Original Research Paper

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Biochemistry

ASSAY OF UMBLICAL CORD BLOOD TSH LEVEL IN NEW BORN IN UTTARAKHAND

Dr. Farah Ahsan*	Assistant Professor, department of biochemistry, SGRR Medical College & Hospital, Dehradun. *Corresponding Author
Alok Khan	Department Of Biochemistry, SGRR Medical College & Hospital, Dehradun.
Dr B.C.Kabi	Professor, Department of Biochemistry, SGRR Medical College & Hospital, Dehradun.

ABSTRACT

Purpose : to estimate Cord Blood TSH level in newborn in area of Uttarakhand

Method: 100 newly born babies in Shri Mahant Indresh Hospital Obs & Gynae department who were admitted in pediatrics ward . Cord Blood TSH sample taken and run in Biochemistry department by Electrochemiluminescent Immunoassay.

Result: In my study with cord blood TSH of new born:

1 st correlation was done with maternal age to cord blood.

19-25

26-30 yrs p-value was 0.42 that is non significant.

>30 yrs

2nd correlation to Gestational age of baby

27-35week

35-39week p-value was 0.694 that is non significant.

>39week

3rd with correlation to birth weight of new born

1.5-2.5 kg

>2.5 kg p-value was .653 that is non significant.

4th Anaemic and non Anaemic mother to cord blood TSH,

with Anaemic mother p-value was 0.04 that is significant.

Non Anaemic mother p value was 0.165 which was non significant

5th Hypothyroid and Non-hypothyroid mothers with cord blood TSH .

Non-hypothyroid p-value was .683 that is non significant

Hypothyroid p-value was .689 that is non significant

In my study out of 101 patients,27 patients were in border line TSH(10- 20). Only 3 patients have congenital hypothyroidism TSH (>20). So with only Anaemic mother have significant value.

KEYWORDS :

INTRODUCTION:

The thyroid gland is the first endocrine gland to develop on the 24th day of gestation. It originates from the endodermal epithelial cells on the median surface of the developing pharyngeal floor arising from the first pharyngeal arch. The C-cells arise from neural crest cells that migrated to the ultimobranchial body which then fuses with the thyroid gland. If the above process fails and the thyroid gland does not form, congenital hypothyroidism occurs. Congenital hypothyroidism affects 1 in 4000 newborns, it is usually caused by thyroid dysgenesis (85%) and the other 15% is due to disorders of hormone synthesis (1). Thyroid dysgenesis is usually sporadic with only 2% having a positive family history (2). The main genes involved in dysgenesis are PAX8, TITF1 and FOXE1.

THYROID CHANES DURING PREGNANCY:

During pregnancy numerous physiological changes occur to provide the fetus with sufficient thyroid hormones, and these result in profound and complex effects on thyroid function. Firstly, the thyrotropic action of human chorionic gonadotrophin (hCG) results in low levels of TSH in the first trimester with a clear mirror image between the two. hCG is a glycoprotein hormone which consists of a 92 amino acid α-subunit and a 145 amino acid β-subunit coded by different chromosomes and are bound non-covalently before entering the circulation. The α-subunit is structurally homologous to that of TSH and their receptors are also analogous. The comparison was initially made when patients with trophoblastic tumours or hyperemesis gravidarum were reported to be hyperthyroid. hCG is produced by the gestational cytotrophoblasts which differentiate into extravillous cytotrophoblast and syncytiotrophoblast (3).

During implantation (first two weeks) the extravillious cytotrophoblast produces hyperglycosylated hCG which promotes invasion of the uterine wall, forming anchoring villi and increasing the circulation in the spiral arteries . The syncytiotrophoblasts form the epithelium lining the villous tree and produces regular hCG which maintains production of progesterone from corpus luteum until placenta takes over as well as promoting spiral artery angiogenesis (4,5).The level of hCG peaks at 10 weeks when TSH reaches a nadir, the thyrotrophic impact seems to be the strongest at that gestation (6). The levels of hCG then decrease up to 20 weeks' gestation then reaches a plateau (7) In twin pregnancies these levels are nearly double and the peak period lasts for a longer time (8).

The relationship between hCG and TSH is stronger at the lower TSH centiles possibly due to an adaptive mechanism where patients with higher TSH values need the thyroid gland to be stimulated by both TSH and hCG to produce adequate levels of thyroid hormones for the mother and fetus (6).

