Health Science Monitor
2023; 2(4): 262-272
Published online (http://hsm.umsu.ac.ir)

Original Article

Study of the prevalence and associated factors of major congenital anomalies at birth in Shahreza County during 2016-2018

Mina Salesi [1], Ahmad Khaleghnejad Tabari [2], Mohammad Reza Maracy [3] *

[1] *Student Research Committee, Faculty of Health, Isfahan University of Medical Sciences, Isfahan, Iran*

[2] *Specialist in pediatric surgery, Research Institute for Children's Health Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

[3] *Professor of Epidemiology, Department of Epidemiology and Biostatistics, Faculty of Health, Isfahan University of Medical Sciences, Isfahan, Iran*

***Corresponding author:** Mohammad Reza Maracy, **Address**: Faculty of Health, Isfahan University of Medical Sciences, Isfahan, Iran, **Email**: mrmaracy@yahoo.co.uk, **Tel**: +98 - 31- 3668 0042

Abstract

***Background & Aims*:** The health and vitality of the future society depend on the health of today's infants and the future youth of the society, and one of the factors threatening this health is congenital anomalies. Therefore, this study was conducted to determine the prevalence and some associated factors of major congenital anomalies at birth in Shahreza County during 2016-2018.

***Materials & Methods*:** The present study was a cross-sectional study and the study population included all newborns born in 2016-2017-2018 in Shahreza County, whom information were extracted from the mother and child records of the only hospital in the county (Amir Al-Momenin Hospital) and information registration (Sib) system. The prevalence of major congenital anomalies was estimated from the collected data, and data analysis was performed to find statistical relationships between variables using multiple logistic regression test and SPSS software v.20. A probability of < 0.05 was accepted as significant.

***Results*:** In total, 91 infants with major congenital anomalies were identified from 4,516 records. The prevalence of major congenital anomalies was 2.64% in 2016, 1.89% in 2017, 1.27% in 2018, and 2.01% in 2016 to 2018. There was a significant relationship between cesarean delivery type 0.6 (0.4-0.9), infant birth year 0.3 (0.1-0.5), and 0.4 (0.2-0.7), with congenital anomalies in the infants ($p < 0.05$).

***Conclusion*:** The decline in the prevalence of congenital anomalies during the years 2016, 2017 and 2018 could be attributed to the screening of congenital anomalies during the fetal period based on the existing protocols before the 20th week of pregnancy and the termination of pregnancy in cases of diagnosis of a major congenital anomaly, with the permission of a forensic doctor. This suggests that improving the quality of prenatal care can reduce the prevalence of major congenital anomalies. Therefore, by conducting genetic counseling and fetal screening, the occurrence of major congenital abnormalities can be prevented.

Keywords: Congenital Anomaly, Cross-Sectional Study, Infant, Prevalence, Risk Factors, Shahreza City

Received 15 November 2022; accepted for publication 01 October 2023

Introduction

Congenital abnormalities are developmental defects present at birth and can be classified into structural and functional types (1-5). These abnormalities can occur due to various factors, including single-gene disorders, chromosomal abnormalities, hereditary conditions, environmental factors, or specific nutritional deficiencies (5). moreover, racial and cultural differences contribute to variations in the prevalence of these disorders in different regions (6, 7). Structural abnormalities that are visible at birth are referred to as overt congenital abnormalities (8).

Congenital abnormalities account for 20% of infant mortality under one year of age and are a contributing factor to the deaths of 49,500 children worldwide. Additionally, 25% of hospitalizations in children are due to congenital abnormalities (9). Congenital abnormalities are divided into two categories based on their severity: major and minor. Minor abnormalities, also known as mild abnormalities, are observed in approximately 4% of the population, while major abnormalities or significant anatomical abnormalities affect an individual's life and normal functioning, requiring medical interventions. They encompass approximately 2% of all live-born infants with prevalent congenital abnormalities (7, 10, 11).

