



## Research Article

# Ramification of thyroid dysfunction in progression of jaundice in preterm infants among rural population of Prayagraj, India

Godson P. Nelson, Sapna Smith Lal

## Abstract

In infants, overall growth is a continuous process and it depends upon the right care, nutrition, and metabolism. Metabolism is regulated by many factors and, the endocrine system is one of them. The thyroid gland is one of the important glands in the endocrine system and dysfunction of this gland may lead to many metabolic disorders. Prevalence of Jaundice is the most common metabolic disorder in preterm infants (32-34 gestational weeks) and the root cause of many diseases. Keeping this fact, this study is designed to draw the relation between thyroid dysfunction in preterm infants and the prevalence of jaundice. A total of 200 preterm infants were randomly selected for the study as per consent given by their parents and their treating doctors. Out of these 116 infants were diagnosed with total bilirubin levels of more than 1mg/dl and selected as respondents for the research work. 3 ml venous blood samples were collected within 42-78 hrs after their birth from Infants having jaundice and estimated for triiodothyronine (T3), tetraiodothyronine (T4), and thyroid stimulating hormones (TSH) and compared them with full term (34-36 gestational weeks) infants. The study reveals that 58% of preterm infants were high serum bilirubin and out of which 72% were suffering from congenital hypothyroidism as compared to fullterm infants. It may be because of the gestational period of 36 weeks have lower chances of thyroid dysfunction due to their completely matured hypothalamic pituitary thyroid axis (HPT). After statistical analysis of the data obtained, it is concluded that high serum total bilirubin is associated with thyroid gland dysfunction in newborn preterm infants and it is recommended that all newborn preterm infants must be screened early for thyroid dysfunction.

**Keywords** bilirubin, preterm infants, thyroid stimulating hormones, triiodothyronine

## Introduction

When a baby is delivered before 38 gestational weeks, called a preterm infant [1]. Preterm birth is, globally the most common cause of neonatal death [2]. Hyperbilirubinemia is a clinical condition where the total serum bilirubin level is greater than 1 mg/dl and it is associated with preterm infants [3]. Development of hyperbilirubinemia, concurrent or after hyperthyroidism, and can be due to thyrotoxicosis [4]. A clinic based study from Mumbai –India saying 79% of children were affected with

**Received:** 09 November 2022

**Accepted:** 05 January 2023

**Online:** 20 January 2023

### Authors:

G. P. Nelson, S. S. Lal ✉  
Department of Clinical laboratory science,  
Sam Higginbottom University of Agriculture,  
Technology and Sciences, Prayagraj,  
Uttar Pradesh, India

✉ sapna.lal@shiats.edu.in

**Emer Life Sci Res (2023) 9(1): 22-26**

**E-ISSN: 2395-6658**

**P-ISSN: 2395-664X**

**DOI:** <https://doi.org/10.31783/elsr.2023.912226>

with hypothyroidism [5]. The prevalence of hypothyroidism in India is about 1 in 1031 neonates and it's very higher than in several other countries this is indicating that newborn screening for thyroid is very must in India [6]. Studies have stated that hypothyroidism is one of the aetiologies in severe hyperbilirubinemia. Prolonged jaundice is sometimes associated with congenital hypothyroidism, which appears to be associated due to delayed maturation of hepatic uridine diphosphate glucuronyl transferase enzyme activity which may lead to thyroid dysfunction [7]. Unconjugated or conjugated hyperbilirubinemia and prolonged physiologic icterus may be observed in infants with congenital hypothyroidism.