The metabolism of hCG affects its thyrotropic activity where truncated β-hCG has higher thyrotropic potency than intact (9). During pregnancy there is a high level of oestrogen production reaching 60 mg/day during the last trimester (10). Estradiol more specifically has been shown to increase synthesis of TBG by the hepatocytes (10,11). and it also increases sialylation of TBG (oligosaccharide modification) decreasing clearance (12,13). The increase in thyroid binding globulin (TBG) occurs throughout the first half of pregnancy, it plateaus at 24 weeks and stays unchanged until term(14,15)

Thyroid Function In The Neonatal Period:

After birth there is an acute discharge of TSH provoked by cooling, which reaches a peak at 30 minutes before falling towards basal levels within the first 3 days. There is an associated release of thyroid hormones and enhanced peripheral conversion of T4 (closely linked to D2 activity), which results in a pronounced increase in T3 in the first hours of life. There is a further increase in total T3 and free T3 levels for about 36 hours around the time of the postnatal peak in T4, and free T4 levels relatively high for the first weeks of life (16). Preterm infants (>30 weeks) delivered before this maturational process is complete show similar but lesser changes in TSH and thyroid hormone concentration (17). By l-2 months of age, thyroid

hormone levels are comparable to those in term infants. In the case of infants under 30 weeks gestation, the postnatal surge does not occur and T4 levels frequently fall to a nadir around 1 -2 weeks of age, which is more pronounced with increasing prematurity (18,19). Thyroxin levels remain below those of full-term infants through the first few weeks of life and climb gradually to normal postnatal levels (20).

Congenital Hypothyoidism

Congenital hypothyroidism (CH)is one of the common preventable cause of intellectual disability. Most cases of CH are not hereditary and result from thyroid dysgenesis (70-80)or one of the inborn errors of thyroid hormone synthesis[Disharmonies 20-30%]. Most of infants with CH can be detected by newborn screening programs in the first few weeks afterbirth, before any clinical symptoms and signs develop (21). Any delay in treatment can affect the child in terms of delayed cognitive milestones. However, as CH is often asymptomatic in early infancy, less than one third get diagnosed before 3 months of life. Availability of a simple diagnostic blood test with low cost and easily available treatment, this makes CH as one of the best condition that can be detected byscreening program (22). It is the responsibility of each individual Paediatrician and Obstetrician, to take initiative and start screening all the babies born under their care, 31 one baby at a time. Screening should be done for every newborn baby using cord blood (soon after birth), if cord blood sample is not taken at birth, peripheral blood sample can be taken at 48-72hrs of age. Neonates with cord blood TSH>20mIu/L serum units, confirm the congenital hypothyroidism by peripheral blood sample taken at 48- 72 hrs of age (confirmation by TSH >20mIu/L or T4<7 (23). If neonates (sick babies) not screened for congenital hypothyroidism at birth or not even at 48-72 hrs of age, they should be screened by at least 7th day of age. NSCH [newborn screening for congenital hypothyroidism] has beenuniversally accepted as an essential part of screening for various metabolic disorders.

Purpose:

To Estimate Cord Blood TSH Level In Newborn In Area Of Uttarakhand

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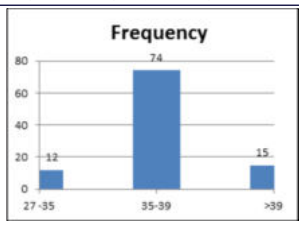
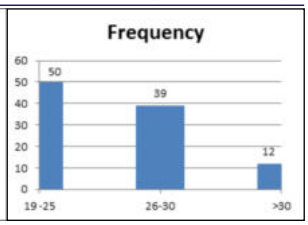
Maternal age (years)	Frequency	Minimum	Maximum	Mean	Standard deviation	p-value
19 -25	50	2.320	23.900	8.869	5.096	0.422
26-30	39	0.547	33.800	9.503	6.083	
>30	12	2.700	11.500	7.197	2.733	



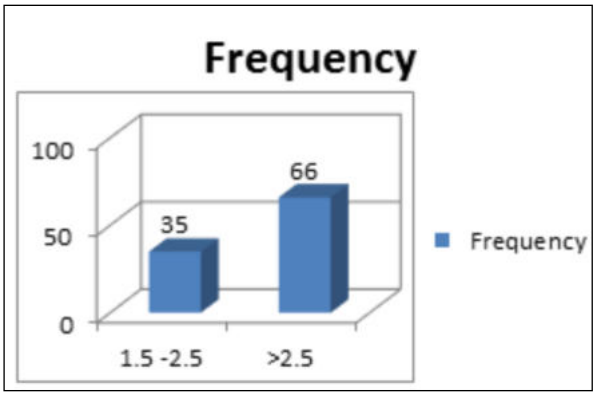


Gestational age(weeks)	Frequency	Minimum	Maximum	Mean	Standard deviation	p-value
27 -35	12	4.990	12.200	7.862	2.585	0.694
35-39	74	0.547	33.800	9.171	5.585	
>39	15	3.180	23.900	8.493	5.620	

Cord blood TSH level of neonates with birth weight of neonates

Birth weight (kgs)	Frequency	Minimum	Maximum	Mean	Standard deviation	P-value
1.5 -2.5	35	3.970	23.900	8.587	4.670	0.653
>2.5	66	0.547	33.800	9.089	5.633	

Weight of neonates does not affect the cord blood TSH level.



