



RESEARCH ARTICLE

STUDY OF GLUCOSE LEVELS IN NEWBORNS WITH SPECIFIC REFERENCE TO HYPOGLYCEMIA

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ABSTRACT:

Background and objectives: Hypoglycemia is one of the common metabolic problems in neonatal medicine. Early diagnosis and treatment of neonatal hypoglycemia is important as many studies found that, hypoglycemic episodes in neonates lead to neurodevelopmental and physical growth deficits. In this study, blood glucose levels at different time points were assessed and the influence of maternal blood glucose, mode of delivery, gestational age on neonatal blood glucose levels were studied.

Results: Blood glucose levels were low at 0 and 6th hour and maximum at 24th hour. The blood glucose levels ranged from 27 mg/dl to 140 mg/dl. Neonates with high maternal blood glucose were hypoglycemic, showing a negative correlation. The mean blood glucose levels were low in pre-term and post term babies compared to term and the range was wide in pre-term and term babies compared to post-term. The mean blood glucose levels were high and range was wide in babies delivered vaginally at all the time points compared to the babies delivered by LSCS. 17% babies were hypoglycemic at birth but none of them had signs. The major signs noted were jitteriness (88%), high cry (88%), lethargy (55%), tremors (55%), limpness (22%), apathy (22%), weak cry (11%) and poor feeding (11%).

Conclusion : 0 and 6th hour are the vulnerable time points for hypoglycemia.

Neonates with high maternal blood glucose, pre-term, post-term and babies delivered by LSCS were more prone for hypoglycemia requiring blood glucose monitoring. There is a wide variation in signs of hypoglycemia and babies showing signs require monitoring.

Keywords : blood glucose levels, pre-term, term ,post-term , hypoglycemia

INTRODUCTION

Hypoglycemia is one of the common metabolic problems in neonatal medicine, the assessment of blood glucose has consequently become a significant part of basic neonatal care in many hospitals⁵. Various factors influence newborn blood glucose concentrations even in healthy term newborns, like birth weight, gestational age, presence or absence of disease, perinatal complications, mode of delivery and feeding behaviour¹⁻³. The reported incidence of hypoglycaemia is approximately 16% in large for gestational age babies⁴. The incidence of hypoglycemia was 8.1% when hypoglycemia was defined as blood glucose level < 1.7 mmol/L (30.6 mg/dl) and 20.6% when it was defined as <2.2 mmol/L (39.6 mg/dl).⁵

AIMS AND OBJECTIVES

To assess the blood glucose levels in newborns born at S.V.S Medical College and Hospital, Mahabubnagar.

To assess the influence of mode of delivery on neonatal blood glucose levels.

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To assess the influence of gestational age on neonatal blood glucose levels.
To assess the influence of weight for gestational age on neonatal blood glucose levels.
To assess the signs associated with hypoglycaemia.

MATERIALS AND METHODS

It is a hospital based prospective study carried out in labor room, operation theatre, Post-operative ward, NICU and postnatal ward of SVS Medical College Hospital conducted during the study period.

Data collection:Data collection was undertaken by applying following inclusion and exclusion criteria.

Inclusion criteria: Babies born at SVS Medical College and Hospital, irrespective of gestational age, weight for age, sex and mode of delivery.

Exclusion criteria:Sick infants with congenital anomalies and chromosomal anomalies were excluded from the study.

Performance analysis: - The performance data for Accu-Chek Performa system (Accu-Chek Performa meter with Accu-Chek Performa test strips) were obtained using capillary blood from diabetic patients (method comparison, accuracy) venous blood (repeatability) and control solution (reproducibility). The system is calibrated with venous blood containing various levels of glucose. The reference values are obtained using hexokinase method.⁶

For method comparison, the results were compared with results obtained using the hexokinase method with deproteinisation (automatic analyzer).

Measuring principle

The enzyme on test strip, glucose dehydrogenase, in the presence of coenzyme, converts the glucose in the blood sample to gluconolactone. This reaction creates a harmless direct electrical current that interprets for the blood glucose. The sample and environmental conditions are also evaluated using a small alternate current signal.

Blood glucose levels were measured in mothers after taking all the aseptic measures.

After taking all aseptic precautions, blood glucose levels of the newborns were measured at 0,3,6,12 and 24 hours after birth. These time points were chosen in order to study the most vulnerable period of glucose homeostasis.

