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Study of incidence of congenital hypothyroidism in neonates

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ABSTRACT *Congenital hypothyroidism is the most common preventable cause of mental retardation in children. Clinical features are often lacking at birth even up to the first few weeks or months of life. Diagnosis based on clinical features is difficult at birth without biochemical screening, resulting in delayed initiation of therapy and irreversible brain damage in the affected children. Screening during birth can help in early diagnosis and treatment. One thousand newborns delivered at a tertiary care hospital whether by normal vaginal delivery or Caesarean section were included in the study. Cord blood samples of these new born were collected and sent for serum Thyroid Stimulating hormone (TSH) estimation by IRMA method and followed up. 12 newborns detected to have serum TSH more than 20* **μIU***/ml, were further investigated with complete thyroid profile and out of these only one newborn detected to have congenital hypothyroidism eventually.*

Introduction:

Congenital hypothyroidism (CH) is one of the commonest causes of preventable mental retardation. Its worldwide incidence varies from 1:3000 to 1:4500. Retrospective clinical studies showed that less than half were diagnosed by three months and approximately two-thirds by one year of age (1,2). International Atomic Energy Agency (IAEA) estimates that each year 50,000 new-borns are at risk of CH in the South East Asia. Although screening of new-born for CH has been a routine practice in developed countries for more than 40 years, developing countries have addressed this concern only in the past decade due to various challenges in their health systems (Rose and Brown, 2006). In the era before new-born screening, less than half of the cases of severe hypothyroidism were recognized in the first month of life. As the months proceeded, these infants would grow poorly and be delayed in their development. By several years of age, they would display the recognizable facial and body features of cretinism. Persistence of severe, untreated hypothyroidism resulted in severe mental impairment, with an IQ below 80 in the majority. Most of these children eventually ended up in institutional care.

Most children born with congenital hypothyroidism and correctly treated with Thyroxine grow and develop normally in all respects. Yet, CH screening is not routinely done due to many logistical constraints.

Materials and methods:

The study was conducted as a prospective observational study. One thousand consecutive newborns delivered at a tertiary care hospital were included in the study. Mixed cord blood sample from umbilical artery and vein was obtained in a sterile container for TSH estimation by IRMA method at the time of delivery. Types of outcome measures was in form of raised TSH (TSH>20 **μ**IU/ml) or normal TSH (TSH< 20 **μ**IU/ml). Babies detected to have elevated cord blood TSH were recalled for complete thyroid profile and were clinically examined by a pediatrician. Preterm delivered newborns and mothers who were known cases of hypo or hyperthyroidism or on any drugs were excluded from the study.

Written and informed consent was taken from the parents for umbilical cord blood collection and they were advised to come for follow up. Parents were told about the implication of an abnormal result and they were assured early treatment and follow up if required in future.

Results

One thousand cord blood samples were sent for TSH estimation to RIA laboratory by IRMA method. Total umbilical cord blood TSH level are depicted in **(Table 1).**

Ratio of primigravida to multigravida in the study group was 464:536 **(Table 2).** The birth weight range of cohort was between 2.5 to 4.2 kg. The male to female ratio was 522:478 (1.09:1). A total of 12 infants were detected to have TSH value more than 20 **μ**IU/ml. The percentage of detection of raised TSH was 1.2%. Of these 12 neonates 09 were detected to have TSH value between 20-24.99 **μIU/ml**. One neonate detected to have a TSH of 28 **μ**IU/ml and another with TSH of 33 **μIU/**ml. The highest level of TSH detected in this study was 52 **μ**IU/ml and this baby was detected to have congenital hypothyroidism eventually.

These 12 neonates were followed up with full thyroid profile **(Table 3).** In this subgroup ratio of male to female was 9:3 **(Table 4)** and birth weight ranged between 2.58-3.80 **(Table 5).**

Of the 464 primigravida, 06 neonates (3%) had TSH value more than 20 **μ**IU/ml and out of 536 multigravida, 06(1.1%) had TSH value more than 20 **μ**IU/ml. P value calculated for primigravida and multigravida was 0.801. Out of 522 male neonates only 09 (1.7%) had TSH value more than 20 **μ**IU/ml and out of 478 female neonates only 03 (0.6%) had TSH value more than 20 **μ**IU/ml. However, P value calculated for male and female neonates was 0.112 and thus not significant.

