J Compr Ped. 2016 May; 7(2):e34500. doi: 10.17795/compreped-34500.

Published online 2016 May 10. **Brief Report**

Neonatal Screening for Congenital Hypothyroidism in an University Hospital in Tehran, Iran

Bita Najafian,[1] Ehsan Shahverdi,[2,*] Shahla Afsharpaiman,[3] Majid Shohrati,[4] Shahram Karimi,[2] and Mohammad Amin Konjedi[2]

[1]Department of Pediatrics, Baqiyatallah University of Medical Sciences, Tehran, IR Iran
[2]Students' Research Committee, Baqiyatallah University of Medical Sciences, Tehran, IR Iran
[3]Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran
[4]Department of Clinical Pharmacy, Faculty of Pharmacy, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

[*]*Corresponding author*: Ehsan Shahverdi, Students' Research Committee, Baqiyatallah University of Medical Sciences, Tehran, IR Iran. Tel/Fax: +98-2188620826, E-mail: shahverdi_ehsan@yahoo.com

Received 2015 November 08; **Revised** 2016 January 28; **Accepted** 2016 March 09.

Abstract

Background: The national program of neonatal screening was performed in 2005 in Iran. According to the studies, the outbreak of congenital hypothyroidism (CH) was one in every 670 live births in 2011. The prevalence of the disease in the world is 1 in 3000. The mean prevalence of this disease in Iran is estimated to be 1 in 1,000, which indicates a high prevalence of the disease in Iran.
Objectives: This study was conducted to investigate the prevalence of congenital hypothyroidism among neonates in the Najmiyeh hospital in Tehran, Iran.
Patients and Methods: This cross-sectional study was conducted from 2011 to 2014. Most heel blood samples were taken between three and seven days of birth. Thyroid stimulating hormone (TSH) was tested using the enzyme-linked immunosorbent assay method. Neonates with abnormal screening results (TSH > 10 mIU/L, Free T4 < 1.6 mg/dL) were re-examined. Data were analyzed using the SPSS software.
Results: A total of 11427 infants were screened. Of 399 re-called subjects (re-call rate = 3%), 57 cases were detected with CH, a CH prevalence of 1:200 (the female:male ratio of 1:1.5).
Conclusions: The prevalence of CH in our center is high. These results emphasize the importance of the congenital screening program.

Keywords: Congenital, Hypothyroidism, Neonatal Screening

1. Background

Normal function of the thyroid gland is essential for the growth of the baby's physical and mental health (1). Congenital hypothyroidism (CH) is the most common endocrine disease and the leading cause of preventable mental retardation (2-4). The thyroid screening in many developed countries was routinely performed by measuring TSH (thyroid-stimulating hormone) and T4 cord blood or neonatal heel blood (5). Studies have suggested that an increased incidence of CH is on the rise due to factors such as premature birth, aging pregnancy and multiple pregnancies in some countries (6-10). National program of neonatal screening was performed in 2005 in Iran. According to studies, the outbreak was one in every 670 live births in 2011. The mean prevalence of this disease in Iran is estimated to be 1 in 1,000. However, the prevalence in the world is 1 in 3000, which indicates a high prevalence of the disease in Iran (5, 6).

2. Objectives

Considering the high prevalence of CH in Iran, this study was conducted to determine the prevalence of hypothyroidism in newborn babies in order to identify the effectiveness of national programs in CH and to compare our results with those from other provinces of Iran.

3. Patients and Methods

In this cross-sectional study, 11700 infants who were referred to Najmiyeh hospital in Tehran, Iran, to participate in the screening of newborns in the third to fifth day were selected using the census sampling method between 2011 and 2014.

The blood samples of peripheral vessels were taken to measure the TSH and free T4 levels. Thyroid stimulating hormone was tested using the enzyme-linked immunosorbent assay method. We considered TSH > 10 and free T4 < 1.6 as hypothyroidism. If hypothyroidism was found in

the initial test, we checked TSH again in recall time but this time we considered TSH > 5 as hypothyroidism. Hypothyroidism was diagnosed by a pediatric endocrinologist with 10 years of experience. The positive family history of hypothyroidism was taken by checking the newborns' family history.