### Methodology

A total of 200 preterm infants were randomly selected for the study as per consent given by their parents and their treating doctors. Out of these 116 infants were diagnosed with total bilirubin levels of more than 1mg/dl and selected as respondents for the study and were estimated for triiodothyronine (T3), tetraiodothyronine (T4), and thyroid stimulating hormones (TSH). After thyroid panel test screening 64 preterm infants with high serum bilirubin and altered T3 and T4 level were selected as final respondents and classified as Group I compare them with full-term infants whose bilirubin levels were within the normal limits having normal thyroid profiles and classified them as Group II. 3 ml venous blood samples were collected by the pediatrician within 42-78 hrs. after their birth from Infants having jaundice. Blood samples were collected from different laboratories associated with government and private hospitals in the rural area of Prayagraj viz Handia, Sorao, and Kausambi villages. Samples were analyzed for total bilirubin by Erba chem. 7 semi-auto biochemistry Analyzer based on the DIAZO method [8], TSH, T4, and T3 are estimated using VIDAS hormone analyzer which works on the principle of enzyme immune assays and which method with a final fluorescent (ELFA) technique [9]. Data were statistically analyzed by online T-test calculator-Graphpad, performs unpaired t-tests, and paired t-tests. Calculates exact P value and confidence interval [10]. Research work was ethically approved by Institutional Ethical Committee.

### Results and Discussion

#### *Prevalence of hyperbilirubinemia in preterm infants*

It is revealed from the data presented in Figure 1, that 58% of preterm infants were suffering from jaundice. Out of which, 72% of infants have congenital hypothyroidism. It shows that the prevalence rate of congenital jaundice is high in preterm infants belonging to the rural population of Prayagraj. The study conducted by Jardine and Woodgate [11], concluded that 80% of preterm babies developed jaundice and it is due to increased red cell breakdown and decreased bilirubin excretion.

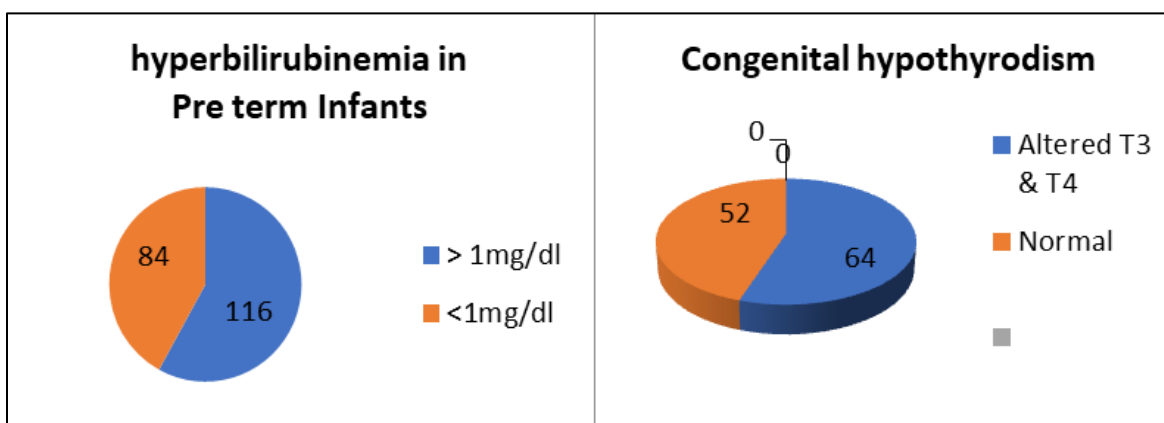
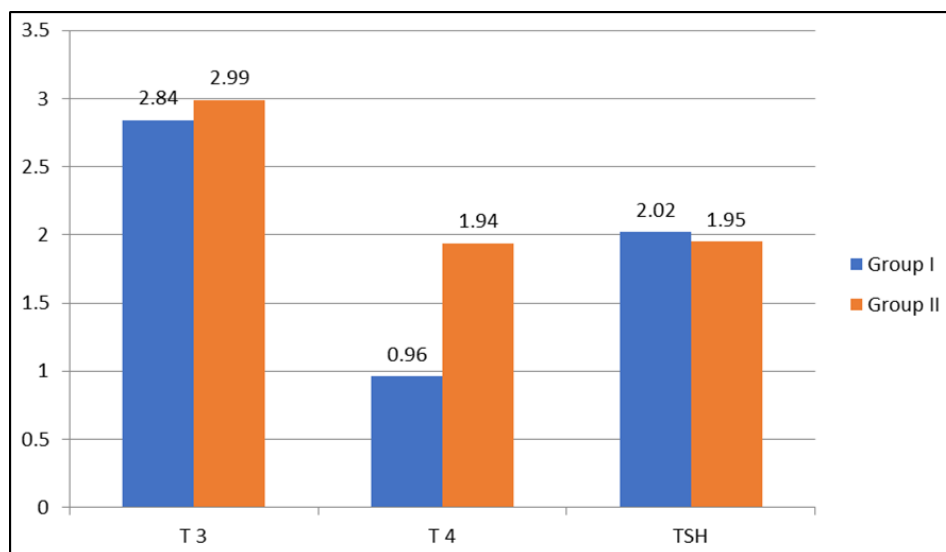


