Original Article

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Paediatrics Section

Early Neonatal Weight Changes among Babies Delivered by LSCS versus Normal Vaginal Delivery: A Prospective Observational Study

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ABSTRACT

Introduction: Weight loss in newborns during the first few days of life is normal, with full-term neonates losing up to 5-10% of their birth weight. The American Academy of Paediatrics considers a loss greater than 7% excessive. Recent studies suggest that the mode of delivery may influence newborn weight loss.

Aim: To compare birth weight changes over 28 days in term neonates born via Normal Vaginal Delivery (NVD) and Lower Segment Caesarean Section (LSCS).

Materials and Methods: A prospective observational study was conducted at St. Stephen's Hospital in New Delhi, North India, between September 2020 to September 2021 involving 93 term neonates. Of these, 49 were born vaginally and 44 by LSCS. Weights were measured at six intervals: birth, 24 hours, 48 hours, day 3, day 7, and day 28. Statistical analysis was performed to compare weight loss and gain patterns between the two groups. Continuous variables were presented as mean±SD, and categorical variables as absolute numbers and percentages. The means of two numerical variables were compared using t-test analysis. Nominal data was compared with Chi-square analysis. The p-value <0.05 was considered significant.

Results: Out of 93 babies, 48 were male and 45 were female. The mean gestational age for neonates born via NVD was 38.10±0.94 weeks, and for those born via LSCS, it was 38.07±0.99 weeks. Neonates born via LSCS experienced more weight loss, particularly within the first 24 hours (p=0.005). By 48 and 72 hours, the differences were no longer statistically significant. No significant differences were observed in weight gain by day 7 and day 28.

Conclusion: As per the present study findings, infants born by caesarean section experience more weight loss in the first 24 hours as compared to vaginally delivered babies.

Keywords: Lower segment caesarean section, Mode of delivery, Neonatal growth, Newborn weight loss, Type of feeding

INTRODUCTION

Weight loss in the first few days of life is normal for newborns, mainly due to the contraction of extracellular fluid [1]. Full-term neonates typically lose 5-10% of their birth weight, while preterm infants may lose up to 15% [1,2]. Several factors influence this weight loss, including breastfeeding adequacy, intravenous fluids during labour, maternal health, and environmental conditions [3].

In recent years, the incidence of LSCS has increased significantly in India [4]. Studies have explored how LSCS affects early birth weight patterns, especially in exclusively breastfed infants [3,5-7]. One proposed explanation for increased weight loss in LSCS-delivered newborns is the delay in lactogenesis II, which is essential for initiating milk production. This delay can hinder breastfeeding initiation, reducing early milk intake and leading to greater weight loss [5].

Research by Nissen E et al., suggests that LSCS mothers experience reduced oxytocin and prolactin synthesis, hormones crucial for milk ejection and production, potentially complicating breastfeeding [8]. Additionally, intravenous fluids administered during LSCS may cross the placenta, increasing foetal extracellular fluid and influencing birth weight and early weight loss [9,10]. Although several studies have examined the link between mode of delivery and weight loss, there is limited research in India that comprehensively evaluates neonatal weight changes with a focus on delivery mode, especially given the surge in LSCS over the last few decades [3,9-11]. This gap highlights the need for further research on the relationship between delivery method and neonatal weight dynamics.

In a study by Saki A et al., LSCS-delivered babies experienced greater weight loss than those born via vaginal delivery during the first few days [7]. Similarly, Samayam P et al., found that babies born by LSCS had more significant weight loss and lower weight gain after the first month compared to vaginally delivered babies [6]. Unlike prior studies that focused on early weight loss within the first 72 hours or those limited to exclusively breastfed neonates, this study assesses weight loss and gain up to 28 days in term neonates. It also includes both breastfed and mixed-fed infants for a more comprehensive view of neonatal weight in routine practice.

With this background, this study aimed to examine how the mode of delivery influences birth weight and weight changes during the first 28 days in term neonates.

MATERIALS AND METHODS

This prospective observational study was conducted at St. Stephen's Hospital, New Delhi, North India, over one year, from September 2020 to September 2021. After approval from the ethics committee (SSHEC/R0134), written informed consent was obtained from the parents or legal guardians of all enrolled neonates before their

inclusion in the study. The study was conducted in accordance with the declaration of Helsinki, 2013.

Inclusion criteria: The study included all babies born in the hospital with a gestational age between 37 and 42 weeks and a birth weight over 2.5 kg, whether born by LSCS or NVD. Mothers with gestational diabetes mellitus, in whom glycaemic control was attainable through dietary restrictions alone, were included.

Exclusion criteria: The exclusion criteria included babies resuscitated at birth or admitted to Neonatal Intensive Care Unit (NICU) for severe illnesses, those born by assisted vaginal delivery, or with congenital anomalies. Additionally, babies born to mothers with co-morbidities, pregnancy-related complications, infections, or a history of smoking/alcohol intake were excluded.