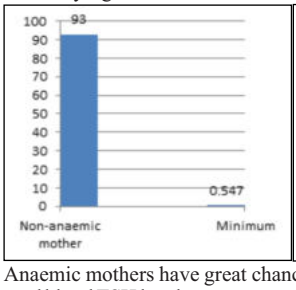
Cord blood TSH level of neonates with non-anaemic mother:

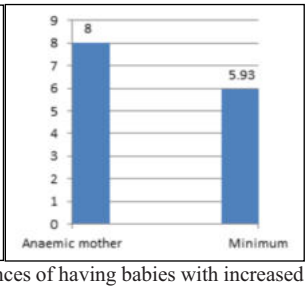
Non-anaemic mother	Minimum	Maximum	Mean	Standard deviation	P – value
93	0.547	33.800	8.602	5.043	0.165

Cord blood TSH level of neonates with anaemic mother:

Anaemic mother	Minimum	Maximum	Mean	Standard deviation	p-value
8	5.930	23.900	12.554	7.125	0.042

Statically significant

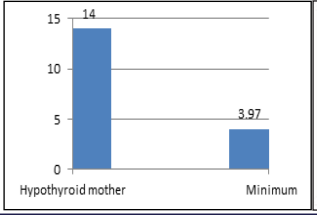


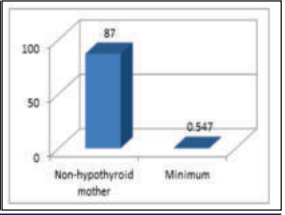


Anaemic mothers have great chances of having babies with increased cord blood TSH levels

Cord Blood TSH Level Of Neonates With Mother Having Hypothyroid :

Hypothyroid mother	Minimum	Maximum	Mean	Standard deviation	P-value
14	3.970	17.400	9.446	5.112	0.689





Cord blood TSH level of neonates with non-hypothyroid mother:

Non-hypothyroid mother	Minimum	Maximum	Mean	Standard deviation	P -value
87	0.547	33.800	8.830	5.354	0.683

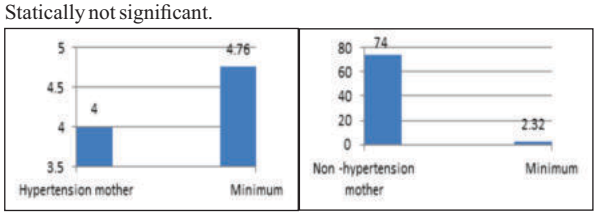
Statically not significant.

The presence of hypothyroidism in mother has no effect on the cord blood TSH level.

Cord blood TSH level of neonates with mother having hypertension :

Hypertension mother	Minimum	Maximum	Mean	Standard deviation	P-value
4	4.760	11.20	7.900	2.793	0.601

Statically not significant.



Non -hypertension mother	Minimum	Maximum	Mean	Standard deviation	P-value
74	2.320	23.900	9.162	4.739	0.448

Statically not significant.

The hypertension in mother has no effects on cord blood TSH level.

DISCUSSION:

New Born Screening for congenital hypothyroidism is a must for timely diagnosis and treatment of preventable condition whose consequences will be detrimental if left unidentified. Screening is done by assasing TSH levels and can be done either by heel prick or cord blood sample.In our study out of 101 patients only 3 had cord blood TSH > 20m IU/L and 27 had cord blood between 10-20 m IU/L & rest remaining had normal cord blood. And when cord blood for all 3 when repeated was also high.Umblical cord blood TSH levels remain an attractive & a practical step for screening for congenital hypothyroidism.We have used the cut off 20m IU/L as congenital hypothyroidism and 10-20 m IU/L for borderline . As borderline had more number of patients that was 27 as compared to 3 who had value more than 30.

CONCLUSION:

In our study the incidence of congenital hypothyroidism was 3 in 101 babies. Which was very high compared to national and international refrences, indicating an urgent need for adopting universal screening in neonates for congenital hypothyroidism especially in rural setting.There should also screening of mothers haemoglobin as anaemia of mother is correlating with newborn hypothyroidism. Therefore screening of mother and newborn is important.Maternal age, maternal hypothyroidism & gestational age of newborn were also studied but no correlation was found.

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