All the newborns were exclusively breastfed as per the hospital policy. In case the blood glucose levels were below 40 mg/dl (2.2 mmol/L) the signs of hypoglycemia were noted and the baby was treated with a trial of additional breastfeed or expressed breast milk and glucose levels were monitored. Trial of oral feeds (expressed breast milk or formula) and repeat blood test after 1 hour.

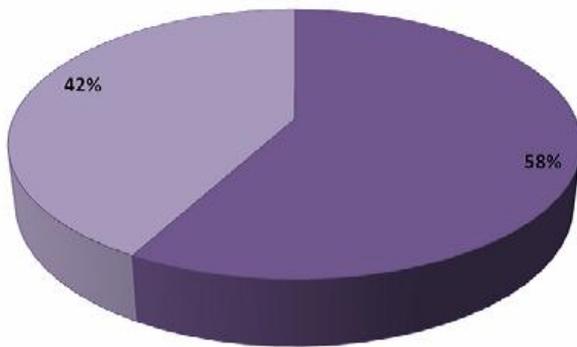
If the baby had hypoglycemia, it was noted whether the baby was symptomatic. The time since last feed was also noted before noting the blood glucose level.



RESULTS

100 babies irrespective of sex, mode of delivery, parity of mother, gestational age and weight, were enrolled in the study and data was collected according to the proforma.

Of the 100 babies, 58 were male and 42 were female. 49 babies were delivered vaginally and remaining 51 by LSCS . 54 babies were born to primiparous mother and 46 to multiparous mother.



