

A STUDY OF EFFECT OF PERINATAL ASPHYXIA ON THYROID HORMONE IN NEONATESRajesh Tikkas¹, Pankaj Kumar Pal², Manasi Garg³**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: AIMS AND OBJECTIVE: To study the effect of perinatal asphyxia on thyroid hormones of term neonates. **MATERIAL AND METHODS:** It was a prospective case control study and it was conducted in department of pediatrics, Kamala Nehru Hospital Gandhi Medical College, Bhopal. Total 60 full term neonates who have completed 37 wks of gestation at birth included in study, 30 asphyxiated newborn taken as cases and 30 healthy neonates as control. For inclusion of cases criteria was, 1 and 5 minute APGAR score <7 and Control were selected with criteria of 1-minute APGAR score >7 and no sepsis setting. Classification of HIE done on the bases of Sarnat and Sarnat staging. Blood samples were collected for determination of thyroid profile (T₄, T₃ and TSH), first within 6 hours of birth and seconds 18 to 24hour of age. **RESULT:** Out of 30 cases, 13.13% were HIE-I, 50% were HIE-II and 36.67% were HIE-III. Mean value of TSH was low at 6 hours as well as at 18-24 hours between case and control group while mean value of T₃ and T₄ were low at only 18-24hrs of age. **CONCLUSION:** The mean T₃, T₄ and TSH levels at birth of asphyxiated newborn was significantly lower than the control group at 18-24 hours. Due to low TSH surge, asphyxiated babies could not increase their T₃ and T₄ level significantly.

KEYWORDS: APGAR score, Thyroid profile, HIE.

INTRODUCTION: Perinatal asphyxia results in an insult to newborn due to deficiency of oxygen to various organs and affects almost all the organ systems of body.^{1,2} after an episode of asphyxia some babies may recover fully and some may develop permanent sequel.

There are few studies evaluating the effect of perinatal asphyxia on thyroid hormone.³⁻⁶ most of these studies conducted in developed countries and cord blood pH is used to define asphyxia, while in India most of the study used clinical criteria like APGAR score to define birth asphyxia.

AIM: To study the effect of perinatal asphyxia on thyroid hormone of term neonate.

MATERIAL AND METHODS: The present study is a prospective case control study and it was conducted in department of pediatrics, Kamala Nehru Hospital Gandhi Medical College, Bhopal (MP) from September 2011 to September 2012.

Total 60 full term neonates who have completed 37wks of gestation and weight >2100gm at birth included in study, 30 asphyxiated newborn taken as cases and 30 healthy neonates as control, delivered normal vaginally or by LSCS in Sultania Zanana hospital. Written informed consent was taken from parents. It was approved by institutional committee of Gandhi Medical College. For inclusion of cases criteria was, 1 and 5 minute APGAR score <7 and neonates with any evidence of sepsis, intrauterine infection, congenital anomaly were excluded from study. Control were selected with criteria of 1- minute APGAR score >7 and no sepsis setting. Classification of HIE done on the bases of the bases of Sarnat and Sarnat staging.

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Two blood samples were collected for determination of thyroid profile (T_4 , T_3 and TSH), first within 6 hours of birth and seconds 18 to 24hour of age. A 3 ml blood sample of mother was collected. T_3 , T_4 and TSH measured by chemiluminescent immunoassay (CLIA). Descriptive statistical analysis was done in our study. Continuous variables are described on Mean \pm SD and categorical variables are described in number (%). Student's t test used to assess continuous variables for pair matched samples with a confidence limit of 95% and chi square test to assess categorical variables. SPSS statistical software used to analyze data.

OBSERVATION:

Sl. No.	Birth Weight	Cases	Control	Total
1	>2500	22(73.33%)	23(76.67%)	45(75%)
2	<2500	8(26.67%)	7(23.33%)	15(25%)
Total		30	30	60

Table 1: Distribution of newborns according to their birth weight

Sl. No.	Stages	Cases	%
1	HIE-I	4	13.33
2	HIE-II	15	50
3	HIE-III	11	36.67
Total		30	100

Table 2: Distribution of hypoxic ischemic encephalopathy in asphyxiated newborns

Out of 30 cases, 13.13% were HIE-I, 50% were HIE-II and 36.67% were HIE-III.

Sl. No.	Thyroid status	Cases (n=30)	Control (n=30)	P value
1	T_3 (ng/dl)	119.39 \pm 20.05	128.17 \pm 23.18	0.1
2	T_4 (mcg/dl)	8.01 \pm 1.68	8.07 \pm 1.53	0.8
3	TSH(mIU/L)	3.88 \pm 1.19	4.01 \pm 1.04	0.65

Table 3: Mean thyroid levels of study and control group mother

There was no significant difference in mean value of T_3 , T_4 and TSH between case and control group of mothers.

Sl. No.	Thyroid profile	Cases 6 hours	Controls 6 hours	P value	Cases 18-24 hrs	Controls 18-24 hrs	P value
1	T_3 (ng/dl)	70.03 \pm 17.08	74.46 \pm 19.29	0.3	108.2 \pm 20.28	151.66 \pm 29.34	<0.001
2	T_4 (mcg/dl)	9.01 \pm 1.55	9.03 \pm 1.35	0.9	10.86 \pm 1.7	12.93 \pm 2.4	<0.001
3	TSH(mIU/L)	4.4 \pm 2.84	7.95 \pm 2.23	0.001	3.46 \pm 2.45	6.16 \pm 2.21	<0.001

Table 4: Comparison of mean T_3 , T_4 and TSH of cases and control

(p value <0.05 is significant)

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In our study difference of mean value of TSH was statically significant at 6 hours as well as at 18-24 hours between case and control group while mean value of T₃ and T₄ were statistically significant at only 18-24 hrs. of age.

