

Review Article

EPIDEMIOLOGY OF NEONATAL CONGENITAL HYPOTHYROIDISM DURING 2011-2017

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Abstract

Introduction: Neonatal hypothyroidism is a condition of treatable thyroid deficiency that can lead to severe retardation if not diagnosed on time or inappropriately treated. The present study is an epidemiologic study of neonatal congenital hypothyroidism in Lordegan during 2011-2017.

Materials and Methods: This descriptive-analytical study was performed to evaluate the epidemiological characteristics of congenital hypothyroidism. The data were entered into SPSS version 20 software and analyzed by statistical tests, Chi square, ANOVA, T-Test, Pearson Correlation and Spearman Correlation at 0.05 Level.

Results: The analysis of 7-years data showed that from the screening of 39332 newborns, 335 were identified as definitive patients, 159 males, 176 females, 275 rural (82.1%) and 169 neonates with a history of family marriage (50.4%). There was a significant relationship between neonatal birth weight and congenital hypothyroidism ($P = 0.000$). There was a significant relationship between type of delivery and hypothyroidism ($P = 0.000$). In the treated children, there was a direct relationship between the age of onset of treatment and their TSH level, which was statistically significant ($P = 0.013$).

Conclusion: Due to the high prevalence of congenital hypothyroidism in Lordegan, it is necessary to study further the factors affecting the incidence of congenital hypothyroidism as well as educate pregnant women and timely screening for this disease.

Keywords: Neonatal, Epidemiology, Congenital Hypothyroidism.

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INTRODUCTION

Neonatal hypothyroidism is a condition of treatable thyroid hormone deficiency that can lead to severe retardation and impaired growth if left untreated or treated inappropriately, while timely diagnosis, treatment is simple, easy, inexpensive and effective (1). Currently, almost all industrialized nations and many developing countries, including Iran, are regularly screening for neonatal hypothyroid screening (2). Prior to the neonatal screening program (before 2005) for CH (Congenital Hypothyroidism) the incidence of this disease was reported to be 1 in 1000-7000 and many patients were not diagnosed and so the statistics were much lower than the reality. The incidence of CH has been reported in approximately 1 patient in 500-3500 live births in the US, 1 in 300 in Europe, 1 in 6600-7300 in Sweden and 1 in 5700 in Japan. In Greece, CH has been reported 1 in 800 live births, which is very high. Scientific reports show that in the United States, in 1987, the incidence of CH was 1 in 4,000, and in 2002, the incidence was 1 in 2372 (3). The incidence of the disease varies across communities, with an average of 1 in 4,000 births reported (4,5). Prevalence of the disease in country 1 varied from 370 to 1000, according to previous academic research. Reports of program implementation in the country from 2005 to August 2010 show that the outbreak (permanent type) is 1 alive in 670 newborns. Girls are about two times more

likely to develop the disease than boys. It is also 35 times more likely to develop in Down syndrome. It is more common in some races and ethnicities, for example Asians than in English, it is usually sporadic (3). In addition to race and sex, twin pregnancy and genetics are also risk factors for congenital hypothyroidism, and the different causes of congenital hypothyroidism in different parts of the world are related to the type of testing used for screening, contractual criteria for diagnosis, differences Ethnic and ethnic groups attributed the excessive use of iodine-containing antiseptics, prematurity, other environmental factors, and family marriage (6, 7). The most important complications of this disorder are mental retardation, developmental disorder, hearing loss and stunting, which can put a heavy financial burden on the family and community economy (3). The purpose of this study was to determine the epidemiological characterization of congenital hypothyroidism in Lordegan during 2011-2017.

MATERIALS AND METHODS

This study was an analytical study to evaluate the epidemiological characteristics of congenital hypothyroidism. All neonates with congenital hypothyroidism in the city of Lordegan during March 2012 to the end of March 2018 were included in the study. Sampling was done after disinfection of the heel and was deposited on Whatman filter paper. After drying at room

temperature, samples were sent to the provincial reference laboratory and assayed by ELISA method. Neonates who had a positive result in the first stage of the test (TSH ≥ 5) were recalled, and their TSH in the second stage were classified into subgroups of 5-9.9, 10-19.9 and more than 20 mmol / L. Neonates with TSH levels more than 5 were referred to the focal point physician of the children's hypothyroid program in Lordegan county for a more accurate diagnosis and diagnosis of hypothyroidism (3) and additional tests for serum TSH were performed on them and children whose disease was confirmed by a physician were treated. In addition, data collection and information on household records available in health homes were used to collect epidemiological information on infants. Data were collected including child gender, birth weight, Type of delivery, sampling time, and treatment initiation time. Ethical considerations were complied with in accordance with the principles of the Helsinki Code of Ethics, and parents answered questions in an informed and informed manner. Quantitative data were analyzed by SPSS version 20 software and analyzed by means of statistical tests, Chi square, ANOVA, Pearson Correlation and Spearman Correlation at the 0.05 level. The Code of Ethics for this study is IR. SKUMS. REC 1397, 271.

