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Investigation of Risk Factors of Congenital Hypothyroidism in Children in Southwestern Iran

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Abstract

Due to the fact that congenital hypothyroidism is one of the preventable causes of mental retardation, so this study was conducted to determine the risk factors in children with congenital hypothyroidism. In this descriptive-analytical cross-sectional study, the study population included all children with congenital hypothyroidism referred to outpatient clinics of teaching hospitals whose congenital hypothyroidism was diagnosed by a physician specializing in this field from the first months after birth. The data collection tool is a researcher-made checklist that includes individual and clinical variables (age, sex, height, weight, several children in the family, etc.). In order to analyze the data, $SPSS_{19}$ software and descriptive statistics such as mean, standard deviation and frequency percentage were used to describe the demographic information. The significance level used in statistical tests was considered equal to 0.05. The results of this study showed that out of 350 affected children, 163 (46.6) were girls and 187 (53.4) were boys. Also, the majority of children are over 6 years old (35.14%). Most children live in the city (88.57%). Also 55.71% of mothers of affected children had a normal delivery. 57.42% of the parents of children have a family relationship. According to the results of this study, many risk factors for congenital hypothyroidism are identified. Therefore, based on these findings, Health planners should consider the necessary strategies to prevent and control this congenital disease in a timely manner.

Keywords

Congenital hypothyroidism, Risk factors, Children

Introduction

Congenital hypothyroidism is defined as a deficiency of thyroid hormone at birth and is one of the most common endocrine disorders in newborns.[1,2]

Congenital hypothyroidism, with a prevalence of 1 in 3000-4000 live births, is the most common preventable cause of mental retardation in children.[3,4]

The rate of this disorder is lower in whites and blacks and higher in Hispanics and Asian countries.[5] Congenital hypothyroidism in Iranian provinces also has a variable prevalence.[6] Dalili et al In their study state that the incidence of 1 case of congenital hypothyroidism per 781 live births is comparable to other studies in Iran and it has a significant incidence compared to most reports from other countries. Due to the higher incidence in several Iranian studies, the genetic predisposition of the Iranian population is a possible cause but a significant variation in the incidence of hypothyroidism in different parts of Iran is a significant effect of environmental factors.[2] Newborns with hypothyroidism have a normal appearance and clinical signs at birth are low and non-specific. Therefore, if the diagnosis is based on clinical symptoms, the diagnosis and treatment is delayed and the newborn will suffer irreversible complications such as deafness and mental retardation.[7] Congenital hypothyroidism is generally classified into 2 types, transient and permanent. The transient type improves on its own while in the permanent type, a person must take medicine for the rest of one's life. The transient type is mainly due to iodine disorders in the mother during pregnancy or exposure of the newborn to high levels of iodine during or after birth.[8]

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On the other hand, congenital hypothyroidism refers to when thyroid stimulating hormone is more than 5 mu/L from a heel sample in newborn 3 to 7 days and confirmation with a venous sample of TSH greater than 10 mu/ L and T4 less than 6.5 µgr/dl and transient hypothyroidism, normalization of venous TSH (less than 5 mu/L) in congenital neonatal hypothyroidism before the age of 3.[9] Screening for congenital hypothyroidism in infants and rapid initiation of levothyroxine treatment significantly increases the prognosis of mental development and linear growth in these children and is significant as one of the preventive medicine programs in which the profit-to-cost ratio is positive.[10] Screening is the most acceptable way to diagnose congenital hypothyroidism due to ambiguous clinical manifestations at birth.[11] Congenital hypothyroidism is considered as one of the preventable causes of mental retardation due to the role of thyroid hormone in neurological development in newborns. Due to this fact, neonatal screening for congenital hypothyroidism in many countries is for early detection and treatment of congenital hypothyroidism and, consequently, prevention of related neurodevelopmental complications.[12] Also, by diagnosing and treating infants with congenital hypothyroidism as soon as possible during screening, Also, by diagnosing and treating newborns with congenital hypothyroidism as soon as possible during screening, they will enjoy normal development and normal intelligence and cognition function.[5] On the other hand, neonatal recall is one of the cases that is important in the implementation stages of congenital hypothyroidism screening in terms of time and cost, as well as the psychological consequences for the parents of newborns.[13] As well as, Osuli et al In this regard, State that information about the distribution of congenital hypothyroidism in the cities and provinces of the country is one of the needs of the screening program of the disease in order to allocate the necessary funds and facilities.[14]

