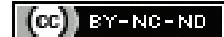


Effect of Mode of Delivery on Cord Blood Thyroid Stimulating Hormone Levels- A Cross-sectional Study

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ABSTRACT

Introduction: Cord Blood Thyroid Stimulating Hormone (CBTSH) level estimation is an accepted screening tool for Congenital Hypothyroidism (CH). CBTSH levels are affected by many perinatal factors including mode of delivery. Previous studies have shown conflicting results on effect of mode of delivery of CBTSH levels.

Aim: To study CBTSH profile in neonates born at tertiary care referral centre and to analyse the influence of mode of delivery (vaginal vs caesarean) on CBTSH levels.

Materials and Methods: This was a cross-sectional study conducted at Mahatma Gandhi Medical College and Hospital from February 2014 to August 2015. Study population included

856 neonates (males=437, females=419). The CBTSH levels were estimated using Electrochemiluminescence Immunoassay 'ECLIA' on the Elecsys 2010 analyser. CBTSH levels between vaginally delivered and caesarean section born babies were compared. The values were tabulated as mean and statistically analysed using Statistical Package for the Social Sciences (SPSS) software version 21.

Results: Mean CBTSH level of vaginally born neonates were 9.59 (median 7.0) in comparison to 9.11 (median 7.15) in caesarean born babies, this difference was not statistically significant.

Conclusion: As per the present study finding mode of delivery did not have any significant effect on CBTSH levels.

Keywords: Caesarean section, Congenital hypothyroidism, Newborn screening, Perinatal factors, Vaginal delivery

INTRODUCTION

Congenital hypothyroidism is the most common preventable cause of mental retardation. It has an incidence of 1 in 4000 births in various neonatal screening programs [1]. Screening for CH is one of the most cost-effective tools for preventing mental retardation in the population. The Indian Society for Paediatric and Adolescent Endocrinology and The Indian Academy of Paediatrics has recommended screening for every newborn by testing cord blood, or postnatal blood, ideally at 48 to 72 hours of age for TSH levels [2,3]. Cord blood TSH value of >20 μ U/mL is seen as safe cut-off for calling patients for retesting [2]. However, apart from CH, some other factors may raise CBTSH levels like birth asphyxia, difficult deliveries, perinatal stress events, birth weight, sex and mode of delivery [4,5]. Some studies reported that plasma concentration of thyroid hormones remains lower in caesarean section infants than other delivery methods [6,7]. However, Fuse Y et al., reported no significant difference among the infants delivered vaginally by vacuum extraction, or by caesarean section [8]. False positive elevation of CBTSH levels due to perinatal factors

will increase the number of patients requiring repeat testing. Thus, there are conflicting reports regarding the CBTSH levels difference in various delivery modes. Present study was undertaken to examine the effect of method of delivery on cord blood concentration of TSH.

MATERIALS AND METHODS

A cross-sectional study of all consecutively delivered newborns at Mahatma Gandhi Medical College and Hospital was conducted from February 2014 to August 2015. The Ethical Committee approved the study protocol (MGMEC2014/12). A total of 856 newborns were enrolled in the study after taking written and informed consent of parents. Inclusion criteria were- full-term (gestational age more than 37 weeks), normal birth weight babies (birth weight more than 2.5 kg) delivered by standard vaginal delivery or elective caesarean section. Preterm, low birth weight babies and full-term babies requiring Neonatal Intensive Care Unit (NICU) care were excluded. Neonates whose mothers had a history of thyroid disorder or who took thyroid affecting medications were also excluded. At the time

of the baby's birth, 10 mL of blood sample was collected in a sterile container drawn from the umbilical cord's placental site before ligation. TSH was estimated within 24 hours by ECLIA on the Elecsys 2010 analyser. CBTSH levels of the two groups, i.e., normal vaginal delivery and caesarean section babies were compared, and statistical analysis was done. All newborns with CBTSH more than 20 mIU/L were recalled after seven days for repeat T4 and TSH estimation and confirmation of CH.

STATISTICAL ANALYSIS

All the data was entered into Microsoft Excel 2007 spreadsheet and analysed using SPSS software version 21. Mann-Whitney U test were used to test the nominal significance at the p-value <0.05 level, for high significance, the p-value was <0.01 and not significant p-value >0.05. Descriptive statistics of the various clinical and laboratory parameters were performed.