RESULTS

Analysis of data from 7 years of study, from 2011 to the 2017 in Lordegan showed that out of 39332 newborns, all newborns were screened, of which 335 were identified as definitive patients. The screening coverage was 100% in this study. After measuring serum TSH, 335 patients had serum TSH of 5 mmol per liter and more (8.51 per 1000 live births) who were treated with definitive diagnosis of congenital hypothyroidism. The incidence of congenital hypothyroidism has increased from 5.4 to

8.7 per thousand live births during the years 2011-2017 (Figure 1). 159 males (47.5%), 176 females (52.5%), 275 rural (82.1%), 60 urban (17.9%), 169 neonates with history of family marriage (50.4%), 4 neonates with thyroid disease in mother (1.2%), 3 neonates with thyroid disease in father (0.9%), the birth weight of infants ranged from 1300 to 5200 grams and their average weight was 3169 grams. 41 neonates (12.3%) weighed less than 2500 grams at birth. There was a statistically significant relationship between birth weight and congenital hypothyroidism (P = 0.000). 26.6% of neonates were born by cesarean section. There was a significant relationship between type of delivery and hypothyroidism (P = 0.000). The highest prevalence was observed in summer (105 neonates, 31.3%) and the least in autumn (72 neonates, 21.5%).

Also, the highest thyroid disease was diagnosed in 2013 (68 neonates, 20.3%) and the least thyroid disease in 2011 (27 neonates, 8.1%) that there was a significant relationship between the number of patients in different years (P = 0.000) and the seasons of the year (P = 0.026) (Figure 2).

There was no statistically significant relationship between parental marital status and primary TSH in infants in Lordegan during the 7-year period (P = 0.041). The heel TSH level in the children studied ranges from 5 to more than 20 mmol / l in Table 1. In the treated children, there was a direct relationship between the age of onset of treatment and their TSH level, which was statistically significant (P = 0.013). This indicates that the longer the delay in treatment initiation in children, the higher the TSH level in children. There was no significant relationship between primary TSH and sex (P = 0.231) and type of delivery (P = 0.072).

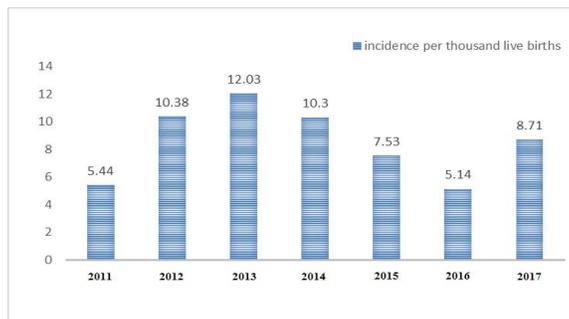


Figure 1: Disease incidence per thousand live births (P <0.001)

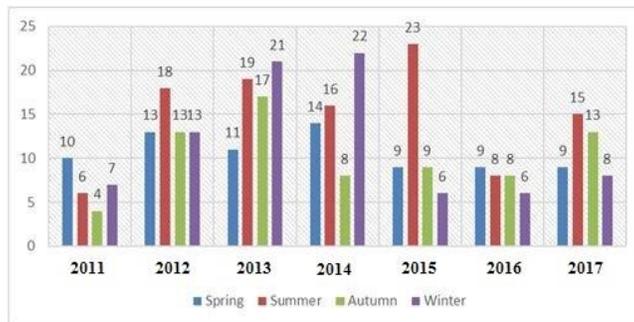


Figure 2: Frequency of the disease according to seasons from 2012 to 2018

Table 1: Demographic characteristics of congenital hypothyroidism patients

Frequency percent	Frequency	Sex		Type of item	Item
82/1	275	136	Male	Rural	Location
		139	Female		
17/9	60	23	Male	Urban	
		37	Female		
50/4	169	79	Male	Yes	Family marriage
		90	Female		
49/6	166	80	Male	No	
		86	Female		
6	20	11	Male	Yes	Family history of thyroid disease
		9	Female		
94	315	148	Male	No	
		167	Female		
10/2	34	18	Male	Yes	Anomaly
		16	Female		
89/8	301	141	Male	No	
		160	Female		
12/3	41	15	Male	Below 2500 gr	Weight
		26	Female		
87/7	294	151	Male	Above 2500 gr	
		140	Female		
73/4	246	115	Male	Natural	Type of delivery
		131	Female		
26/6	89	44	Male	Cesarean section	
		45	Female		
61/5	206	97	Male	5-9.9	Heel TSH level (mmol/l)
		109	Female		
28	94	42	Male	10-19.9	
		52	Female		
10/5	35	20	Male	More than 20	
		15	Female		
45/3	152	77	Male	Less than 28 days old	Age of onset of treatment
		75	Female		
54/7	183	82	Male	More than 28 days old	
		101	Female		

