



Effects of neonatal Thyroid Stimulating hormone and free T4 levels on Apgar score, Maturity and Modes of delivery

Authors

Tabassum Yasmin¹, Shafat Imam Siddiqui², K.R. Prasad³

Naved Ahmad⁴, Akash Gupta^{5*}

¹MD, Assistant Professor, Department of Biochemistry, Rama Medical College and Hospital, Pilakhua, Hapur, U.P.

²MD. Assistant Prof, Department of Medicine, Katihar Medical College, Katihar, Bihar

³MD, Professor, Department of Biochemistry, Katihar Medical College, Katihar, Bihar

⁴PhD scholar, Department of Biochemistry, Subharti Medical College, Meerut, U.P.

^{5*}MD, Assistant Professor, Department of Biochemistry, Rama Medical College and Hospital, Pilakhua, Hapur, U.P.

*Corresponding Author

Dr Akash Gupta

Department of Biochemistry Rama Medical College and Hospital, Pilakhua, Hapur, U.P

Email - akash_inspace@yahoo.com

Abstract

Thyroid disorders are four to five folds more common in women particularly during child bearing period. Cord blood is a source for the determination of thyroid related hormones in neonates. To find the effect of TSH and fT4 levels on apgar score of neonates, on term and preterm delivery and on mode of delivery. Total 80 pregnant and 80 non pregnant females were selected and their serum TSH and fT4 levels and cord blood of new born were estimated by ELFA technique on Minividas automated analyser. In our study we have found that there was no significant correlation of serum TSH and fT4 between the cases and controls of both the age groups, between asphyxiated and non asphyxiated neonates and the neonates born by vaginal delivery or caesarean section. Serum TSH was found to be significantly higher in the preterm neonates as compared to term neonates. Our study suggests that TSH has influence on maturity of neonates born to pregnant mothers. But TSH and fT4 does not have any influence on Apgar score and mode of delivery

Keywords – TSH, fT4, Cord Blood, Apgar score, Mode of delivery

Introduction

Around 42 million Indians are suffering from thyroid disorders and about 200 million people are at risk of iodine deficiency disorders. ^[1,2] Thyroid disorders are more frequent in women of child bearing age. ^[3] Thyroid hormones deficiency during gestation is associated with permanent brain damage. ^[4-6] Cord blood is a source for the determination thyroid related hormones in neonates. ^[7] The postnatal surge in TSH levels, common to all newborn is considered to be mediated through alpha adrenergic stimulation following the cold stress. ^[8] This alpha adrenergic stimulation in turn might be responsible for the observed increase in cord blood TSH in subjects who had low Apgar score, required active resuscitation after birth were born through vaginal delivery or non-elective lower section caesarean section and to primiparous mother. ^[9] Neonatal exposure to cold external environment at time of the parturition may evoke a marked and transient elevation of TSH. ^[10] Asphyxia cause both anatomical as well as physiological damage of different organs. Different causes of fetal hypoxia, before and during birth results in gestational age specific neuropathy. A better understanding of the maternal fetal inter relationships related to the ongoing thyroid process must remain our constant quest.

Materials and methods

The present hospital based study was undertaken in the department of Biochemistry in collaboration of the department of Obstetrics and Gynaecology

and paediatrics, Katihar Medical College and Hospital, Bihar. A total of 80 pregnant women (cases) and 80 non pregnant women (controls) accompanying the pregnant women were selected. Both, cases and controls were not on any medication at the time of investigations. The cases and controls were informed about the risk and benefit of the study. Written consent was taken from all the subjects. The study was approved by institutional ethical committee. The new born of the pregnant mother were divided into two groups of Apgar score < 4 (asphyxiated) and ≥ 4 (non-asphyxiated). The study was extended to find out the effect of mode of delivery (vaginal or cesarian) and maturity (term or preterm) on pituitary thyroid axis of new born of above mothers. Venous blood of pregnant mother and cord blood of new born of these mothers was collected and allowed to clot to obtain the serum. Estimation of serum fT4 and TSH was done by enzyme linked fluorescent technique on Minividas instrument from Biomerieux, France. Reference range of TSH is - 0.34 to 4.25 μ IU/ml and of fT4 is - 0.7 to 1.24 ng/dl. ^[11]

Statistics Data was analysed using the statistical package programme (SPSS) ver15. The data for biochemical analysis were expressed as mean \pm SD and p value of < 0.05 was considered as significant.

