided in the table below (see table4)

Table 4Bivariate and multivariate analysis to identifies predictors associated with postnatal weight gain among preterm low birth weight neonates admitted in selected hospital Addis Ababa,2023 (N=242)

Variables with categories		Postnatal weight gain		COR(95%CI)	AOR(95%CI)	p-value
		Adequate postnatal weight gain	poor postnatal weight gain			
Sex	Female	23	90	1684(.848,3.342)	1512(.611,3743)	.371
	male	17	112	**1**	1	
Birth weight	<1500gm	15	50	1824(.892,3.730)	.822(.198,3.421)	.788
	≥1500gm	25	152	**1**	1	
Age at regaining birth weight	≤14 days	22	77	1984(1001,3.934)	1258(.512,3.094)	.616
	>14days	18	125	1	1	
GA	<34 wks	34	141	2.452(.979,6.142)	1379(.403,4.714)	.609
	≥34 wks	6	61	**1**	1	
RDS	No	24	76	2.487(1243,4.976)	**4.155(1630,10.590)**	**.003***
	Yes	16	126	**1**	**1**	
Hypothermia	No	27	109	1772(.865,3.630)	1894(.734,4.886)	.187
	Yes	13	93	**1**	1	
Mode of delivery	SVD	35	106	6.340(2.384,16.839)	**8.082(2.414,27.259)**	**.001***
	C/S	5	96	**1**	**1**	
ANC visit	Yes	34	147	2.120(.844,5.328)	1460(.467,4.562)	.515
	No	6	55	**1**		
When to start feeding	1st day	24	54	4.111(2.031,8.322)	**3.292(1308,8.300)**	**.011***
	2nd day and beyond	16	148	**1**	**1**	

KMC	No	13	112	.387(.189,.793)	.495(.192,1277)	.146
	yes	27	90	1	1	
Length of stay	Mean ±SD	2140±3.691	24.3614±3.399	.804(.730,.885)	**.754(.662,.839)**	**.000****
Minimum weight recorded	Mean ±SD	1408.18±328.702	1593.65±351436	.999(.997,.999)	.998(.996,1000)	.040

1=indicated for reference group, *=significant association at p-value <0.05, **=highly significant, COR= crude odds ratio, AOR= Adjusted odds ratio, SD= standard deviation

6. Discussion

The purpose of this study was to know the postnatal weight gain and it's predictors among preterm LBW neonates who were admitted in NICU at selected four public hospitals in Addis Ababa Ethiopia.

According to this study there was a lower rate of adequate weight gain, demonstrating that percentage for postnatal weight growth was under the accepted level of 15 g/kg/day. Among possible predictors, not having respiratory distress syndrome, spontaneous vaginal delivery, shorter length of stay, initiations of first feeding within the 1st day of life were statistical significant for adequate weight gain.

The result from this research shows the rate of poor postnatal weight gain were (83.5%) of the sampled neonate, similar to this study, findings from Tanzania and Kenya revealed that the poor postnatal weight gain was also high with 86.8%, 72.6% respectively (26,46). The possible explanation for this observation might be by the fact that populations, hospital configurations, and feeding habits vary between different places.

A finding in this study shows that the average postnatal weight gain was 9.77±5.602 g/kg/day that was lower from stated standard (15g/kg/day). A study conducted in Nigeria which was 8.2g/kg/day shows similar findings but contrary to this study this finding, the study conducted in India showed a higher average of postnatal weight

gain per kg per day (16.24 ±2.37 g/kg/d), (14,47). It is possibly explained by variety of circumstances as such the living environment, Sociodemographic traits, the way of feeding, and could also be hospitals documenting custom on the respective countries.