DISCUSSION

Congenital Hypothyroidism is one of the common diseases of the neonatal endocrine gland and also is an important preventable cause in mental retardation (1). Incidence of neonatal hypothyroidism was 8.51 per 1000 live births in Lordegan. One out of every 117 babies born in Lordegan County has hypothyroidism. This rate is different for 1 patient in 3500-5000 live births in the US, 1 in 300 live births in Europe, 1 in 800 live births in Greece and 1 in 5700 live births in Japan (1). In Iran, in a study conducted in Yazd from 2014 to 2015, 1 case was reported for every 295 births (8). In another study conducted in Qazvin in 2012, the prevalence of hypothyroidism in infants was 1 in 297 (9). Also, in a study conducted in Torbat-e-Heydariyeh in 2012, the prevalence of neonatal hypothyroidism was reported 1 in 833 (10). Our study showed that the prevalence of congenital hypothyroidism in Lordgan County is approximately 6 times the

national average (1 in 1000 live births). The method of screening for this disease has not changed over the years and has a high sensitivity and specificity. Concerning the cause of different prevalence rates of congenital hypothyroidism in different regions of the world, the following reasons have been raised: 1- Using T4 or TSH alone to screen (11), 2- Ethnic and racial differences, 3- Environmental, hereditary and Familial, 4- Iodine deficiency in some parts of the world (12, 13), 5- Contractual criteria for definitive diagnosis of neonatal hypothyroidism (12). The results of this study showed that of 335 patients with hypothyroidism, 47.5% were male and 52.5% female. In most studies, females have been identified as risk factors. Studies in Italy and the United States have reported a higher incidence of the disease in females than in males (14,15). In another 2010 US study, the incidence of congenital hypothyroidism in recent years in both sexes was the same, and only in a study in Texas similar

to a study in Iran, the province of Kurdistan has shown a higher increase among boys (16, 17). Most studies in some other countries of the world and Iran have reported a higher incidence of the disease in girls than boys (8). In this study, there was a statistically significant relationship between birth weight and congenital hypothyroidism, which is consistent with findings from other studies (8, 18, 19) indicating a higher risk of preterm weight and birth weight. In the present study, there was a significant relationship between the type of delivery and hypothyroidism in the study conducted in Yazd (8) as well as in another study in Bosnia (20). Results were similar to the present study. There was no significant relationship between delivery method and neonatal weight. Some studies have reported drug use and delayed neonatal lactation to elevate TSH (21), and some do not appreciate this effect much (22). It appears that our study may also be the cause of this association with drug use and delayed lactation. The present study did not show a statistically significant relationship between parental marriage and neonatal hypothyroidism, which is inconsistent with other studies (23, 24). It seems that due to the lack of association of this disease with the family ratio of various environmental factors in this city, it is involved in the incidence of this disease, which needs further studies. In the present study, the highest prevalence was observed in summer and the lowest in autumn. There was a significant relationship between the number of patients in different years and the seasons. The results have been different in different studies in Iran and in the world. There was no statistical relationship between the number of patients and seasons in Yazd province, but the Japanese, English and study findings in East Azarbaijan province contradict the present study, so there was no significant relationship between The seasonal pattern requires multicenter research in different geographical areas, with sufficient time and large sample size (8). In this study, there was a significant relationship between TSH and age of onset of treatment, and this result was similar to that in Kermanshah (25). According to studies conducted in Kashan, Kohgiluyeh and Boyer Ahmad, Kermanshah, as well as in Greece and Turkey, it can be said that treatment has been delayed slightly, which can partially alleviate this problem by training in the importance of the disease (26). The percentage of screening coverage at Lordegan during the years 2011 to 2017 was 100%, which is a good trend compared to other studies to identify newborns with congenital hypothyroidism.

CONCLUSION

Given the high prevalence of congenital hypothyroidism in Lordegan, it is necessary to further study on factors affecting the incidence of this disease and also educate pregnant women about congenital hypothyroidism and timely screening can be effective.

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Conflict of interest

None.

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