Figure 1. Showing prevalence of hyperbilirubinemia in preterm infants

**Blood serum value of T3, T4 and TSH in study group**

When Thyroid dysfunction was estimated in preterm infants suffering from jaundice, it indicates that serum T3 and T4 were low in preterm infants having jaundice and serum TSH level is high as shown in Figure 2 and Table 1. As per the study conducted by Hay Rim Chung [12], on infants having 1 month of age, 34% of infants have low T4 with a high TSH level.



**Figure 2. Showing thyroid profile test in preterm infants**

**Table 1. Showing Blood serum values of T3, T4 and TSH in the study group**

Parameters	Value	Study group	Pathological Condition	Statistical Level of significance
T3 pg/ml	2.84± 0.21	Group I	Preterm (32-34) with high serum total bilirubin level	Significant difference on 0.0001
	2.99±0.14	Group II	Fullterm (34-36) with normal serum bilirubin	
T4 ng/dl	0.96± 2.4	Group I	Preterm (32-34) with high serum total bilirubin level	Significant difference on 0.0001
	1.94±0.146	Group II	Fullterm (34-36) with normal serum bilirubin	
TSH mU/l	2.02±2.4	Group I	Preterm (32-34) with high serum total bilirubin level	Significant difference on 0.0001
	1.95±1.34	Group II	Fullterm (34-36) with normal serum bilirubin	

**Gender based evaluation of thyroid dysfunction in study group**

The data presented in Figure 3 shows gender based evaluation results of thyroid dysfunction in the study group and represents that thyroid dysfunction was more prevalent in females than males. The proposed mechanism is behind it is the deficiency in peroxidase enzyme, selenium, TBG, and Iron deficiencies are more prevalent in rural females child, infants, and pregnant women’s and it may be a cause of thyroid dysfunction. The result is supported by Triggiani [13]. Micronutrients, mostly iodine and selenium, are required for thyroid hormone synthesis and function. Iodine is an essential component of thyroid hormones and its deficiency is considered the most common cause of

thyroid dysfunction.