All newborns participated in the hypothyroidism screening program between 2011 and 2014 were included in the study. Incomplete records, any comorbid disorder like Down syndrome and lack of access to neonatal hypothyroidism a year after screening were considered as exclusion criteria.

3.1. Statistical Analysis

Data were analyzed using statistical package for social sciences (SPSS) version 16 (SPSS Inc. Chicago, IL) for windows. Normal distribution variables (approved by one-sample Kolmogorov-Smirnov test) were compared using independent sample t-test between the groups and paired sample t-test within the groups. The chi-square test was also used to compare categorical variables in the two groups. A P value of less than 0.05 was considered as statistically significant.

3.2. Ethical Considerations

This study was approved in ethics committee of Baqiyatallah University of Medical Sciences and health services. Individuals were asked to sign an informed consent form before answering the questionnaire. All the terms of Helsinki declaration were considered and the personal information remained anonymous.

4. Results

From a total of 11427 cases (5813 females and 5614 males), 399 infants (3.5%) had TSH > 10 and 11028 (96.5%) were with TSH < 10. The mean TSH level was 3.26 ± 3.40 milli-international units per liter (mIU/L). Table 1 shows the distribution of TSH level in terms of gender. The mean level of TSH in males was 3.23 ± 3.42 mIU/L and in females was 3.28 ± 3.39mIU/L. According to this table, there was no significant correlation between the TSH level and gender (P = 0.56). Moreover, there was no significant difference between gender and the prevalence of hypothyroidism (P = 0.84).

Four hundred and forty-seven female infants and 370 male infants had free T4 < 1.6. There was no significant difference in the incidence of hypothyroidism on T4 based on gender. (P = 0.248)

Also, 399 patients were recalled (recall rate = 3%) that 57 infants (35 males and 22 females) were with secondary TSH > 5. There was no significant relationship between gender and the prevalence of hypothyroidism based on secondary hypothyroidism (P = 0.19).

Table 1. Distribution of the Thyroid Stimulating Hormone Level in Terms of Gender

TSH Level	Gender	
	Male	Female
TSH < 10	5484	5544
TSH > 10	194	205

The prevalence of neonatal hypothyroidism was estimated to be 1/200 birth. The prevalence of hypothyroidism was evaluated about 0.4%.

Also, 31.9% of the patients had a positive family history of hypothyroidism. There was no significant relationship between the prevalence of hypothyroidism and family history (P = 0.14).

5. Discussion

The incidence of hypothyroidism in our study was 0.4%. We found that the incidence of hypothyroidism based on either TSH or FT4 was nonsignificantly higher in girls than in boys.

In most previous studies, the study population was higher than our study. Zeinalzadeh and Talebi (11) study population was 62459. Ordookhani et al. (12) reported that the study population was about 20000. While in some others the study population was lower (13). We studied about 11000 infants in our study.

According to Hashemipour et al. (14) study, the recall rate was about 2.6%. Our study had a similar recall rate. While this value was lower in the Ordookhani study (15) (recall rate = 1.6%). Hashemipour et al. (16) reported the prevalence of neonatal hypothyroidism about 1/370 birth. The prevalence of neonatal hypothyroidism was estimated to be 1/200 birth.

In Zeinalzadeh et al. (11) study, a female/male ratio was 1:1.4 that was similar to our study. The female/male ratio in our study was 1:1.5.

5.1. Conclusions

In conclusion, the prevalence of neonatal hypothyroidism is close to many of the other provinces in Iran and this rate is high. These results emphasize the importance of the neonatal screening program. Finally, further studies with a larger sample size are suggested to confirm the results of this study.

Footnote

Authors' Contribution: All authors contributed equally in this study.