RESULTS

A total of 856 healthy term neonates were enrolled in the study. Of which, 546 (64%) were born of normal full-term vaginal delivery, and 310 (36%) were delivered by elective caesarean section before the onset of labour. There was no significant difference in sex, birth weight, and gestational age in the two groups [Table/Fig-1]. Fifty newborns had CBTSH levels more than >20 μ IU/mL. Though the median CBTSH level of vaginally born neonates was 7 and it was more than the median CBTSH level of the caesarean newborn, i.e., 7.15. Mann-Whitney U test with two tailed hypothesis and significance level 0.05 was applied in view of skewed data. The difference between two groups was not statistically significant [Table/Fig-2].

Variables	Vaginal delivery (N=546)	Caesarean section (N=310)
Mean CBTSH levels (IU/mL)	9.59 \pm 10.18	9.11 \pm 8.21
Mean gestational age (weeks)	38.73 \pm 0.96	38.62 \pm 0.92
Mean birth weight (kg)	2.86 \pm 0.28	2.94 \pm 1.68
Male: Female ratio	1:1	1.1:1

[Table/Fig-1]: Baseline characteristics of two groups.

CBTSH (IU/mL)	Normal vaginal delivery	Caesarean section	Z-value	p-value
	N=546	N=310		
Median	7.0	7.15	0.457	0.648 p>0.05 Not Significant
Interquartile Range (IQR)	5.20-9.20	4.90-9.20		

[Table/Fig-2]: Cord blood TSH levels of neonates according to mode of delivery.

Mann-Whitney U test, statistical significance defined is p<0.05

DISCUSSION

Congenital hypothyroidism is the most common preventable cause of mental retardation in children. The CBTSH measurement for screening CH has many advantages, ease of collection as it is non-invasive and repeat sampling if needed, can be done, and the results would be available before the mother leaves the hospital. This study demonstrated the effect of the delivery process on the cord blood TSH levels.

Mean CBTSH value of the study population (both vaginal and caesarean born babies) was 9.30 which was comparable to findings of previous studies with mean TSH value from 6 to 10 μ IU/mL [9-11]. Though few other studies also noted higher mean TSH value of more than 10 μ IU/mL [12-14].

Several studies have been conducted to assess the influence of mode of delivery on cord blood TSH and came up with paradoxical results. Many authors have reported a significant correlation between methods of delivery and cord blood TSH level [15,16]. They demonstrated that CBTSH concentration of the babies following elective caesarean section was lower than that of normal vaginal delivery. Some authors further argue on "which of the modes of delivery increases cord blood TSH level? Ramezani Tehrani F et al., revealed that the mean CBTSH level of vaginal and emergency caesarean section was significantly higher than that of the elective caesarean section [6]. However, some scholars reported the absence of a significant correlation between mode of delivery and newborns cord blood TSH level [17,18].

In present study, mean CBTSH level in newborns delivered by vaginal delivery was similar to, i.e., 9.59 (median-7.0) than those delivered by elective caesarean section, i.e., 9.11 (median 7.15). The reason for the increase in TSH level in emergency caesarean section, vaginal delivery, and instrumental delivery than elective caesarean section was proposed to be due to release of a high amount of catecholamine during parturition and catecholamine release is more elevated in vaginally delivered newborns compared to those born by elective caesarean section [4]. The postnatal surge in the TSH level is mediated through α -adrenergic stimulation. Stimulation of α -adrenergic might affect the Hypothalamic-Pituitary-Thyroid (HPT) axis at birth, resulting in TSH surge [19,20]. But contrary to these explanations in the present study, mode of delivery was not found to affect CBTSH levels. As other parameters affecting CBTSH levels like prematurity, birth asphyxia, and maternal disorders were already excluded in this study, it offers a unique opportunity to assess the cord serum levels of thyroid hormone in physiological conditions. Further studies are needed with larger sample size and better design to explore the effect of delivery stress on thyroid profile of newborns.

Limitation(s)

The main limitation of present study was its small sample size. In present study due to financial constraints we measured only cord blood TSH levels without cord blood Triiodothyronine (T3), Tetraiodothyronine (T4) levels. Testing for T3, T4 levels along with CBTSH and retesting the hormone levels of newborn by heel prick on fifth day of life would have helped us to understand in better way the effect of delivery stress on newborn TSH levels.

CONCLUSION(S)

No statistical difference was found in CTSH levels between vaginally and caesarean delivered newborns.

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