Sample size: A convenience sampling method was used, including all eligible term neonates delivered at the study centre during the study period, resulting in an initial sample of 116 participants. Out of these 116 participants, 54 were born by LSCS, and 62 were born via NVD. Of the babies born via LSCS, 10 were excluded from the study. Three of these babies required phototherapy at some point during the study period, one was admitted to the NICU due to suspected neonatal sepsis, and six were lost to follow-up. Similarly, among the babies born via NVD, 13 were excluded. Five of these babies needed phototherapy for neonatal hyperbilirubinemia, one was admitted to the NICU due to suspected sepsis, and seven were lost to follow-up.

Study Procedure

Data was collected from 93 babies who met the inclusion criteria. Among these, 44 babies were born via LSCS, while 49 were born through NVD. Their weights were recorded at six different times: at birth, 24 hours, 48 hours, 72 hours, day 7, and day 28 of life. Weights were measured without clothing using a portable electronic weighing scale (CAS weighing scale model SW-1, USA), which had a precision of 1 gram. The scale featured taring, zeroing, and holding functions, and the final reading was taken as the average of three measurements.

The recorded weights were statistically analysed to determine differences in weight loss and gain patterns over the first 28 days of life. Weight gain was calculated in grams per kilogram per day (g/kg/day) using the following formula: Weight (gm)- birth weight(gm)/ birth weight (kg) ÷ number of days.

Weight gain was monitored over two periods: from birth to day 7 and from birth to day 28, with all calculations referencing birth weight, expressed as g/kg/day. Weight loss, relative to birth weight, was evaluated during the first three days (24, 48, and 72 hours) and expressed as a percentage. Babies discharged from the hospital were followed-up in the outpatient department.

STATISTICAL ANALYSIS

Statistical analysis was performed by the Statistical Package for Social Sciences (SPSS) program for Windows, version 20.0 (SPSS, Chicago, Illinois). Continuous variables were presented as mean±SD, and categorical variables were presented as absolute numbers and percentages. The mean of two numerical variables was compared using t-test analysis. Nominal data was compared using the Chi-square analysis. The p-value <0.05 was considered as significant.

RESULTS

Out of 93 babies, 48 were males and 45 were females. The two groups were comparable with respect to maternal and neonatal clinicodemographic variables, including maternal age, gestational age, gender distribution, feeding practices, gestational diabetes status, and Appearance, Pulse, Grimace, Activity, Respiration (APGAR) scores, with no statistically significant differences observed (p>0.05) [Table/Fig-1].

Parameters		NVD (n=49)	LSCS (n=44)	p-value
Maternal age (years), mean (SD)		27.7 (3.59)	28.5 (4.54)	0.341
Mothers with gestational diabetes (n)		20	16	0.660
Gestational age (weeks), mean (SD)		38.10 (0.94)	38.07 (0.99)	0.867
Gender	Boys	24	24	0.592
	Girls	25	20	
Mode of feeding	Exclusively breastfed	35	30	0.733
	Mixed fed	14	14	
APGAR scores, mean (SD)	1 min	8.55 (0.5)	8.48 (0.6)	0.545
	5 min	8.96 (0.2)	8.86 (0.4)	0.149

[Table/Fig-1]: Demographic profile of the newborns and mothers in the study.

The mean birth weight of babies delivered via LSCS was 3.128±0.36 kg, while those born by NVD had a mean birth weight of 3.037±0.26 kg. The mean weight at 24 hours, 48 hours, 72 hours, day 7, and 28 between the two modes of delivery were comparable in the study (p>0.05) [Table/Fig-2].

Interval	Type	N	Mean (Kg)	Std. deviation	p-value
Birth weight	NVD	49	3.037	0.26	0.170
	LSCS	44	3.128	0.36	
24 hours	NVD	49	2.995	0.27	0.359
	LSCS	44	3.055	0.35	
48 hours	NVD	49	2.925	0.25	0.255
	LSCS	44	2.996	0.34	
72 hours	NVD	49	2.860	0.28	0.320
	LSCS	44	2.972	0.37	
Day 7	NVD	49	3.038	0.26	0.252
	LSCS	44	3.118	0.37	
Day 28	NVD	49	3.756	0.41	0.249
	LSCS	44	3.850	0.37	

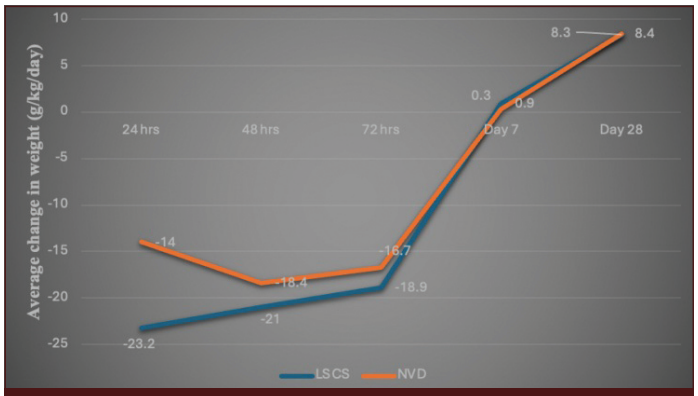
[Table/Fig-2]: Comparison of mean weight of the newborns on different days between the two modes of delivery.