Distribution of newborns based on gender

■ Male ■ Female

Distribution of babies based on gestational age

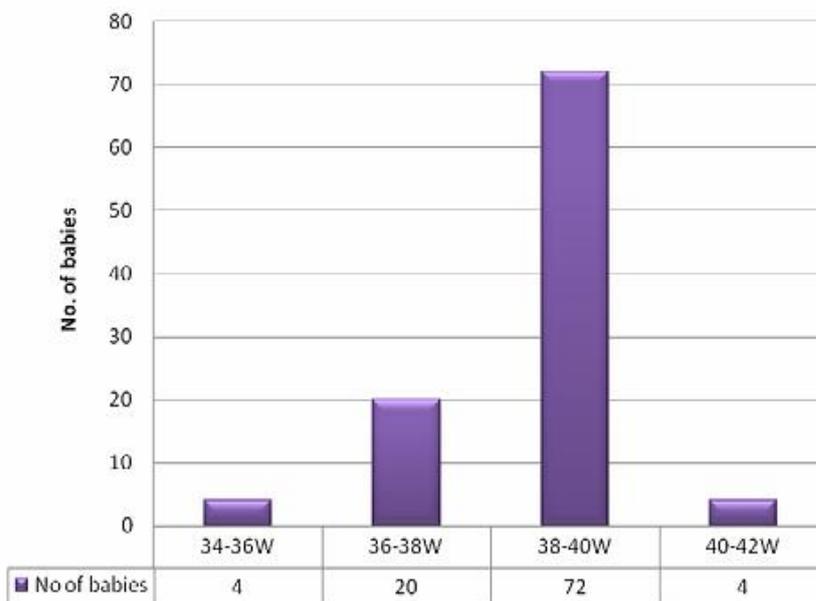
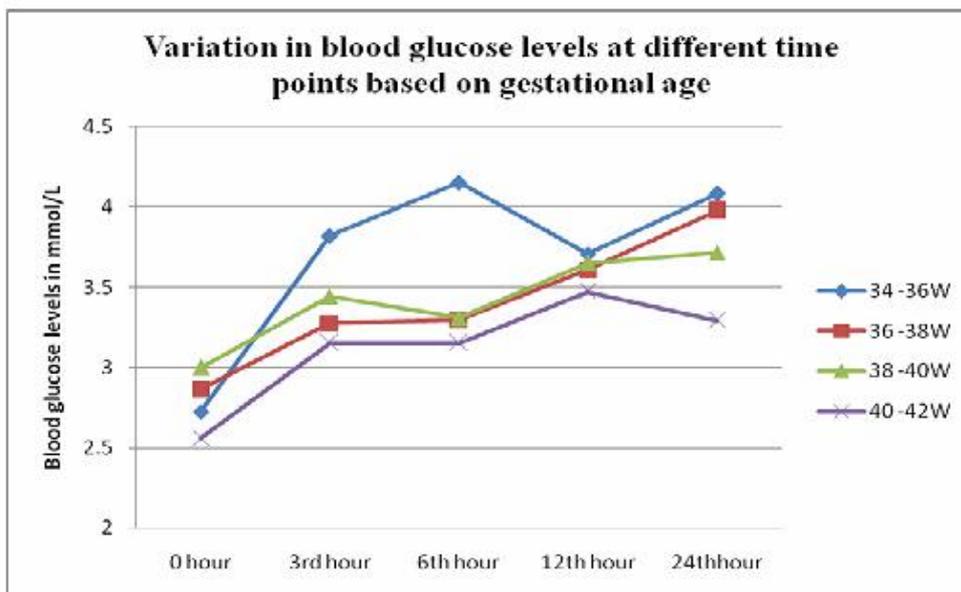
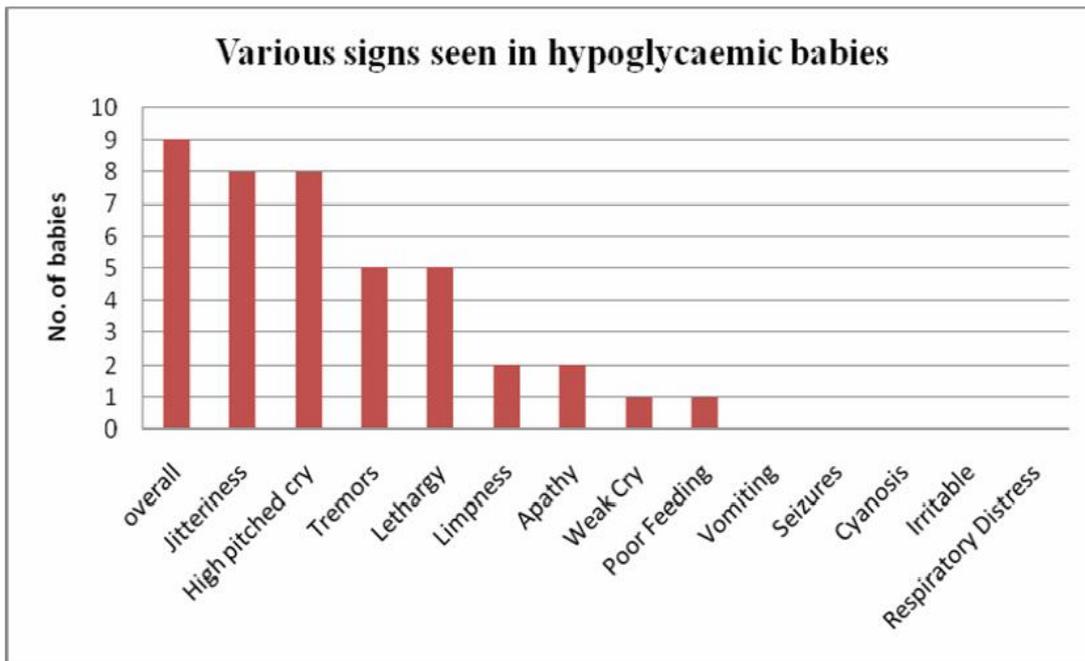
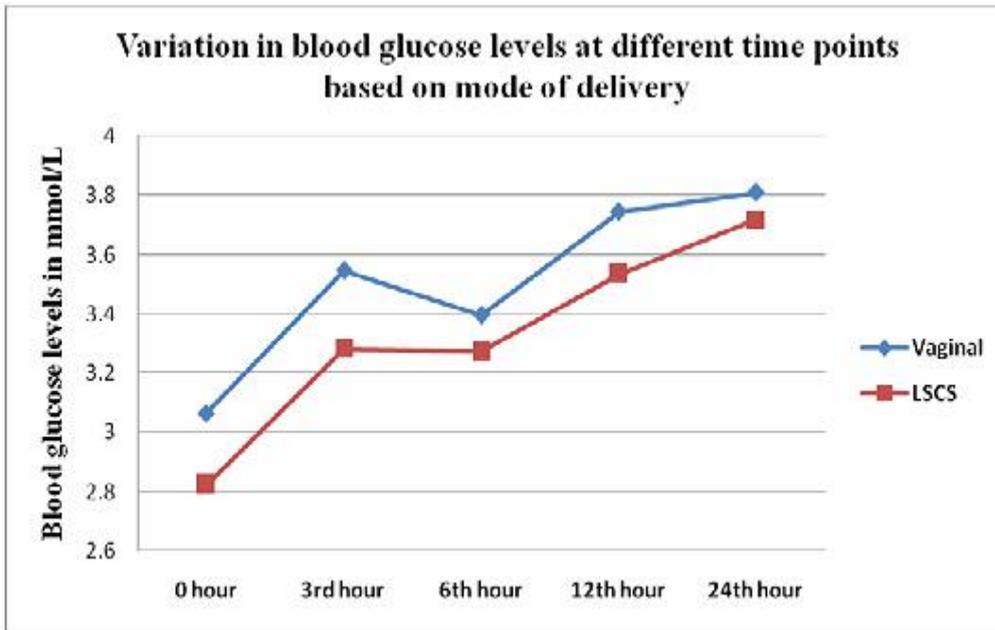


