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Cross sectional survey on Clinical profile and physiological parameters of low-birth weight babies in selected hospital of Mohali,Punjab .

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Abstract

Introduction:

Low birth weight (LBW) is a condition with substantial global impact, underscoring the need for specialized neonatal care. To ensure better outcomes, it is essential to comprehend the link between the clinical profile and physiological parameters of LBW infants. By exploring this relationship, healthcare professionals can implement tailored interventions and optimize neonatal care practices. Understanding how clinical characteristics, such as gestational age, birth weight, and maternal health, interact with physiological indicators like temperature, heart rate, respiratory rate, and oxygen saturation, offers valuable insights into the health status of LBW babies.

Methods:

A cross sectional survey was conducted to assess the physiological parameters of low birth weight babies admitted in neonatal intensive care unit. A total of 150 samples were chosen using purposive sampling. Data collection was done using WHO guidelines physiological parameters. The author determined relationship between the temperature, heart rate, respiratory rate, oxygen saturation of with clinical profile of low birth weight babies.

Results:

The study results indicate that a one-unit decrease in age is associated with a 0.231-unit decrease in temperature, a 0.335-unit change in heart rate, a 1.944-unit change in respiratory rate, and a 1.521-unit change in oxygen saturation. These findings highlight the influence of age on the physiological parameters of low birth weight babies, providing valuable insights for targeted neonatal care and interventions.

Conclusion:

This research has provided valuable insights into the relationship between the clinical profile and physiological parameters of low-birth weight babies. The findings highlight the importance of monitoring temperature, heart rate, respiratory rate, and oxygen saturation in these vulnerable neonates to assess their health status and guide appropriate interventions.

Keywords: Low birth weight, neonatal care, clinical profile, physiological parameters, gestational age.

Background

Low birth weight (LBW) is a critical health concern that affects a substantial number of newborns worldwide. Infants with LBW, defined as having a birth weight of less than 2.5 kilograms (5.5 pounds), are at increased risk of various medical complexities and face heightened vulnerability during the neonatal period. These vulnerable neonates require specialized care and monitoring to ensure their optimal growth and development.[1-4]

The clinical profile and physiological parameters of low birth weight babies play a pivotal role in assessing their health status, guiding medical interventions, and predicting potential health risks. The clinical profile comprises essential characteristics, including gestational age, birth weight, birth complications, maternal health status, and the presence of congenital anomalies. Concurrently, physiological parameters such as temperature, heart rate, respiratory rate, and oxygen saturation are crucial indicators used to monitor the well-being of these neonates.[4-8]

Temperature regulation is a fundamental aspect of neonatal care, particularly for premature infants, who are at higher risk of temperature instability. Low birth weight babies, especially those born prematurely, have underdeveloped thermoregulatory mechanisms, making them susceptible to fluctuations in body temperature. Monitoring heart rate is essential for assessing cardiovascular function and detecting potential cardiac issues in LBW infants. Premature babies may have higher heart rates due to cardiac immaturity or other health concerns. Similarly, monitoring respiratory rate is vital for evaluating the efficiency of the respiratory system in these neonates. Premature infants often experience respiratory distress due to underdeveloped lungs, necessitating careful monitoring and intervention to ensure adequate respiratory support. Additionally, monitoring oxygen saturation is crucial for assessing tissue oxygenation, particularly in LBW infants with compromised respiratory function. Maintaining adequate oxygen saturation levels is essential for their overall well-being and development.[8-13]

Understanding the relationship between the clinical profile and physiological parameters of low-birth-weight babies is imperative for providing tailored and effective neonatal care. Identifying associations between clinical characteristics and physiological outcomes can help in early detection of health issues and guide appropriate interventions. Early intervention and prompt medical attention can significantly improve the outcomes of LBW infants, reducing the risk of complications and long-term health challenges.

The aim of this research paper is to explore the relationship between the clinical profile and physiological parameters of low-birth-weight babies. By analyzing these associations, we intend to gain valuable insights into their health status and potential risk factors. This research seeks to contribute to the existing body of knowledge on LBW infants and enhance neonatal care practices to improve outcomes for these vulnerable neonates worldwide.

Methods

Study Design

A cross sectional survey was conducted to assess the physiological parameters of low-birth-weight babies admitted in neonatal intensive care unit of Shri guru Harkrishan sahib hospital, Mohali.

Participants

The participants for the present study were low birth weight neonates who are admitted in neonatal intensive care and who fulfilled the inclusion criteria such was Preterm infant with gestational age of 26-36 weeks, preterm infant whose birth weight >1500grams and admitted in NICU, Preterm infant those who are hemodynamically stable.