SL. No.		T ₃ (ng/dl)		T ₄ (mcg/dl)		TSH (mIU/L)	
		At 6 hours	At 18-24 hrs	At 6 hours	At 18-24 hrs	At 6 hours	At 18-24 hrs
1	HIE-I (n=4)	84±19.12	135.5±22.57	9.325±1.57	11.05±1.66	8.17±3.25	6.64±2.76
2	HIE-II (n=15)	75.53±17.08	112.27±20.28	9.22±1.55	10.99±1.56	5.12±2.85	3.98±2.45
3	HIE-III (n=11)	57.45±18.28	94±21.41	8.59±1.59	10.64±1.66	2.05±2.93	1.58±2.51

Table 5: Mean thyroid levels in different group of cases at the age of 6 hours and 18-24hrs

On comparison of mean value of T₃ and TSH level of newborn at the age of 6hrs and 18-24hrs between HIE-I and HIE-III, HIE-II and HIE-III it was statistically significant ($p < 0.05$), while mean value of T₄ was not significant.

DISCUSSION: Perinatal asphyxia continues to be an important cause of morbidity and mortality in newborn. Organ dysfunction depends in asphyxiated neonates on duration of asphyxia and early management. Because of diving reflex in newborn blood diverted from less vital organ to more vital organs like brain, heart and kidney. The present study included 60 neonates of which 30 were cases of perinatal asphyxia and 30 were healthy neonates as control. Asphyxiated newborn were further divided into three groups on the bases of severity of hypoxic ischemic encephalopathy (HIE).

In the present study, the mean weight in asphyxiated newborns was 2.732kg while in control group it was 2.81kg. Study conducted by Tahivoric HF³, Borges et al.⁷ mean birth weight was 3.6kg and 3.3kg respectively. This deference in the mean weight of newborn observed in our study and other studies is due to ethnic and geographic variation.

In our study 90% asphyxiated newborn and 83%new born in control group were delivered vaginally and rest was delivered by caesarian section and there is no statistical deference was observed in mean thyroid values of newborn delivered by either route. These observations were similar to those observed by Shi LX,⁸ Beilawski J et al,⁹ Fuse Y et al,¹⁰ Eltom A et al.¹¹

In our study cases were classified in three group as per the Sarnat and Sarnat staging of hypoxic ischemic encephalopathy (HIE), 13.33%were in stage I, i.e. mild, 50% were in stage II i.e. moderate and 36.67% were in stage III i.e. severe.. On comparison of mean value of T₃ and TSH level of newborn at the age of 6hrs and 18-24hrs between HIE-I and HIE-III, HIE-II and HIE-III it was statistically significant ($p < 0.05$), while mean value of T₄ was not significant.

The deference in mean T₃, T₄ and TSH value of cases group mother and control group mother was not statistically significant ($p \text{ value} > 0.05$).

The mean T₃ and T₄ of study group and control group newborns within first 6 hours were 70.03, 9.01 and 74.46, 9.03 which was statistically not significant. The mean TSH of study group and control group newborns at the age of 6 hours was 4.4 and 3.6 respectively. The difference was found

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to be statistically significant (p value >0.001). We observed in our study that normal physiological TSH surge was absent in asphyxiated newborns.

The mean value of T_3 and T_4 was similar in both the groups within 6 hours. These findings were comparable to Borges et al,⁷ and Pereira DN et al⁶ whereas Thivoric HF³ found that mean value of T_3 and T_4 were significantly lower in cord blood of asphyxiated newborns compared to healthy term babies.

We observed in our study that means of TSH were significantly lower in study group when compared to control group (p value <0.001) within 6 hours of life but on contrary Borges et al,⁷ observed rapid increase in TSH at 5 min and 3 hours of birth.

Sak et al,¹² Kim EY¹³ observed a significantly higher levels of TSH and lower levels of T_3 , T_4 and FT_4 in cord blood in asphyxiated newborn. They had not studied mean thyroid levels within 6hrs or 18-24 hrs of birth. Rashmi Seth et al,¹⁴ reported same finding in her study. The difference in results found in our study and other may be because of difference in timing of collection of samples.

In our study mean value of T_3 and T_4 and TSH of study and control newborns during 18-24hrs after birth were 108.2, 10.86, 3.46 and 151.66, 12.93, 6.16 respectively. The difference in mean value of T_3 , T_4 and TSH between study and control group was found significant (p value <0.001).

This study showed that asphyxiated newborns failed to increase their T_3 and T_4 levels due to decrease in TSH surge when compared to normal newborn. Similar results were observed by Pereira DN et al,⁶ Borges et al⁷ observed that mean value of FT_3 and FT_4 levels were significantly lower at 24 hrs and 48 hrs in the asphyxiated group than the control group but the mean levels of TSH were similar. In contrast to all studies, Franklin R C et al,⁴ found no significant correlation in birth asphyxia and thyroid profile in newborn.

CONCLUSION: After evaluating all parameter of the study, it was seen that there was a decrease in the physiological TSH surge among asphyxiated neonates due to effects of asphyxia. Following this low TSH surge, the corresponding increase in T_3 and T_4 was diminished in asphyxiated neonates. This suppression of thyroid hormones needs to be followed up on a long term basis to determine its detrimental effects on growth and development of neonates.

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