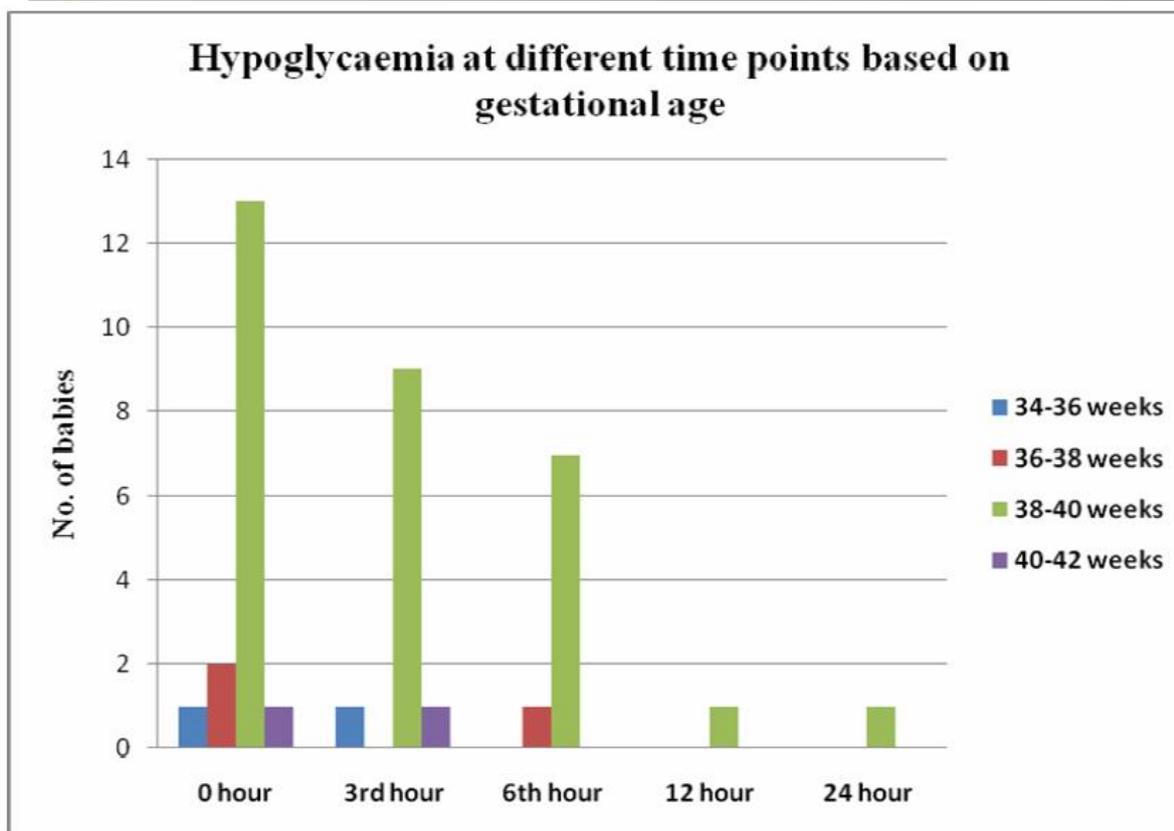


Table 1: Variation in blood glucose levels in mmol/L in newborns in 5 different time points

