

## ORIGINAL ARTICLE

# Frequency of Congenital Hypothyroidism in Newborn at Tertiary Care Hospital in Quetta

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## ABSTRACT

**Objective:** To determine the frequency of congenital hypothyroidism (CH) in newborn at tertiary care hospital in Quetta, Pakistan.

**Study design:** Cross-sectional study.

**Place and Duration:** The Department of Paediatrics, Unit-II, Bolan Medical College Hospital, Quetta, Pakistan from January 2022 to June 2022.

**Methodology:** Neonates of both genders born with birth weight above 1500 grams having gestational age above 28 weeks, presenting between 3 to 5 days following birth were analyzed. At the time of enrollment, demographic characteristics of the neonates were noted and screening of CH was done. The CH was labeled as serum TSH  $\geq$  20mU/ml and T4 < 9 pmol/l.

**Results:** During the study period, a total of 383 neonates as per inclusion/exclusion criteria were analyzed. There were 239 (62.4%) boys and 144 (37.6%) girls. The mean age was  $3.87 \pm 0.843$  days. The mean TSH level was  $12.807 \pm 5.11$  mU/ml (ranging 7 to 50 mU/ml). We noted that CH was found in 10 neonates (2.6%).

**Practical Implications:** The reported frequency of CH seems higher as compared to contemporary literature which raises the importance of CH screening programs at national level.

**Conclusion:** The frequency of congenital hypothyroidism was 2.6% among newborns at a tertiary care hospital of Quetta, Pakistan.

**Keywords:** Congenital hypothyroidism, newborn, thyroid-stimulating hormone.

## INTRODUCTION

Among neonates, the commonest reason of mental deficiency is congenital hypothyroidism (CH) which can possibly be prevented if detected and treated timely.<sup>1</sup> With the help of screening programs for newborn babies, most of the developed countries have considerably reduced the burden of mental deficiency in their societies.<sup>1</sup> In late 2006, Turkey inaugurated the "National Newborn Screening Program" for CH, and the first data published by the "Turkish Directorate of Public Health", reported very high incidence rates of CH.<sup>2</sup> Although, the occurrence of CH is frequent and can be treated easily, but in majority of the cases, early signs and symptoms are not present which instigated the developed countries to provide universal thyroid screening for the newborns.<sup>3,4</sup>

In Islamabad, a study performed at Maternal and Child Health center of "Pakistan Institute of Medical sciences" revealed that among 1337 newborn babies, three babies presented with CH.<sup>5</sup> In the period of February 2010 to November 2011, a study was carried out at Gynaecology & Obstetrics and Pediatric departments of Shaikh Zayed Hospital and Jinnah Hospital, Lahore which reported that among 1357 newborns, 2 babies presented with CH showing a higher incidence rate to rest of the world.<sup>6</sup> If CH is diagnosed within 10-13 days of the birth and blood levels of thyroid hormones are normalized up to 3 weeks of age, it can greatly improve outcome and prevent mental retardation.<sup>7</sup> Although, screening is carried out on the basis of primary "thyroid-stimulating hormone (TSH)" throughout the world, however, in under developing countries, newborn thyroid screening is still to be established.

In Pakistan, the magnitude of CH is still not truly known as newborn screening have not been made compulsory for all neonates and many undiagnosed cases could be left untreated which ultimately receive permanent damage to their health and create mental disturbances for their family. In order to treat thyroid dysfunction in neonates, it is necessary for the clinicians to have complete awareness and it should be diagnosed and treated promptly. Keeping in view the significance of CH, we decided to determine the frequency of congenital hypothyroidism in newborn at tertiary care hospital of Quetta, Pakistan. Results of this

research may be shared with the healthcare providers, emphasizing them to initiate potential screening programs so that morbidity could be prevented by early diagnosis and treatment of CH.

## METHODOLOGY

This cross-sectional study was conducted at The Department of Paediatrics, Unit-II, Bolan Medical College Hospital, Quetta, Pakistan from January 2022 to June 2022. Approval from "Institutional Ethical Committee" was acquired. Informed and written consents were taken from parents / legal guardians of all cases. Inclusion criteria were neonates of both genders born with birth weight above 1500 grams having gestational age above 28 weeks, presenting between 3 to 5 days following birth. Exclusion criteria were neonates having congenital heart diseases (as per medical record and clinical assessment) or those whose parents / legal guardians refused to be a part of this research.

At the time of enrollment, demographic characteristics of the neonates were noted and screening of CH was done. Blood was taken by heel prick after sterilization and TSH levels were measured by ELIZA method at study institute laboratory. Cutoff value of TSH was set at 10 mU/ml. All babies with value of TSH in range of 10-20 mU/ml was considered as borderline cases. Cases with borderline TSH levels were advised to repeat test and labeled as case of CH when repeated test also showed persistent high levels ( $\geq$ 10mU/ml). If the results of the second set of tests were within normal limits, the neonate was considered as a case of transient TSH elevation. Babies with level of TSH above 20mU/ml were called back while 2 ml of fresh venous blood was drawn from these cases. The CH was labeled as serum TSH  $\geq$  20mU/ml and T4 < 9 pmol/l. Data was collected on a specially formed proforma.

Collected data was analyzed using "Statistical Package for Social Sciences (SPSS)", version 26.0. Qualitative data was reflected as mean with standard deviation while categorical data were highlighted as frequency and percentages. Chi-square test was applied to stratify CH with respect to age and gender taking  $p < 0.05$  as significant.