The significance value (combined) for gestation age **(Table 6),** birth weight and maternal age **(Table 7)** for TSH more than 20 **μ**IU/ml was 0.096, 0.714 and 0.583 respectively. Mean and standard deviation for age, gestation age and birth weight are depicted in **(Table 8).** Normal thyroid function parameters for neonate aged 2 to 4 weeks given in **(Table 9).**

Data were analyzed by using WHO recommended computer software SPSS (Statistical Package for Social Sciences) version 17.0.1 December 2008.

Discussion

Screening for congenital hypothyroidism (CH) is widespread for the last two decades. We have not been able to implement it in India because of several factors, like cost, lack of reliable laboratories on a large scale, and non-availability of baseline data in our population. Use of cord blood TSH as a screening tool is an attractive proposition because of its simplicity and accessibility. Fuse, et al. (3) had shown that mixed cord blood is a good sampling technique for screening for CH. Walfish(4) concluded that cord TSH had a better specificity and sensitivity as compared to cord or filter paper T4 at 3-5 days of age.

In our study the mean value of cord blood TSH was 7.86 ± 4.45 **μIU/ml**

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in the 1000 new-borns screened , while Feleke, et al.(5) observed value of 9.6 ± 7.8 mIU/L in 4206 new-borns. Our TSH values were somewhat lower than found by Feleke et al and Khadilkar et al (6) who, in a study of 203 neonates found a mean cord TSH value of 12.3 ± 4.9 **µIU/ml** . Our recall rate was 1.2% which compared well with of the large study of Wu et al(7)whose large cohort 11,000 neonates had a recall rate of2.27%Normal cord TSH values show a wide range of 1-38.9 **µIU/ml** (8), and we had used a cut-off of 20 **µ**IU/ml, but had we opted for a higher cut-off of 25, 30 for recall purposes, our recall rates would have fallen to 0.03 and 0.02% respectively.

We had one baby with CH out of a cohort of 1000 giving an incidence of 1 in 1000, which is much higher than the world figure of 1 in 4000(9), but other Indian data too have quoted higher incidences as 1 in 248(10) and 1 in 1700(11) and a recent Iranian study found an incidence of 1 in 914(12). Probably geographic and ethnic differences are responsible and of course, this cohort of 1000 samples is too small to assess incidence. Our figures have shown a comparable trend as with the normative data for cord blood TSH values as reported by various workers across the globe. We conclude that we may safely use the widely used cut off cord blood TSH value of >20 **µ**IU/ml for purposes of recall for retesting, though from logistic angles a cut off value of >30 or >40 may be used. Still even larger population-based studies may be done to achieve more credible guidelines, more so to gauge the incidence and epidemiology of CH in our country.

Conclusion

If congenital hypothyroidism is detected early and treated it prevents mentally retarded children and increase in IQ with normal physical growth. The neonate needs to be evaluated as soon as possible, usually within 48 hours of notification at appropriately equipped, pediatric center. Counselling of parents with babies with congenital hypothyroidism is very important as the parents are naturally very apprehensive about the future. They need to be reassured about the favorable prognosis, and the likelihood that their child will grow into a normal, healthy adult with normal intelligence.

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Conflict of interest: None

Ethical approval: Approved by Institutional Ethics Committee

Table1: Umbilical cord blood TSH levels

Cord blood TSH level(µIu/ml)	No of samples n=1000	%
<4	305	30.5
4-15.99	670	67
16-19.99	13	1.3
20-24.99	09	0.9
25-29.99	01	0.1
30-34.99	01	0.1
52	01	0.1

Parity	Total no of cases	% Age
Primigravida	464	46.4
Multigravida	536	53.6
Total	1000	100%

Mean=7.86 Standard deviation=4.45

Table 2: Parity wise case distribution

T3(ng/dl)	T4(ug/dl)	TSH(mIu/l)	Free T4(ng/dl)
200	8.4	4.0	1.4
165	7.0	3.5	1.2
212	13	4.8	0.98
108	7.9	6.0	2.1
268	11.2	7.8	1.7
108	9.2	5.6	1.3
63	2.5	54	0.4
214	9.8	4.0	1.92
178	8.8	4.7	1.88
179	13.4	8.2	1.0
204	11	6.5	1.6
124	11.8	4.8	1.4