New born blood glucose levels in mmol/L	0 hour	3rd hour	6th hour	12th hour	24th hour
Mean	2.9428	3.4117	3.3328	3.6378	3.7633
Std. Error of Mean	0.07694	0.10121	0.11112	0.09975	0.07735
Median	3.0000	3.4444	3.1111	3.4444	3.7222
Std. Deviation	0.76937	1.01209	1.11121	0.99746	0.77346
Minimum	1.50	1.78	1.94	2.11	1.67
Maximum	5.11	7.78	7.72	7.56	7.33







DISCUSSION

Blood glucose levels were studied in 100 mothers and newborns irrespective of gestational age, weight for gestational age, sex and mode of delivery. It revealed that, there was a negative correlation between the maternal blood glucose taken within half an hour of delivery or at the time of delivery and neonatal blood glucose level taken at birth. The blood glucose levels were low in neonates at birth, whose mothers had high blood glucose levels. This correlates with the study done by Singhi et al who also found a negative correlation between the maternal blood glucose and neonatal blood glucose levels taken at birth⁷. In this study the blood glucose concentrations were assessed at 5 different timepoints: 0, 3, 6, 12 and 24 hours of life. It was found that, the lowest mean blood glucose levels were seen at 0 hour, then there was mild increase in the mean blood glucose levels at 3rd hour followed by a minimal decrement at 6th hour. Then there was mild increment at 12th hour and the maximum blood glucose levels were reached by 24th hour. This correlates with the study done by Cornblath et al who found that, blood glucose levels in neonates normally fall in the first few hours after birth while endogenous glucose production is beginning. Levels then rise to reach a steady state glucose concentration by 2 to 3 hours after birth⁸. It was found that the mean blood glucose levels were high in babies delivered vaginally, at all the time points compared to the babies delivered by LSCS. The range of blood glucose levels was narrow in babies delivered by LSCS, at all the time points when compared to babies delivered by normal vaginal route. This correlates with the study done by Kayiran et al, who showed that neonates delivered by caesarean section had lower plasma glucose levels, as caesarean section involves less stress for the baby and the possible impact of perinatal anaesthesia, compared to a vaginal delivery.



After a caesarean section, mothers are often not ready to breastfeed for a relatively longer period of time compared to those after vaginal delivery⁹.

At birth the mean blood glucose levels were noted to be low in 34-36 weeks and 40-42 weeks GA neonates. It was high in 38-40 weeks GA neonates. But later at 3 hours the mean blood glucose levels were high in 34-36 weeks GA neonates but remained low in 40-42 weeks GA neonates. The mean blood glucose levels were almost equal in 36-40 weeks. Similar results were seen in a study done by Kayiran et al, who found that there was a significant decrease in blood glucose concentrations for pre-terms, in the first hour of life, suggesting they were less able to adapt to the cessation of intra uterine nutrition compared to term neonates. He also found that glucose concentration of newborns were observed to rise with increasing gestational age but in this study it was found that glucose levels increased with the gestational age up to term gestation and then was found to decrease in post-term neonates.

There was a wide variation in the incidence of hypoglycemia. In this study 17% of the babies were hypoglycemic at birth, 11% at 3rd hour, 7% at 6th hour, 1% at 12th hour and 1% at 24th hour. This can be correlated with study done in Tehran Children's Hospital of Iran where the incidence of hypoglycemia was 15.15%.¹⁰

Hypoglycemia was noted in 25% of 34-36 weeks GA babies, 10% of 36-38 weeks GA age babies, 18% of 38-40 weeks GA babies and 25% of 40-42 weeks GA. This showed that pre-term and post-term babies were more prone for hypoglycemia when compared to term babies in contrast to a study done by Dorina Radica et al, who found hypoglycemia in 45.53% of term neonates, 52.84% of preterm neonates and 1.63% of post-term neonates¹⁵. In this study none of the babies showed signs of hypoglycemia at birth. Overall 9% babies had signs of hypoglycemia, 7% showed signs at 3rd hour, 6% at 6th hour and 1% at 12th and 24th hours respectively.