Many studies, maternal and fetal factors including parental sanguinity inbreeding, fetal abnormalities and mutations, iodine deficiency disorders, immune deficiencies, familial goiter or hypothyroidism or family history of thyroid disease, race, parental kinship, socioeconomic factors, smoking In father, sex and age of the baby, height and weight of the baby, excessive use of betadine for the baby immediately after birth, congenital defects, twins and multiples, breastfeeding, Maternal factors (maternal hypothyroidism, age, maternal exposure to drugs during pregnancy, untreated hyperthyroidism during pregnancy, cesarean section, maternal parity, maternal body mass index, consumption of foods and goitrogen drugs in the mother during pregnancy), cleansing chemicals, iodine consumption (drugs, radioactive substances), Iodized salt intake, geographical area, diet has been associated with this metabolic disease.[15-21] An overview of the adverse effects of these complications along with the heavy financial burden that the provision of services and care for these children imposes on the community economy, Highlights the urgent need to investigate and take preventive measures for this congenital complication.[10] Until now, several studies have been conducted to identify the risk factors for congenital hypothyroidism, which indicate the influence of genetic factors and various environmental factors in the incidence of this disease.[17,22-24] Genetic factors in the transient type and environmental factors in the permanent type have been suggested as the cause. Identifying these factors is very helpful in controlling the disease and its complications.[25] Given that the prevalence varies according to ethnicity and geographical area.[26] In this regard, perhaps one of the reasons for the increase in this disorder in the southwestern regions of Iran is the residence of different ethnicities and the prevalence of consanguineous marriages in these ethnicities.

Therefore, this study was performed to determine the risk factors in patients with congenital hypothyroidism to identify risk factors and then continuous control by the health team and appropriate treatment for patients to prevent their mental retardation and guarantee the survival of a healthy and efficient generation. Also, by using the results of the above study, it is possible to avoid high financial costs for the family and the health system.

Methods

The present study is a descriptive-analytical study that includes all children with congenital hypothyroidism referred to outpatient clinics of teaching hospitals affiliated to Ahvaz Jundishapur University of Medical Sciences. It should be noted that congenital hypothyroidism in children was diagnosed by a specialist in the field from the first months after birth. Due to the nature of the research, the population size was equal to the sample size and according to the census method, there were 350 children. Information was collected by obtaining a license and an ethics code from the relevant university with the presence of a researcher in the clinics of teaching hospitals affiliated to Ahvaz Jundishapur University of Medical Sciences in the years 2008 to 2020. In addition, with the oral and written consent of the parents of these children, the necessary information was collected during the research. The data collection tool is a researcher-made checklist that includes individual and clinical variables (age, sex, height, weight,

several children in the family, etc.). It should be noted that the data over a period of 12 years, according to the checklist was collected through existing files (affected children) in the relevant clinics. Then, in order to analyze the data, SPSS19 software and descriptive statistics such as mean, standard deviation and frequency percentage were used to describe the demographic information. The significance level used in statistical tests was considered equal to 0.05.

Results

The results of this study showed that out of 350 affected children, 163 (46.6) were girls, and 187 (53.4) were boys. Also, the majority of children are over 6 years old (35.14%). Most children live in the city (88.57%). Also 55.71% of mothers of affected children had a normal delivery. 57.42% of the parents of children have kinship relations. Other characteristics of the participants in the study are presented in Table 1.

Discussion

The present study aimed to determine the risk factors in children with congenital hypothyroidism was performed. According to the results of this study, most of the affected children were boys. In this regard, the results of studies also indicate that the number of affected boys is higher.[27-29] Therefore, gender variable is one of the risk factors for this disease. In the present study, most children live in the city. According to Namkin et al, Most children with hypothyroidism live in the city.[27] Probably the knowledge of families living in the city and their follow-up in connection with this type of disease is more.

According to the findings of this study, most mothers of affected children had a vaginal delivery. In this regard, in a study, most children were born with a vaginal delivery.[30]

In the event that, according to the results of other studies, most children are born by cesarean section.[31-33] Perhaps one of the reasons for the difference in study results, the adherence of the relatives of each region in our country is the use of a type of delivery method. The results of this study indicate that most of the parents of children have a family relationship. Other research findings also show that parental family relationship is one of the risk factors for congenital hypothyroidism.[30] Of course, Racial and ethnic issues are involved in creating this factor. The results of this study indicate that low birth weight is one of the effective factors in causing this disorder .The results of other studies are in line with the results of the present study.[30,32,34,35] It should be noted that to prevent the birth of a low birth weight newborn, implementing prenatal care is very important. Thus, health care providers should repeatedly remind pregnant women of this point.