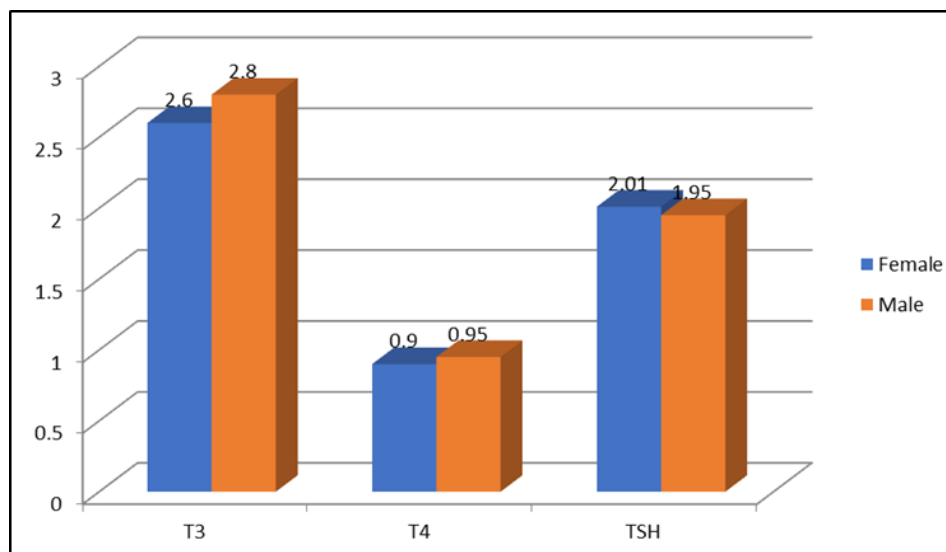


Figure 3. Gender based evaluation of thyroid dysfunction in study group

## Conclusion

It is concluded from the study that pre term infants are more prone towards the thyroids dysfunction as compare to full term infants. Pre term infants having more prevalence of hyperbilirubinemia as compare to full term and high serum bilirubin level is a major cause towards alteration in serum T3, T4 and TSH level because of immature hypothalamic pituitary thyroid axis (HPT). Gender based evaluation results of thyroid dysfunction in study group representing that thyroid dysfunction were more prevalent on females than males.

## Acknowledgements

We are highly thank full towards Prof. (Dr.) R. B. Lal –Vice Chancellor of our university for providing the necessary facility. I give my thanks to Dean Faculty of Health sciences and all the technical and supporting staff of research laboratory for their continuous support during this study.

## Conflict of interest

We declared that we have no conflict of interest.

## Funding source

This research work is not supported by any funding agencies. During the research work all facilities were provided by our host institution.

## References

- [1] <http://www.CDC.gov>
- [2] L. Liu, S. Oza, D. Hogan, Y. Chu, J. Perin, J. Zhu and J. E. Lawne et al., (2016). Global, regional, and national causes of under-5 mortality in 2000-15: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet*, **388**: 3027-3035.
- [3] M. L. Porter and B. L. Dennis (2002). Hyperbilirubinemia in the term newborn. *Am. Fam. Physician.*, **65**: 599-607.



- [4] S. Kurtoglu, D. Coban, M. A. Akin, L. Akin and A. Yikilmaz **(2009)**. Neonatal sludge: A finding of congenital hypothyroidism. *J. Clin. Res. Ped. Endo.*, **1**: 197-200.
- [5] A. G. Unnikrishnan and U. V. Menon **(2011)**. Thyroid disorders in India: An epidemiological perspective. *Indian J. Endocr. Metab.*, **15(Suppl2)**: S78-S81.
- [6] A. G. Unnikrishnan, S. Kalra, R. K. Sahay, G. Bantwal, M. John and N. Tewari **(2013)**. Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. *Indian J. Endocr. Metab.*, **17**: 647-652.
- [7] R. D. S. S. Wikramasinghe, W. A. N. V. Luke, B. S. Sebastampillai, M. P. M. L. Gunathilake and R. Premaratna **(2016)**. Thyrotoxic crisis presenting with jaundice. *BMC. Res. Notes*, **9**: 320. [doi: 10.1186/s13104-016-2126-z](https://doi.org/10.1186/s13104-016-2126-z).
- [8] R. J. Henry **(1974)**. Estimation of serum total bilirubin clinical chemistry: principle and technique (2<sup>nd</sup> Ed.) Haper and Row. P.1042.
- [9] T. Mitsuma, J. Colucci, L. Shenkman and C. S. Hollander **(1972)**. Rapid simultaneous radioimmunoassay for triiodothyronine and thyroxine in unextracted serum. *Biochem. Biophys. Res. Commun.*, **46**: 2107-2113.
- [10] Graphpad, <https://www.graphpad.com/quickcalcs/ttest1.cfm>
- [11] L. A. Jardine and P. Woodgate **(2011)**. Neonatal jaundice. *BMJ. Clin. Evid.*, 0319.
- [12] H. R. Chung **(2019)**. Screening and management of thyroid dysfunction in preterm infant. *Ann. Pediatr. Endocrinol. Metab.*, **24**: 15-21.
- [13] V. Triggiani, E. Tafaro, V. Giagulli, C. Sabba, F. Resta, B. Licchelli and E. Guastamacchia **(2009)**. Role of iodine, selenium and other micronutrients in thyroid function and disorders *Endocr. Metab. Immune. Disord. Drug Targets*, **9**: 277-294.