Table 3: Follow up T3 T4 TSH and free T4 done between 2 to 4 week of age

Male	522	52.2%
Female	478	47.8%

Table 4 :Sex wise distribution of case

Table 5 : Weight wise distribution of samples

Weight(Kg)	No of samples (%)
2.5-2.99	698 (69.8%)
3.0-3.49	217(21.7%)
3.5-3.99	78 (7.8%)
4 and above	07 (0.7%)
Total	1000 (100%)

Gestation age in Weekes	No of cases	%Age
37-37.6	30	3.0
38-38.6	187	18.7
39-39.6	772	77.2
40-41	11	1.1

Table 6: Gestation age wise distribution of cases
Mean=39.07 Standard deviation=0.52

Table 7: age wise distribution of cases

Age(yrs.)	No of cases
Between 20-30	939
31 & above	61

Table 8: Mean and standard deviation for age gestation age and birth weight are as follows

TSH(mIU/l)		Age (Yrs)	Gestation age (week)	Birth wt (Kg)
<20	Number	988	988	988
	Mean	25.41	39.467	2.9798
	SD	3.177	11.3358	0.34597
20 and above	Number	12	12	12
	Mean	25.92	39.308	3.0167
	SD	3.679	0.2778	0.35978
Total	Number	1000	1000	1000
	Mean	25.42	39.465	2.9802
	SD	3.182	11.2676	0.34597

Table 9: Normal thyroid function parameters in infant aged 2 to 6 weeks (13)

Serum constituents	Concentration
T3	100-300(ng/dl)
T4	6.5-16.3(ug/dl)
Free T4	0.9-2.2(ng/dl)
TSH	1.7-9.1(mIU/l)

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References:

1. Alm J, Larsson A, Zetterstrom R. Congenital hypothyroidism in Sweden. Incidence and age at diagnosis. ActaPaediatrScand 1978; 67:1-3.
2. Alm J, Hagenfeldt L, Larsson A, Lundberg K. Incidence of congenital hypothyroidism: retrospective study of neonatal laboratory screening versus clinical symptoms as indicators leading to diagnosis. Br Med J 1984; 289: 1171-5
3. Fuse Y, Wakae E, Nemoto Y, Uga N, Tanaka M, Maeda M, et al. Influence of perinatal factors and sampling methods on TSH and thyroid hormone levels in cord blood. EndocrinolJpn 1991; 38: 297-302.
4. Walfish PG. Evaluation of three thyroid function screening tests for detecting neonatal hypothyroidism. Lancet. 1976; 1: 1208- 1210.
5. Feleke Y, Enquoselassie F, Deneke F, Abdulkadir J, Hawariat GW, Tilahun M, et al. Neonatal congenital hypothyroidism screening in Addis Ababa, Ethiopia. East Afr Med J 2000; 77: 377-381
6. Khadilkar V, Khadilkar A, Cowasji H. Neonatal thyroid screening program using filter paper method. Cape News 2002; 6:1.
7. Wu LL, Sazali BS, Adeeb N, Khalid BAK. Congenital hypothyroid screening using cord blood TSH. Singapore Med J 1999; 40: 23-26 29 Ordookhani A, Mirmiran P, Najafi R, Hedayati M, Azizi F. Congenital hypothyroidism in Iran. Indian J Pediatr 2003; 70: 625-628.
8. Behrman RE, Kleigman RM, Jenson HB, editors. Nelson Textbook of Pediatrics, 17th ed. Philadelphia: Saunders; 2004: p. 2412.
9. Dussault JH. The Anecdotal history of Screening for Congenital hypothyroidism. J ClinEndocrinol& Metabolism. 1999; 84: 4332-4334
10. Desai MP, Upadhye P, Colaco MP, Mehre M, Naik SP, Vaz FE, Nair N, Thomas M. Neonatal screening for congenital hypothyroidism using the filter paper thyroxine technique. Indian J Med Res 1994; 100: 36-42.
11. Devi AR, Naushad SM. Newborn screening in India. Indian J Pediatr 2004: 71; 157-160
12. Ordookhani A, Mirmiran P, Najafi R, Hedayati M, Azizi F. Congenital hypothyroidism in Iran. Indian J Pediatr 2003; 70: 625-628.
13. Manual of neonatal care sixth edition, John P Cloharty,Eric C Eichenwald, Ann R Stark.21.