According to the findings of this study, Existence of thyroid diseases in first-degree relatives is one of the risk factors for congenital hypothyroidism in children. The results of this study are consistent with the results of another study.[21] Probably the presence of genetic and environmental factors involved in creating this factor. The results of this study indicate that most children have permanent congenital hypothyroidism. In this regard in another research most children had transient hypothyroidism.[36] Perhaps one of the reasons for the different results in the type of congenital hypothyroidism is related to environmental and genetic factors. The onset of treatment in most children is 28 to 40 days. In the event that, according to other research results, the treatment of children is less than 28 days.[28] Given this difference at the beginning of treatment, it can be acknowledged, early education for families of affected children and prevention of subsequent complications for these children is very important. Other risk factors according to the results of this study, include a history of hypothyroidism in the mother, nutritional problems of the mother during pregnancy, body mass index of the child, anomalies, and low gestational age. In general, each of the risk factors, due to its nature, can cause serious complications for the affected children and also create many problems for their families, psychologically and materially. There were no specific restrictions on conducting this research. Therefore, it is suggested that annual and continuous evaluation in relation to these risk factors and other possible risk factors be performed in the relevant institutions and finally the necessary guidance in this regard be provided to the families of affected children.

Conclusion

According to the results of this study, many risk factors are involved in the development of congenital hypothyroidism in children. It should be noted that the irreversible consequences of this disease for children including mental retardation is one of the cases which to control and remove it, Planned measures should be taken by health planners. Therefore, it is necessary to provide coherent and regular educational programs in the relevant clinics to increase the knowledge of families, especially during pregnancy and after the birth of a child in relation to this disease and its complications.

Table 1. Frequency Distribution of Demographic Characteristics of Children With Congenital Hypothyroidism.

Percent	Number		Variable
6.46	163	Girl	Sex
4.53	187	Boy	
6	21	Less than 1 year	age
57.24	86	3 years-1	
34.28	120	6 years-4	
35.14	123	More than 6 year	
71.43	153	Less than 2011	Date of birth
71.25	90	2011-2015	
57.30	107	More than 2015	
71.25	90	Less than 2300 gr	Birth weight (gr)
71.45	160	2300-2500 gr	
57.28	100	More than 2500 gr	
42.25	89	Less than 45 cm	Height at birth (cm)
42.57	201	50 cm −45	
14.17	60	More than 50 cm	
57.88	310	City	Address
11.42	40	Village	
71.55	195	vaginal	Type of delivery
57.44	156	Cesarean section	
42.57	201	has	Parental kinship
57.42	149	does not have	
14.39	137	has	Existence of thyroid diseases in first-degree relatives
60.85	213	does not have	
16	56	has	Having anomalies
84	294	does not have	
42.31	110	Less than 28 days	Age of the baby at the time of starting treatment by day
57.48	170	40 days-28	
20	70	More than 40 days	
42.93	327	Under treatment	treatment process
57.6	23	Discontinue treatment	
57.20	72	Less than 30 cm	Around the baby's head
57.68	240	32 cm −30	
85.10	38	More than 32 cm	
85.22	80	Persian	Race
28.46	162	Arab	
85.30	108	Bakhtiari	
14.57	200	Less than 30 year	Mother's age
28.34	120	35 year −30	
57.8	30	More than 35 year	
0	0	has	Tobacco consumption of mother and father
100	350	does not have	
85.18	66	Preterm	Status of birth
77.71	272	Term	
42.3	12	Post term	
28.14	50	Less than 35 week	Gestational age
28.74	260	40 weeks-35	
11.42	40	More than 40 week	
36.28	127	High	Economic capital
28.42	148	medium	
42.21	75	Low	
57.8	30	has	Multiplicity
91.42	320	does not have	

(continued)

Table 1. (continued)