Sample size and estimation

Power analysis was done based on the objectives of the study. The study conducted by Jalil et al. [14] reported incidences of 24.5% of Low-birth-weight babies in Punjab. Based on the incidence of rate sample size was calculated by proportion method using open epi sample size calculator with following input parameters.

Frequency = 24.5%

Absolute Precision = 5%

Confidence interval = 95%

Power= 80%

Design effect =1

The formula used for sample size calculation was

$$\mathbf{n = [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]}$$

The estimated sample size was 122. Considering the drop out rate of 10% the sample size was increased to 150.

Sampling Technique

In this study Purposive sampling technique is used which samples are chosen by choice not by chance through the judgement made the researcher based on the knowledge about the population.

Instruments

Section A: Assessment of Clinical profile of low birth weight neonates

The clinical profile of low birth weight neonates includes gestational age in weeks, gender, birth weight in grams, mode of delivery, meconium aspiration, colour of the baby.

Section B: Assessment of Physiological parameters

The low-birth-weight temperature, pulse rate, respiratory rate, oxygen saturation was assessed in this study.

Validity of the tool

The content validity assessment of a physiological parameters tool involved seven expert evaluators from the fields of paediatrics and nursing. These experts were carefully selected based on their job titles, extensive qualifications, and substantial experience. To ensure a comprehensive evaluation, a content validity evaluation form was meticulously prepared, taking into account the criteria proposed by Yaghmaie [15]. The experts were asked to review and rate the items in the tool, considering their relevancy, clarity, simplicity, and ambiguity on a four-point relevance ordinal scale.

The results of the content validity revealed unanimous agreement among the experts, with all the items in the physiological parameters tool receiving a perfect Item level Content Validity Index (I-CVI) of 1. This means that every item was considered highly relevant and appropriate by all the experts, with no modifications needed. Additionally, the Scale level Content Validity Index (S-CVI) was calculated using the Universal Agreement (UA) method, resulting in an impressive S-CVI/UA value of 1, indicating that the entire content of the tool was unanimously deemed essential by the panel of experts.

Reliability of the tool

Cohen Kappa was used to measure inter-rater reliability of the tool. It is generally thought to be a more robust measure than simple percent agreement calculation, as κ takes into account the possibility of the agreement occurring by chance. The inter-rater reliability showed the tool was stable with r value of 1. Reliability was calculated using Cohen's Kappa reliability formula which is given below.

Ethical consideration

It is a part of PhD thesis, ethical clearance was obtained from the Desh Bhagat University, Punjab. Ethical clearance was obtained from the selected Guru Hari Krishnan Hospital. Need and purpose of the study was explained to the mothers and Informed consent was obtained from the mothers of Low-Birth weight babies.

Data Collection

The data was collected through clinical profile and physiological parameters of low-birth weight neonates. Base line assessment of physiological parameters (temperature, pulse rate, respiratory rate, oxygen saturation of low birth weight is recorded.

Statistical Analysis

The data was double entered, coded clean, and then processed by using Statistical Package for Social Sciences (SPSS Version 26.0). To summarize and describe the findings of the study. The average (SD) in continuous variables as well as frequencies (percentages) of categorical variables was employed. To determine the relationship between clinical profile and physiological parameters linear regression analysis was used.

Table 1 Clinical Profile of Low birth weight babies

n= 150

Clinical Variables		f	%
Gestational age in weeks	Extremely preterm (less than 28 weeks)	4	2.67
	Very preterm (28 to less than 32 weeks)	10	6.67
	Moderate to late preterm (32 to 37 weeks).	136	90.67
Gender	Male	85	56.67
	Female	65	43.33
Birth weight	LBW (<2.5)	102	68.00
	VLBW (< 2.0)	48	32.00
Mode of delivery	Vaginal Delivery	4	2.67
	Induction of Labour	8	5.33
	LSCS	138	92.00
Meconium Aspiration	Yes	123	82.00
	No	27	18.00
Colour of the baby at birth	Completely Pink	2	1.33
	Body pink, Extremities blue	141	94.00
	Pale blue	7	4.67
Jaundice	Yes	121	80.6
	No	29	19.4