Results

Our study was based on 160 subjects, out of which 80 were pregnant ladies (cases) and 80 were non pregnant ladies (controls). Mean \pm SD

values of TSH and fT4 of cases and controls having age up to 30 years and > 30 years are shown in Table 1 and 2 respectively. In our study we have found that there was no significant correlation of serum TSH and fT4 between the cases and controls of both the age groups.

Also, there was no significant correlation of serum TSH and fT4 between asphyxiated and non-asphyxiated neonates as shown in Table 3.

A significant correlation was found in serum TSH between preterm neonates and term neonates and

the value of serum TSH was found to be significantly higher in the preterm neonates as compared to term neonates. But there was no significant correlation of serum fT4 between preterm and term neonates. (Table 4)

We have also compared serum TSH and fT4 between neonates delivered by vaginal route and caesarean section and no significant correlation was found. (Table 5)

Table1. Comparison of TSH and fT4 values between the pregnant mothers and controls in the age groups up to 30 years.

	TSH (μIU/ml)	fT4 (ng/dl)
Case	2.84 ± 2.13	1.12 ± 0.51
Control	2.91 ± 1.17	1.08 ± 0.48
P value	0.68	0.41

Table2. Comparison of TSH and fT4 values between the pregnant mothers and controls in the age group more than 30 years.

	TSH (μIU/ml)	fT4 (ng/dl)
Case	2.62 ± 1.31	1.19 ± 0.42
Control	3.10 ± 1.40	1.10 ± 0.50
P value	0.11	0.36

Table3. Comparison of TSH and fT4 values between the asphyxiated and non-asphyxiated neonates.

	TSH (μIU/ml)	fT4 (ng/dl)
Asphyxiated	7.36 ± 6.50	2.61 ± 0.93
Non asphyxiated	19.6 ± 11.50	3.11 ± 1.23
P value	0.95	0.03

Table4. Comparison of TSH and fT4 values between the preterm and term neonates.

	TSH (μ IU/ml)	fT4 (ng/dl)
Preterm neonates	18.05 \pm 9.70	2.70 \pm 0.87
Term neonates	7.84 \pm 7.90	3.08 \pm 1.26
P value	0.00	0.06

Table5. Comparison of TSH and fT4 values between the babies delivered by vaginal route and caesarean section.

	TSH (μ IU/ml)	fT4 (ng/dl)
Vaginal delivery	11.39 \pm 12.95	3.38 \pm 1.63
Caesarean section	10.11 \pm 17.39	2.98 \pm 0.93
P value	0.68	0.17

Discussion

Various authors have correlated an increase in TSH values with factors like birth asphyxia and difficult deliveries, ^[12] perinatal stress events, ^[13] instrumental delivery ^[14] and negatively with cesarian sections as mode of delivery. ^[15]

Rashmi et al ^[12] reported that infants with birth asphyxia (Apgar score < 4 at 5 minutes) had significantly higher cord blood TSH levels (mean 31 μ IU/ml, n=18) as compared to those without (mean 10.4 μ IU/ml) (p < 0.01). The highest TSH levels were noted in neonates delivered by forceps extraction (mean 29.4 μ IU/ml, n=17) and lowest levels in infants born by elective caesarean section (mean 8.7 μ IU/ml, n=149).

Suloviv V et al ^[16] reported that the serum T3 concentration in cord blood was significantly lower than that in the serum of the mother. However contrary to T3, rT3 in cord serum was

significantly higher than the maternal serum. Also, the level of TSH in cord blood was considerably higher than in maternal serum.

Avruskin et al ^[17] in their study found that total T3, T4 and TBG levels were all significantly higher than in normal non pregnant women in all trimesters (p <0.001). TSH levels remained unchanged in all three trimesters; values were 2.2, 2.0 and 2.0 μ IU/ml respectively. Free T4 levels were at lower limits (2.4, 2.5 and 2.2 ng/dl) and free T3 levels were below normal (0.29, 0.27 and 0.24 ng/dl). Maternal and cord fT3 and fT4 levels were not significantly different.

Pereira et al ^[18] reported in their study that gestational age, birth weight, sex, size for gestational age, mode of delivery and skin colour (white and non-white) were similar for both groups (with Apgar score < 3 and >8). No differences were found in mean levels of cord

blood TSH, T4, T3 and fT4 between the groups. In the samples collected 18 to 24 hrs after birth, mean levels of TSH, T4, T3 and fT4 were significantly lower in the asphyxiated group than in the control group. Mean concentrations of arterial TSH, T4 and T3 between 18 and 24 hrs of life were lower than concentrations found in the cord blood analysis in asphyxiated new borne, but not in controls.