According to this study there was a significant association among RDS and postnatal weight gain. thoes who were not diagnosed with RDS are 4 times more likely to gain adequate weight in comparison with newborns diagnosed as having RDS. The possible explanation might be neonates with RDS loss more weight than the usual in the first week of life in comparison with those who don't have RDS, this lead to neonates with RDS will take longer to recover from the weight loss, and even after recovery they are slower to gain postnatal weight. In addition to this, neonates with RDS experience more Adenosine Triphosphate (ATP) expenditure meaning this neonates consume more energy in order to breathe the more energy they consume the more calories they burn as a result won't be able to gain appropriate weight. This study is supported by this researches conducted at Uganda and Tanzania, Sated that neonates without comorbidities are more likely to gain postnatal weight than those with comorbidities (5,26). In line with this, a study done in Queen Charlotte's and Chelsea and, illustrated that a highly significant weight loss is evidenced in neonates with RDS babies than with no respiratory distress syndrome, babies with RDS 7.6% (45,48).

The finding of this study found a significance association between days of initiation of the first feeding and adequate weight gain, demonstrating that neonates that took their first fed in the first day were shown to be 3 times more likely to gain adequate postnatal weight from their counter parts. similarly a study conducted in US showed preterm LBW that start their feeding in the first day had adequate weight gain than those started after the first day (27).

Other similar studies done in Iran and Tanzania on those studies initiating feeding in the first day of life showed adequate weight gain with faster growth and shorter duration of hospital stay (40,41,45). The possible scientific explanation for association might be, feeding in the first day have advantage in gaining adequate weight gain because the first feed which is colostrum protects the neonate from infection such as

NEC by invading the gut with normal flora helping the neonate to fight other comorbidities and proper feeding boost calorie intake resulting adequate weight gain (45,49).

WHO recommend that feeding must be started in first 24 h of birth, as much as possible to put the LBW neonates immediately on feeding after birth. And for those neonates who have difficulty to suck, breast milk should be given by cup or tube feeding until sucking is sustained this helps them to have strong immune system (22).

Moreover length of hospital stay was another associated factor for postnatal weight gain. Result from this study, the average duration of stay in hospital was 23.87±3.61 days approximately 24 days. According to this study, prolonged hospital stay has a negative effect on adequate postnatal weight gain in preterm LBW neonates. An increment in hospital stay by a single day resulted in a decreases in adequate postnatal weight gain by 24.6%. supported by other study demonstrated that neonates who stayed more than 21day were 3 fold of having poor postnatal weight gain (10).

Another significant predictor of postnatal weight gain in this study was type of delivery Based on the result; preterm LBW neonates delivered via SVD were 8 times more likely to gain adequate postnatal weight gain than cesarean section delivery. This study had similarity with studies in Iran and London which demonstrates that neonates born via spontaneous vaginal delivery gained adequate postnatal weight (32,50).

The possible scientific explanation for association might be, those neonates who were delivered via C/S tends to face excessive weight loss after birth this leads to prolonged time to recover from the loss. The other explanation is that vaginal deliveries exposed newborns to natural flora, which is crucial for gut development., boosts immune function, resulted in adequate postnatal weight gain (51,52).

7. Conclusion and recommendation

7.1Conclusion

The results of this study showed that postnatal weight increase was less than the recommended weight gain of 15g/kg/d among preterm low birth weight neonates admitted in NICU at particular public hospitals. The absence of respiratory distress syndrome, early commencement of feeding on the first day, SVD, and length of hospital stay are all factors that contribute to preterm low birth weight neonates gaining enough weight after birth.

7.2 Recommendation

Based on the study's findings, the following suggestions are made to help preterm low birth weight neonates obtain enough postnatal weight.

For hospitals

To construct a design to implement

- prevention of RDS
- encourage vaginal delivery

- reduce length

For health professionals

- Checking weight daily and record on the follow shit
- Putting the neonate on trophic feeding on the first day
- Prevent more weight loss than the usual
- Prevent prolonged hospital stay
- Treat neonates with RDS timely

For researchers

- Researchers should have to consider conducting a prospective study design to this area to come up with better findings.

8. Strength and limitation of the study

8.1 Strength

This study's strength is the retrospective nature of the study that including neonates from the past 5 years this gives information on the care system, feeding habits and other lots of related things. Since there is no enough study done in the country this research could give baseline for other interested individuals or groups.