Percent	Number		Variable
71.35	125	Less than 2	Number of deliveries
57.58	205	4-2	
71.5	20	More than 4	
42.85	150	has	Mother nutrition problems during pregnancy
57.14	200	does not have	
63.14	221	Breast milk	Type of newborn feeding
24	84	formula milk	
85.12	45	Breast milk and formula	
2.85	10	has	Congenital kidney disorders
14.97	340	does not have	
46	161	has	History of hypothyroidism in the mother
54	189	does not have	
98.85	346	Permanent	Type of hypothyroidism
1.14	4	Transient	
58	203	normal	BMI
42	147	abnormal	
28.40	141	Less than 12 kg	Current weight (kg)
85.44	157	20 kg −12	
85.14	52	More than 20 kg	
71.21	76	Less than 85 cm	Current height (cm)
42.35	124	105 cm −85	
85.42	150	More than 105 cm	

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Ashrafalsadat Hakim: Writing – original draft, Data collection, Data analysis and Reviewing the final edition

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References

1. Hashemipour M, Ghasemi M, Hovsepian S, et al. Etiology of congenital hypothyroidism in Isfahan: does it different? *Adv Biomed Res*. 2014;3(1):21. doi:10.4103/2277-9175.124658
2. Dalili S, Rezvani SM, Dalili H, et al. Congenital hypothyroidism: etiology and growth-development outcome. *Acta Med Iran*. 2014;52:752-756.
3. Grosse SD, Van Vliet G. Prevention of intellectual disability through screening for congenital hypothyroidism: how much and at what level? *Arch Dis Child*. 2011;96(4):374-379.
4. Olney RS, Grosse SD, Vogt RF Jr. Prevalence of congenital hypothyroidism—current trends and future directions: workshop summary. *Pediatrics*. 2010;125 Suppl 2:S31-S36.
5. Harris KB, Pass KA. Increase in congenital hypothyroidism in New York State and in the United States. *Mol Genet Metab*. 2007;91(3):268-277.
6. Nouri SM, Jafarizadeh M, Mirzaei M, et al. Prevalence of congenital hypothyroidism and transient increased levels of TSH in Yazd province. *J Shahid Sadoughi Univ Med Sci Health Serv*. 2008;16(3):20-15.
7. Büyükgebiz A. Newborn screening for congenital hypothyroidism. *J pediatr Endocrinol Metab*. 2006;19:1291-1298.
8. Beardsall K, Ogilvy Stuart AL. Congenital hypothyroidism. *Curr Pediatr*. 2004;14:422-429.
9. Delavari AR, Yarahmadi S, Ordookhani A, Norouzi Nejad A, Mahdavi AR, Safaei A, et al. *Screening Program for Congenital Hypothyroidism and Transient Increase in TSH in Newborns*. Ministry of Health and Medical Education, Department of Health, CDC; 2006:5.
10. Delavari AR, Yarahmadi S, Birjandi R, Mahdavi AR, Norouzi Nejad A, Dini M. C. *Int J Endocrinol Metab*. 2006;4:84-87.