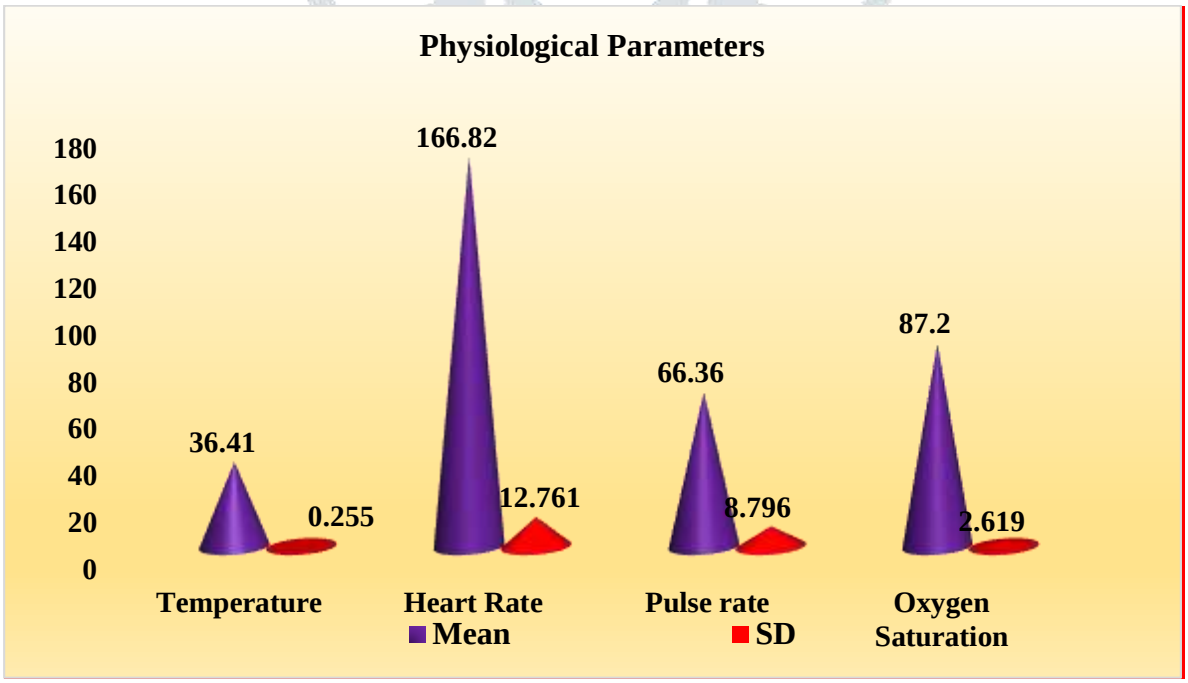

Figure 1: Mean and SD of physiological parameters among low birth weight babies.

Table 2: Relationship between clinical variables and temperature among low birth weight babies.

n= 150

Clinical Variables	Unstandardized Coefficient (B)	Standard error	t	P Value
Gestational age in weeks	-0.231	0.142	7.199	0.000 ***
Gender	1.159	2.525	0.459	0.648
Birth weight	0.571	1.272	8.449	0.453
Mode of delivery	1.220	1.050	1.162	0.251
Meconium Aspiration	1.569	1.098	1.429	0.159
Colour of the baby	3.010	1.657	1.816	0.075

Note: *** - P<0.001 Level of Significant.

Table 2 shows linear regression analysis clinical variables and temperature. The age is significantly predicted the temperature. This indicates that one-unit decrease of age will decrease the value of by temperature 0.231 units.

Table 3: Relationship between clinical variables and heart rate among low birth weight babies.

n= 150

Clinical Variables	Unstandardized Coefficient (B)	Standard error	t	P Value
Gestational age in weeks	0.335	0.061	5.454	0.000 ***
Gender	0.581	1.094	0.531	0.598
Birth weight	0.130	0.552	0.235	0.815
Mode of delivery	0.138	0.455	0.303	0.763
Meconium Aspiration	0.152	0.476	0.319	0.751
Colour of the baby	0.720	.718	0.002	0.015

Note: *** - P<0.001 Level of Significant.

Table 3 shows linear regression analysis clinical variables and pre test heart rate. The age was significantly predicted the heart rate. This indicates that one-unit change in age will change the value of by heart rate by 0.335 units.

Table 4: Relationship between clinical variables and respiratory rate among low birth weight babies.

n= 150

Clinical Variables	Unstandardized Coefficient (B)	Standard error	t	P Value
Gestational age in weeks	1.944	0.285	6.812	0.000 ***
Gender	0.568	5.091	0.112	0.912
Birth weight	2.938	2.565	1.145	0.258
Mode of delivery	2.541	2.118	1.200	0.236
Meconium Aspiration	6.347	2.214	2.867	.006
Colour of the baby	0.958	3.342	2.484	0.44

Note: *** - P<0.001 Level of Significant.

Table 4 shows linear regression analysis clinical variables and pre test respiratory rate. The age was significantly predicted the respiratory rate. This indicates that one-unit change in age will change the value of by respiratory rate by 1.944 units.

Table 5: Relationship between clinical variables and oxygen saturation among low birth weight babies.

n= 150

Clinical Variables	Unstandardized Coefficient (B)	Standard error	t	P Value
Gestational age in weeks	1.521	0.224	6.780	0.000 **
Gender	0.991	4.003	0.248	0.805
Birth weight	1.950	2.017	0.967	0.338
Mode of delivery	1.349	1.665	0.810	0.421
Meconium Aspiration	2.897	1.741	3.388	0.510
Colour of the baby	4.135	2.628	1.574	0.122

Note: *** - P<0.001 Level of Significant.