8.2. Limitation

The Retrospective nature of the study; lack of data more detail information about the mothers pertaining to antenatal risk factors (medication history, feeding practice, and health condition of the mother). By knowing this it could have been generated more predictors from the mother's side.

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10. Annex

Annex I: Information Sheet

Date _____

Title of the Research Project: Assessment of postnatal weight gain and its predictors among preterm low birth weight neonates admitted in neonatal intensive care unit at selected public hospitals: retrospective study, Addis Ababa Ethiopia, 2023

Name of Investigator: AfomiaTemesgen (Bsc)

Name of the Organization: Addis Ababa University

Name of the Sponsor: Addis Ababa University

Introduction: This information sheet is consisting information about study title, purpose, and responsible or contact person.

Purpose of the Research Project: To assess the postnatal weight gain and its predictors among Preterm Low Birth Weight neonates admitted in neonatal intensive care unit at selected public hospitals, 2023

Procedure: using structured checklist data will be collected from the neonates' medical records.

Risk and /or Discomfort: Since the study will be conducted by taking necessary information from medical chart, it will not cause any harm on the patients. The name or any other personal information will not record on the questionnaire and all information is taken from the chart will kept strictly confidential and in a safe place. The information retrieved will be only used for the study purpose.

Benefits: The research have no direct benefit for one whose document/ record are included in this research. But the indirect benefit of the research for the participant and other clients in the program is clear. There is a benefit for clients in the program of getting appropriate care and treatment services for those survived and other newly admitted ones. In all, the research work has a principal direct benefit for health care planners, providers and managers.

Person to contact: This research project will be reviewed and approved by the institutional review board of Addis Ababa University, Tikure Anebesa health science campus. If you have any question you can contact any of the following individuals (Investigator and Advisors) and you may ask at any time you want.

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Annex III: Questionnaires on postnatal weight gain and its predictors among preterm low birth weight neonates admitted in neonatal intensive care unit at

selected public hospitals retrospective study, Addis Ababa Ethiopia, 2023

MRN––––––––			
Part 1 Socio-demographic questions			
No	Question	Possible answers	Skip pattern
101	Maternal age	–––––––	
102	Number of children that the mother has	1One 2 Two and more	
103	Sex of the neonate	1male 2 female	
104	Birth weight (g)	–––––––––––––––	
105	Minimum weight recorded	–––––––––––––––	
106	Age at minimum weight recorded	–––––––––––––––	
107	Age at regain Birth weight (in day)	–––––––––––––––	
108	weight (g) during Discharge	–––––––––––––––	
109	Age at the time of discharge	–––––––––––––––	
110	Average weight gain	–––––––––––––––	
Part 2: obstetrics characteristics			
201	ANC visit by the mother	Yes No	
202	If yes, how many visit	<= Two times > Two times	
203	Mode of delivery	1SVD 2 C/S	

204	Gestational age in wks.		–––––––––––––––	
205	Size for gestational age		1AGA 2 SGA	
Part 3: Variables related to comorbidities				
301	Is the neonate diagnosed with	RDS	1yes 2 no	
302		Hypothermia	1yes 2 no	
303		Jaundice	1yes 2 no	
304		Anemia	1yes 2 no	
305		Sepsis	1yes 2 no	
306		NEC	1yes 2 no	
307		Hypoglycemia	1yes 2 no	
308		Others	1yes 2 no	
309	duration of oxygen use in days		––––––––	
310	Duration of hospital stay in days		––––––––	
311	Outcome of the neonate		1death 2 discharge	

Part 4: Feeding practice related questions			
401	Type of milk fed on admission	1Breast milk 2 Formula milk 3 Mixed	
402	Initial method of feeding	1Tube 2 Breastfeeding	
403	If tube, Initial volume of feeding in ml/kg	–––––	
404	If tube, When to reach full feeding equal to 150ml/kg	–––––	
405	When to start the first feed	1 1st day 2 ≥2nd day	
406	Frequency of feeding	1< every 3 hr 2 Every 3 hr 3 > every 3hr	
407	Does the neonate in KMC	1 yes 2. No	