References

1. Kliegman RM, Stanton B, Geme JS, Schor NF, Behrman RE. Nelson textbook of pediatrics. Elsevier Health Sciences; 2015.
2. Stoppa-Vaucher S, Van Vliet G, Deladoey J. Variation by ethnicity in the prevalence of congenital hypothyroidism due to thyroid dysgenesis. *Thyroid.* 2011;**21**(1):13–8. doi: 10.1089/thy.2010.0205. [PubMed: 21054242].
3. Nagasaki K, Asami T, Ogawa Y, Kikuchi T, Uchiyama M. A study of the etiology of congenital hypothyroidism in the Niigata prefecture of Japan in patients born between 1989 and 2005 and evaluated at ages 5-19. *Thyroid.* 2011;**21**(4):361–5. doi: 10.1089/thy.2010.0005. [PubMed: 21309714].
4. Adachi M, Soneda A, Asakura Y, Muroya K, Yamagami Y, Hirahara F. Mass screening of newborns for congenital hypothyroidism of central origin by free thyroxine measurement of blood samples on filter paper. *Eur J Endocrinol.* 2012;**166**(5):829–38. doi: 10.1530/EJE-11-0653. [PubMed: 22301913].
5. Eftekhari N, Asadikaram GR, Khaksari M, Salari Z, Ebrahimzadeh M. The Prevalence Rate of Congenital Hypothyroidism in Kerman. Iran in 2005-2007. *J Kerman Univ Med Sci.* 2008;**15**(3):243–50.
6. Kalantari S. Neonatal screening for congenital hypothyroidism (CH) in Rasht. *J Guilan Univ Med Sci.* 2004;**13**(50):76–80.
7. Salim FA, Varma SK. Congenital hypothyroidism and the importance of universal newborn screening. *Indian J Pediatr.* 2014;**81**(1):53–7. doi: 10.1007/s12098-013-1299-x. [PubMed: 24323500].
8. Namakin K, Sedighi E, Sharifzadeh G, Zardast M. Prevalence of congenital hypothyroidism In South Khorasan province (2006-2010). *J Birjand Univ Med Sci.* 2012;**19**(2):191–9.
9. Dorreh F, Chaijan PY, Javaheri J, Zeinalzadeh AH. Epidemiology of congenital hypothyroidism in Markazi Province, Iran. *J Clin Res Pediatr Endocrinol.* 2014;**6**(2):105–10. doi: 10.4274/Jcrpe.1287. [PubMed: 24932604].
10. Gillam MP, Kopp P. Genetic regulation of thyroid development. *Current Opinion Pediatr.* 2001;**13**(4):358–63.
11. Zeinalzadeh AH, Talebi M. Neonatal screening for congenital hypothyroidism in East Azerbaijan, Iran: the first report. *J Med Screen.* 2012;**19**(3):123–6. doi: 10.1258/jms.2012.012024. [PubMed: 23060475].
12. Ordookhani A, Mirmiran P, Najafi R, Hedayati M, Azizi F. Congenital hypothyroidism in Iran. *Indian J Pediatr.* 2003;**70**(8):625–8. [PubMed: 14510082].
13. Hashemipour M, Taghavi A, Karimi DM, Amini M, IRAN PR, Hovsepian S, et al. screening for congenital hypothyroidism in Kashan, IRAN. *J Mazandaran Univ Med Sci.* 2005;**15**(15):83–91.
14. Hashemipour M, Amini M, Kelishadi R, Hovsepian S, Haghighi S, Hosseini M, et al. Seasonal variation in the incidence of congenital hypothyroidism in Isfahan, Iran. *Saudi Med J.* 2007;**28**(10):1582–6. [PubMed: 17914523].
15. Ordookhani A, Mirmiran P, Hajipour R, Hedayati M, Azizi F. Screening for congenital hypothyroidism in the Islamic Republic of Iran: strategies, obstacles and future perspectives 2002. Available from: http://apps.who.int/iris/handle/10665/119189.
16. Hashemipour M, Amini M, Iranpour R, Javadi A, Sadri GH, Javaheri N, et al. High prevalence of congenital hypothyroidism in Isfahan, Iran. *Iranian J Endocrinol Metabol.* 2004;**6**(1):13–9.