Conclusion

Pregnancy is a physiological condition that causes profound alteration of metabolic as well as endocrine environment. But there is a beautiful adaptation and so in most pregnant women, thyroid profile maintains its level with in the non-pregnant reference range. Though the cord blood is an immediate source for the determination of thyroid related hormone in neonate, it is not a good specimen for knowing the thyroid status of the babies. Our study suggests that TSH has influence on maturity of neonates born to pregnant mothers. But TSH and fT4 does not have any influence on Apgar score and mode of delivery.

References

1. Fatourehchi V. Subclinical Hypothyroidism: An update for primary care physician. Mayo Clinic Proc. 2009;84(1):65-71.
2. Ahmad N, Panthari M, Gupta A, Chandra P, Nafees S. Prevalence of hypothyroidism among patients of Meerut, Uttar Pradesh: A hospital based study. Int J Med Sci Public Helath. 2013;2:517-521
3. Gliener D. The regulation of thyroid function in pregnancy: pathways of endocrine adaptation from physiology to pathology. Endocr Review. 1997;18:404-433
4. Ermans AM, Delange F, Thilly C, Bourdoux P. Usefulness of neonatal thyroid screening in evaluation and control of a goitrogenic environment. In: proceedings of an international symposium on nuclear medicine and related medical applications of nuclear techniques in developing countries. Document No. IAEA-SM-283/11. International atomic energy agency (IAEA). Vienna, Austria. 1986;pp351-358
5. Gliener D, Delange F, et al. Maternal and neonatal thyroid function at birth in an area of marginally low iodine intake. J Clin Endocrinol Metab. 1992;75(3):800-805
6. Thrope-Beeston JG, Nicolaidis KH, Felton CV et al. Maturation of the secretion of the thyroid hormone and thyroid stimulating hormone in the fetus. N Eng J Med. 1991;324(8):532-536
7. Naser M, Ibrahim A. Does cord blood of thyroid stimulating hormone, T3 and T4 levels in infants differ in different modes of deliveries? A comparative study. JRMS. 2008;15(2):34-37
8. Ballabio M, Nicolini U, Jowett T, Ruiz De Elvira MC, Ekins RP, Rodeck CH. Maturation of thyroid function in normal human foetuses. Clin Endocrinol. 1989;31:565-571.
9. Lee MM, Moshang T Jr. Endocrine disorders of the new born. In:Mac Donald,

- Mhaeri G, Seshia Mary MK, Mullet, Martha D. Avery 's Neonatology 6th ed, Philadelphia: Lippin Williams and Wilkins; 2005. pp1828-95
10. Gupta A, Srivastava S, Bhatnagar A. Cord blood thyroid stimulating hormone level – interpretation in light of perinatal factors. Indian Pediatrics. 2013;51:32-36
11. Dan Longo et al. Harrison's Text book of Internal Medicine, 18th ed, New York: McGraw Hill; 2011. vol2, pp 3595
12. Rashmi, Seth A, Sekhri T, Agarwal A. Effect of perinatal factors on cord blood thyroid stimulating hormones level. J Pediatr Endocrinol Metab. 2007;80:1014-1018
13. Kim EY, Park SK, Song CH, Lim SC. Perinatal factors affecting thyroid stimulating hormone TSH and thyroid hormone levels in cord blood. Korean J Pediatr. 2005;48:143-147
14. Chan LY, Folk WY, Sahota D, Lau TK. Cord blood thyroid – stimulating hormone level and risk of acidosis at birth. Europ J of Obst & Gyne and Reproductive Biol. 2006;124:173-177
15. Chan LY, Leung TN, Lau TK. Influences of perinatal factors on cord blood thyroid stimulating hormone level. Acta Obstetrica et Gynecologica Scandenevica. 2001;80:1014-1018
16. Sulovic V, Siljack B, Sinadinovic J. Serum T4, T3, rT3, TSH and TG levels in cord blood and maternal circulation at the time of delivery. Exp Clin Endocrinol 1984;83(3):256-264
17. Avruskin TW, Mitsuma T, Shenkman L, Sau K, Hollander CS. Measurements of free and total serum T3 and T4 in pregnant subjects and in neonates. Am J Med Sci. 1976;271(3):309-315
18. Pereira DN, Procianoy RS. Effect of perinatal asphyxia on thyroid stimulating hormone and thyroid hormone levels. Acta Paediatr. 2003;92(3):339-345