## RESULTS

During the study period, a total of 383 neonates as per inclusion/exclusion criteria were analyzed. There were 239 (62.4%) boys and 144 (37.6%) girls. The mean age was  $3.87 \pm 0.843$  days while 269 (70.2%) neonates were aged between 3 to 4 days. Table-1 is showing distribution of gender and age among studied neonates.

Table-1: Distribution of Gender and Age among Studied Neonates

Study Variables		Number (%)
Gender	Boys	239 (62.4%)
	Girls	144 (37.6%)
Age (days)	3-4	269 (70.2%)
	5	114 (29.8%)

The mean TSH level was  $12.807 \pm 5.11$  mU/ml (ranging between 7 to 50 mU/ml) whereas TSH levels were between 11-20 mU/ml among 210 (54.8%) neonates. Furthermore, T4 levels were above 8 pmol/l among 374 (97.6%) neonates. Table-2 is showing categorical distribution of serum TSH and T4 levels.

Table-2: Categorical Distribution of TSH and T4 Levels (n=383)

Investigations		Frequency (%)
TSH Levels	$\leq 10$ mU/ml	163 (42.6%)
	11-20 mU/ml	210 (54.8%)
	$> 20$ mU/ml	10 (2.6%)
T4 Levels	1-4 pmol/l	2 (0.5%)
	5-8 pmol/l	7 (1.8%)
	$> 8$ pmol/l	374 (97.6%)

We noted that CH was found in 10 patients (2.6%) neonates. No statistically significant differences were observed in terms of gender ( $p=0.076$ ) or age ( $p=0.093$ ) with respect to prevalence of congenital hypothyroidism among studied neonates as shown in table-3.

Table-3: Stratification of Congenital Hypothyroidism with regards to Gender and Age (N=383)

Study Variables		Congenital Hypothyroidism		P-value
		Yes (n=10)	No (n=373)	
Gender	Boys	4 (40.0%)	235 (63.0%)	0.076
	Girls	6 (60.0%)	138 (37.0%)	
Age (days)	3-4	9 (90.0%)	260 (69.7%)	0.093
	5	1(10.0%)	113(31.3%)	

## DISCUSSION

The CH is considered to be the commonest cause of mental deficiency, particularly associated with mental impairment and stunted growth in newborns. The CH screening among newly born babies in the early days could be of potential importance as those babies having CH might receive early and appropriate treatment. In our study, the frequency of CH was seen in 2.6%. A study done by Adeel et al<sup>8</sup> found the frequency of CH as 1:26. Globally, the reported incidence of CH is 1 out of 4000 while our study results are in accordance with the findings of other local researchers.<sup>9</sup>

A study conducted in Pakistan by Ghaffor et al revealed on the basis of blood TSH that among 1357 screened neonates, 2 cases were detected with CH.<sup>10</sup> In 2008, Afroze et al from Pakistan performed hospital based CH screening. Initially, CH was detected in 10 newborns.<sup>11</sup> Conducive to the correct estimation of the CH incidence rate, the data was reviewed and they came up with 1:160 as the actual incidence rate of CH.<sup>11</sup> In an Indian study conducted by Devi et al, the frequency of CH was 1 in 2481 infants.<sup>12</sup> The reason of such a higher incidence rate could perhaps have been the racial or terrestrial difference, which demands the cost effective treatments and the implementation of TSH assay based screening programs at national level. A study carried out in Iran described 1 CH case out of 914 babies.<sup>13</sup>

Considering risk factors, gender seems to have significant participation in CH development which has been shown by some researchers.<sup>14</sup> Females gender could possibly be at higher risk of

CH but we did not find any such findings.<sup>15</sup> According to a number of studies presented by Canada, Australia and some European countries, the reported contributing trend of female and male CH babies was 2:1.<sup>16-18</sup>

Neonates presenting with CH often look normal at the time of their birth because the signs or symptoms manifested by CH are limited.<sup>17,18</sup> Hence, early diagnosis becomes difficult. Considering the occurrence of CH, insufficient data is available in the underdeveloped countries as they lack in screening programs. In recent times, seeking for the primary health care for children such as immunization, oral dehydration and breast feeding, CH screening in neonates has an important role to play. We suggest on the behalf of our findings that screening programs for newborns should be inaugurated in Pakistan. On the other hand, the determination of CH frequency and to establish an accurate relation with the babies delivered normally and through cesarean section might only be possible by addressing a big population in a study. If TSH level in the serum is elevated, it is an indication that developing brain is not receiving an adequate quantity of thyroid hormone.

Neonatal TSH is an important indicator to assess disorders caused by iodine deficiency as mentioned by "World Health Organization" and "United Nations Children's Fund" like International organizations.<sup>19-20</sup> Screening program in neonates for CH detection depends upon a number of thyroid hormone combinations in the immunoassay measurement. However, the occurrence of transient cases is not rare too because intake of antithyroid drugs by mother, exposure to topical iodine, deficiency or excess of iodine in mother, maternal TSH receptor blocking antibodies, certain drugs containing dopamines or steroids, or prematurity of  $< 30$  weeks, might lead to its occurrence. In early three years of the life, all of the described cases need to be treated, keeping in view the mental deficiency as associated risk factor. After three years of age, these patients should be re-evaluated.

## CONCLUSION

The frequency of congenital hypothyroidism was 2.6% among newborns at a tertiary care hospital of Quetta, Pakistan. The reported frequency of CH seems higher as compared to contemporary literature which raises the importance of CH screening programs at national level.

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