The weight loss with respect to birthweight at 24 hours in the babies born by LSCS was 2.3%, whereas in babies delivered vaginally, the weight loss was 1.4%; this difference was found to be statistically significant (p=0.005). The study showed no statistically significant difference in weight loss at 48 and 72 hours (p>0.05) [Table/Fig-3].

Weight loss (hours)	Type	N	Mean (%)	Std. deviation	p-value
24	NVD	49	1.4	1.4	0.005
	LSCS	44	2.3	1.6	
48	NVD	49	3.6	1.6	0.139
	LSCS	44	4.2	1.6	
72	NVD	49	5.0	1.8	0.068
	LSCS	44	5.6	1.7	

[Table/Fig-3]: Comparison of percentage weight loss with respect to weight in both the groups at interval different.

The mean weight gain (g/kg/day) did not differ significantly between NVD and caesarean delivery. On day 7, mean weight gain was 0.3±2.5 in vaginally delivered infants and 0.9±2.8 in caesarean-born infants. By day 28, mean weight gain was comparable between groups (8.4±2.4 vs. 8.3±1.4 g/kg/day, respectively; p >0.05) [Table/Fig-4].



[Table/Fig-4]: Weight pattern of the newborns over 28 days.

These results suggest that although there were minor variations in weight gain on day 7, by day 28, the weight gain between the two groups was comparable.

DISCUSSION

In this study, neonates born via LSCS had a higher mean weight loss compared to those born via NVD, with a statistically significant difference at 24 hours (2.32% vs. 1.4%, p=0.005). By 48 and 72 hours, weight loss between the two modes of delivery, became statistically insignificant, with the LSCS group losing 4.2% and 5.69%, respectively, and the NVD group losing 3.68% and 5.01%, respectively. Weight gain patterns at day 7 and day 28 showed no significant differences between the two groups, with both LSCS and NVD groups having similar gains by day 28 (8.3 g/kg/day vs. 8.4 g/kg/day).

Similar studies, such as Samayam P et al., observed higher weight loss at 24 hours for LSCS babies. However, in contrast to this study, they also found greater weight loss at 72 hours for LSCS babies [6]. Ghoshal B et al., found that neonates born via NVD lost 2.9-6.7% of their birth weight, while LSCS-born babies lost 4.5-9%. By day 21, LSCS babies weighed 5-10% less than vaginally delivered babies [12]. Whereas, Joshi R et al., found no significant difference in weight loss between LSCS and NVD babies over 72 hours [3]. Possible explanations for the greater early weight loss observed in LSCS-delivered neonates include maternal intravenous fluid administration and delayed initiation of breastfeeding; however, these factors were not directly assessed in the present study. Early breastfeeding support is recommended to mitigate excessive weight loss in these infants.

Hamilcikan S et al., found that LSCS-born babies experienced more weight loss than those born via NVD up to 30 hours of life, with significant differences observed at 24 and 30 hours [13]. Saki A et al., observed that newborns born via caesarean section had slower weight gain than those born vaginally up to 25 days postpartum, but by day 25, the weight gain in caesarean-delivered infants exceeded that of vaginally delivered newborns [7]. In contrast, this study showed only minor differences in weight gain between NVD and LSCS babies on day 7, with both groups showing similar gains by day 28. These differences were not statistically significant suggesting the mode of delivery had no significant impact on long-term weight gain.

In conclusion, while LSCS delivery may result in greater initial weight loss, the long-term impact on weight gain appears minimal. This suggests that mode of delivery does not significantly affect infant weight gain beyond the first few days.

Limitation(s)

The study's small sample size may restrict how broadly the findings can be applied. The study did not adjust for potential confounders such as type of feeding (exclusive versus mixed), timing of breastfeeding initiation, maternal intravenous fluid administration, and indication for caesarean section. These factors may influence neonatal weight changes and should be considered in future studies using multivariate analysis.

CONCLUSION(S)

The study concludes that LSCS babies lose more weight than NVD babies, especially within the first 24 hours of life. Therefore, it is recommended that mothers having a LSCS delivery receive additional encouragement and support for breastfeeding immediately after the procedure.

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