Table 5 shows linear regression analysis clinical variables and pre test oxygen saturation. The age and meconium aspiration were significantly predicted the oxygen saturation. This indicates that one-unit change in age will change the value of by oxygen saturation by 1.521 units.

Discussion

This study was designed to determine the relationship between clinical profile and physiological parameters of low birth weight babies. The results of the study proved the there was negative relationship between

gestational age and respiratory rate, and heart rate and positive relationship between gestational age and temperature, oxygen saturation of low birth weight babies.

This study's findings indicating a positive relationship between gestational age and the temperature of low birth weight babies are noteworthy and have significant implications for neonatal care. As the gestational age of the infants increases, their body temperature tends to be higher. This observation suggests that premature infants, who have lower gestational ages, may face challenges in maintaining their body temperature within the normal range due to underdeveloped thermoregulatory mechanisms.

The identified correlation between gestational age and thermal regulation in low birth weight neonates underscores the importance of monitoring and addressing temperature control in these vulnerable infants. Healthcare professionals can utilize this information to implement targeted interventions and provide specialized care, especially for prematurely born babies, who may be at a higher risk of thermal instability.

Previous studies have also investigated the relationship between gestational age and temperature in low birth weight babies, and their findings supports present study the results. For instance, Neufeld et al.[16] reported a positive correlation between gestational age and body temperature in a cohort of premature infants. Similarly, a study by Ahumada-Barrios et al. [17] found that as gestational age increased, neonates exhibited higher body temperatures, indicating improved thermoregulation in premature babies. These findings are line with our study's results.

This study findings reveal a negative relationship between gestational age and heart rate in low birth weight babies. This finding is significant as it indicates that premature infants, who have lower gestational ages, may have higher heart rates compared to babies born closer to full term. The underdeveloped cardiovascular system in premature babies could contribute to their elevated heart rates. As they mature and approach their expected due date, their heart rates tend to stabilize and decrease, which is consistent with the negative relationship observed in this study.

Previous studies have also investigated the relationship between gestational age and heart rate in low birth weight babies, and their findings supports present study the results. For example, a study conducted by Singh et al.[18] reported similar results, indicating that premature infants had higher heart rates compared to their full-term counterparts. As these premature babies continued to develop and reach closer to their expected due date, their heart rates decreased, supporting the negative relationship observed in our study.

This study findings shows that there is negative relationship between gestational age and respiratory rate low birth weight babies. This finding is significant as it suggests that premature infants, who have lower gestational ages, may have higher respiratory rates compared to babies born closer to full term. The respiratory system of premature babies is often underdeveloped, which can lead to rapid and shallow breathing. As these infants continue to mature and approach their expected due date, their respiratory rates tend to stabilize and decrease, contributing to the observed negative relationship.

Previous study conducted by Bansal et al.[19] reported similar results, indicating that premature infants tend to have higher respiratory rates compared to full-term babies. As these premature infants matured and

approached their expected due date, their respiratory rates decreased, aligning with the negative relationship observed in our study.

However, other studies have presented different findings. For example, a study by Yadav et al.[20] found no significant correlation between gestational age and respiratory rate in low birth weight neonates. The inconsistency in results across different studies could be attributed to variations in sample sizes, study designs, and patient populations.

This study findings shows that there is positive relationship between gestational age and oxygenation saturation low birth weight babies. This finding is significant as it suggests that premature infants, who have lower gestational ages, may exhibit lower oxygen saturation levels compared to babies born closer to full term. As these premature infants continue to develop and approach their expected due date, their lungs and respiratory system mature, leading to better oxygen exchange and higher oxygen saturation levels. This positive relationship observed in our study indicates that as low birth weight babies get closer to their full-term gestational age, their ability to maintain appropriate oxygenation improves.

Previous study conducted by Prajapati et al.[21] reported similar results, showing that as gestational age increased, neonates exhibited higher oxygenation saturation levels, indicating improved respiratory function in premature babies. Another study by Khan et al.[22] found a direct correlation between gestational age and oxygenation saturation, with premature infants having lower saturation levels compared to full-term babies.

These consistent findings across multiple studies suggest that as low birth weight infants approach their full-term gestational age, their respiratory systems mature, leading to enhanced oxygen exchange and higher oxygenation saturation levels.

Conclusion

In conclusion, this research has provided valuable insights into the relationship between the clinical profile and physiological parameters of low birth weight babies. The findings highlight the importance of monitoring temperature, heart rate, respiratory rate, and oxygen saturation in these vulnerable neonates to assess their health status and guide appropriate interventions.

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