CONCLUSION

There was a statistically significant negative correlation between the maternal and neonatal blood glucose levels taken at birth. This suggests that neonates whose mothers have increased blood glucose levels require monitoring and care should be taken not to administer high dextrose concentration I.V fluids to mothers, as it may lead to hypoglycemia in the baby. Blood glucose levels were found to be low at 0 hour, then there was a mild increase in the mean blood glucose levels at 3rd hour followed by a minimal decrease at 6th hour.

Then there was further increment of more than the 3rd hour, at 12th hour and the maximum blood glucose levels were reached by 24th hour. This suggests that 0 and 6th hour are the vulnerable time points for hypoglycemia and require blood glucose monitoring.

At birth the blood glucose levels were noted to be low in 34-36 weeks and 40-42 weeks GA neonates and high in 38-40 weeks GA neonates, revealing that preterm and post-term neonates have low blood glucose levels compared to term neonates.

This suggests that pre-term and post-term babies require blood glucose levels monitoring for hypoglycemia. The mean blood glucose levels were high in babies delivered vaginally, at all the time points compared to the babies delivered by LSCS. This suggests that babies delivered by LSCS require blood glucose levels monitoring, as they are at risk for hypoglycemia.

The major signs of hypoglycemia noted were jitteriness in 8 babies (88%), high cry in 8 babies (88%), lethargy in 5 babies (55%), tremors in 5 babies (55%), limpness in 2 babies



(22%), apathy in 2 babies (22%), weak cry in 1 baby (11%) and poor feeding in 1 baby (11%). This suggests that there is a wide variation in signs of hypoglycemia in neonates. The babies showing these signs should be carefully monitored for hypoglycemia. 4 babies were born to diabetic mother of whom 3 were hypoglycemic. This suggests that, infants of diabetic mother are prone for hypoglycemia and should have their blood glucose levels monitored.

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BIOGRAPHY

Prof .Gaddam Zion Eluzai

Prof .Gaddam Zion Eluzai has obtained his early education in Hyderabad ,Telangana State Bachelor's MBBS and Master's degrees MD Pediatrics from Rajiv Gandhi University of Health Sciences ,Bangalore .He belongs to a dedicated doctors family from Telangana state and whose mother Dr. Salome a senior Obstetrician Retd.Civil Surgeon Specialist was Awarded lifetime achievement as a best doctor in Mahbubnagar Dist. by Telangana Govt.for the year 2015. He has obtained MD pediatrics doctoral degree in the year 2000 under the guidance of Prof. H Veerbhadrappa who was a Syndicate Member of the said university and head of the Dept.of PediatricsMahadevappaRampur Medical College,Gulbarga Karnataka. Dr Gaddam Zion Eluzai started his career as Asst.Professor in Shandan Institute of Medical Sciences Hyderabad Telangana State under the NTR University of Health Sciences Vijaywada ,Andhra Pradesh . Later joined Sri VenkatSai Medical College Hospital and Post



Graduate Teaching Institute, Mahabubnagar, Telangana State as Asso. Professor and currently he is Professor and Head of the Department of Pediatrics in the said institute.

His interests are in Neonatology, Pediatrics and Neonatal critical care are his areas of interest and has vast experience in neonatal critical care, and has also worked in Armed Forces Southern Region Hospital Post Graduate teaching Institute in Khams Mushayath Saudi Arabia.

Published 2 scientific papers on Perinatal Asphyxia in Karnataka Journal Of Pediatrics during his MD Pediatrics Course. Prof. Dr. Gaddam Zion Eluzai has been an ardent teacher, consultant Pediatrician and Neonatologist, has been a guidance to Post Graduate and Undergraduate students in his 15 yrs of experience post MD. He has published over 12 scientific papers in various indexed Journals. He has been a guiding force to many of the Post Graduate Pediatric students for research and scientific papers, chairman and examiner for various Post Graduate and Undergraduate University examinations under the Medical Council Of India New Delhi.

Dr. B DINESH KUMAR

Dr. B DINESH KUMAR is a final year postgraduate from SVS medical college and hospital Mahabubnagar, Telangana. Dr. Dinesh has obtained his early education from Hyderabad and acquired MBBS degree from the prestigious Osmania medical college and general hospital Hyderabad under Dr. NTR University of Health Sciences, Vijayawada. He has a paramount interest in critical care of newborn and wishes to continue extensive research and study in neonatology.

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