11. Tamam M, Adalet I, Bakir B, et al. Diagnostic spectrum of congenital hypothyroidism in Turkish children. *Pediatr Int*. 2009;51(4):464-468.
12. Hashemipour M, Ghasemi M, Hovsepian S, et al. Prevalence of permanent congenital hypothyroidism in Isfahan-Iran. *Int J Prev Med*. 2013;4(12):1365-1370.
13. Hashemipour M, Iranpour R, Amini M, Hovsepian S, Haghighi S. Comparision of the recall rate using two different diagnostic criteria at Isfahan screening program for congenital hypothyroidism. *J Rafsanjan Univ Med Sci*. 2004;3(3):134-140.
14. Osooli M, Haghdoost A, Yarahmadi S, Foruzanfar M, Dini M, Holakouie Naieni K. Spatial distribution of congenital hypothyroidism in Iran using Geographic Information System. *IRJE*. 2009;5(1):1-8.
15. Kopp P. Perspective: genetic defects in the etiology of congenital hypothyroidism. *Endocrinology*. 2002;143:2019-2024.
16. Ordookhani A, Mirmiran P, Moharamzadeh M, Hedayati M, Azizi F. A high prevalence of consanguineous and severe congenital hypothyroidism in an Iranian population. *J Pediatr Endocrinol Metab*. 2004;17:1201-1209.
17. Medda E, Olivieri A, Stazi MA, et al. Risk factors for congenital hypothyroidism: results of a population case-control study (1997-2003). *Eur J Endocrinol*. 2005;153:765-773.
18. Rose SR, Brown RS, Foley T, et al. Update of newborn screening and therapy for congenital hypothyroidism. *Pediatrics*. 2006;117:2290-2303.
19. Ordookhani A, Pearce EN, Mirmiran P, Azizi F, Braverman LE. The effect of type of delivery and povidone-iodine application at delivery on cord dried-blood-specimen thyrotropin level and the rate of hyperthyrotropinemia in mature and normal-birth-weight neonates residing in an iodine-replete area: report of Tehran Province, 1998–2005. *Thyroid*. 2007;17:1097-1102.
20. Sepandi M, Holakoei NK, Yarahmadi SH, Haghdust AA, Nedjat S, Taghdir M. Risk factors for congenital hypothyroidism in fars Province, Iran, 2003-2006. *Journal of School of Public Health & Institute of Public Health Research*. 2009;7(1):35-45.
21. Esmailnasab N, Moasses Ghaffari B, Afkhamzadeh AR. Investigation of the risk factors for congenital hypothyroidism in the newborns in Kurdistan Province. *Sci J Kurdistan Univ of Med Sci*. 2012;17(4):103-108.
22. Olivieri A, Medda E, De Angelis S, et al. Study Group for congenital hypothyroidism. High risk of congenital hypothyroidism in multiple pregnancies. *J Clin Endocrinol Metab*. 2007;92:3141-3147.
23. Hashemipour M, Iran PR, Amini M, Hovsepian S, Haghighi S, Ahmadi N. The prevalence of consanguineous marriages in parents of neonates with congenital hypothyroidism: the Isfahan screening program for neonatal hypothyroidism. *J Urmia Univ Med Sci*. 2005;16(2):104-108.
24. Klett M. Epidemiology of congenital hypothyroidism. *Exp Clin Endocrinol Diabetes*. 2009;105(S 04):19-23.
25. Ordookhani A, Hedayati M, Mirmiran P, Eini E, Sabet Saeidi H, Azizi F. Etiologies of transient congenital hypothyroidism in Tehran and Damavand. *Indian J Endocrinol Metab*. 2004;6:113-107.
26. Rastogi MV, LaFranchi SH. Congenital hypothyroidism. *Orphanet J Rare Dis*. 2010;5(1):17.
27. Namakin K, Sedighi E, Sharifzadeh G, Zardast M. Prevalence of congenital hypothyroidism in South Khorasan province (2006-2010). *J Birjand Univer Med Sci*. 2012;19(2):191-199.
28. Ghadiri K, Darbandi M, Khodadadi L, et al. The prevalence of congenital hypothyroidism in Kermanshah in 2006-2010. *J Kermanshah Univ Med Sci*. 2013;16(7): e77296.
29. Abedi M, Shahsavari S, Salehi R, et al. The study of prevalence and risk factors of hypothyroidism in newborn screening program in Sanandaj city in 2009-2014. *Zanco J Med Sci*. 2015;15(47):46-51.
30. Hazar N, Zare A, Malamiri MJ, Tafti MR, Ordooei M. Congenital hypothyroidism in Yazd: is It really prevalent? *Acta Med Iran*. 2018;56:261-266.
31. Amiri GF, Sharifi H, Ghorbani AE, Mirrashidi FS, Mirzaee M, Nasiri N. Prevalence of congenital hypothyroidism and some related factors in newborn infants in southern Kerman from april to march 2009. *irje*. 2019;15(2): 188-194.
32. Rezaeian S, Poorolajal J, Moghimbegi A, Esmailnasab N. Risk factors of congenital hypothyroidism using propensity score: a matched case-control study. *Res J Health Sci*. 2013;13:151-156.
33. Rezaei R, Alipour A, Kosarian M. Prevalence of transient and permanent congenital hypothyroidism in Mazandaran Province. *J Mazandaran Univ Med Sci*. 2018;28:133-145.
34. Dalili S, Rezvany SM, Medghalchi A, Mohammadi H, Dalili H, Mirzanejad M, et al. Congenital hypothyroidism: a review of the risk factors. *Acta Med Iran*. 2012;50: 735-739.
35. Monroy-Santoyo S, Ibarra-González I, Fernández-Lainez C, et al. Higher incidence of thyroid agenesis in Mexican newborns with congenital hypothyroidism associated with birth defects. *Early Hum Dev*. 2012;88(1):61-64.
36. Daliri S, Asadollahi K, Karimi A, Ehsanzadeh A, Rezaei N. Investigation of the incidence rate and geographical distribution of congenital hypothyroidism in the newborns in Ilam Province by using geographic information system (GIS) between 2006 and 2016. *SJKU*. 2019;24(1):98-111.