According to statistics from the World Health Organization (WHO), approximately 303,000 infants worldwide die within 30 days after birth due to congenital abnormalities (4). Generally, 3 to 5% of infants have detectable defects at birth (12). The prevalence of congenital abnormalities varies in different regions of Iran, with rates reported as follows: Dezful 2.3% (13), Isfahan 2.2% (14), Rasht 4.2% (15), Tehran 3.1% (16), Sabzevar 2.4% (17), Rafsanjan 2.9% (18), Bandar Abbas 3% (19), and Zanjan 5.5% (20). Meta-analysis studies in Iran between 1992 and 2014 reported a prevalence of 8.2%, and between 1986 and 2016, the prevalence was 3.2% (21, 22). In Chaharmahal and Bakhtiari province, the prevalence was 3.0% (23). Additionally, in Mashhad, it was 8.1% (7), in Ardabil 8.0% (3), in Isfahan 7.0% (24), in Tabriz 1.1% (25), and in Sistan and Baluchestan 8.1% (26). Outside of Iran, the prevalence of congenital abnormalities was reported as 2% in Europe (27), 2.0% in Turkey (28), 4.2% in Lebanon (29), and 6.8% in India (30).

Congenital abnormalities can result from genetic, environmental, or combined factors, and the financial burden of hospitalization and medical interventions for affected children places significant strain on healthcare systems and families (3). Known factors contributing to congenital abnormalities include genetic, environmental, and teratogenic factors such as maternal alcohol addiction, infections like rubella and toxoplasmosis, malnutrition, infections, drug use, and exposure to chemicals or radioactive materials (4, 31-33). Other factors like consanguinity, socio-economic factors, low income, maternal age, and newborn weight also increase the risk of congenital abnormalities (31, 34). The age of both parents (34), the number of previous pregnancies for the mother (35), and the mother's blood group (36) also play a significant role in the occurrence of major congenital abnormalities.

Identifying and preventing congenital abnormalities, rather than treating or rehabilitating disabilities resulting from such abnormalities, is cost-effective for societies due to the high expenses associated with treatment, uncertain outcomes, and the possibility of miscarriage or intrauterine death in severe cases (37, 38). Therefore, serious efforts to identify the effective factors associated with congenital abnormalities and their prevention can lead to improved health and well-being for future generations and averted social and economic burdens (26).

While numerous studies have been conducted on congenital abnormalities and related risk factors at the national and regional levels, no study on this subject has been found in Shahreza County. Hence, this study was conducted to determine the prevalence of congenital abnormalities at birth and some associated risk factors during the years 2016-2018 at Amir Al-Momenin Hospital in this county.

Materials & Methods

The present study was a cross-sectional study. The study population consisted of all pregnant women who gave birth in Amir Al-Momenin Hospital in Shahreza County in 2016 to 2018. The outcome of interest in this study was the presence or absence of major congenital anomalies in newborns, which was collected by the researcher using the information recorded in the mother and child records. According to the estimates made from the number of births in 2016 to 2018 in Amir Al-Momenin Hospital in Shahreza, 6,137 delivery records were available and were examined. Of these, 182 mothers were Afghan migrants and 2,041 mothers were residents of other neighboring counties in the province and sometimes other provinces, and only 4,516 records had the entry criteria for the study, including: A) Mother's residence in Shahreza County, and B) All live births and fetal deaths and termination of pregnancy for any reason after 22 weeks of pregnancy. The records of all of them were reviewed and analyzed. The data required for this study included: parental information (mother's age, parental consanguinity, mother's blood group, number of previous pregnancies, and number of abortions) and infant characteristics (type of delivery, gestational age of infant, infant sex, birth weight, infant height at birth, infant head circumference at birth, year and season of birth, and presence or absence of congenital anomaly), which were collected by visiting Shahreza Hospital and by studying the paper records of mother and child carefully.

To recheck, the existing information for all those who had anomalies was matched with the records of Roming (neonatal ward) using the file number and date of birth of the infant, which was not found to be erroneous. In addition, the Excel data were re-examined, and infants who had congenital anomalies records should have at least one type of anomaly. The remaining data deficiencies that were not recorded in the mother and infant file were extracted from the family file of the individuals concerned by referring to the national Sib system, and if they did not have a family file, they were contacted by phone. The data were analyzed using SPSS software v.20. For quantitative variables, mean and standard deviation, and for qualitative variables, frequency distribution and percentage were used. Independent t-test was used to compare the mean of quantitative variables in two groups of normal and abnormal infants. Also, using multiple logistic regression model, factors associated with major congenital anomalies were calculated using odds ratio index. The confidence interval was 95.0 for odds ratio and significance level less than 0.05 was considered significant. The present research project was proposed to the Ethics Committee of Isfahan University of Medical Sciences and Health Services and was approved with the number IR.MUI.RESEARCH.REC.1399.738.

Results

In this study, a total of 4,516 records of mothers and neonates who were born in Amir Al-Momenin Hospital in Shahreza during 2016-2018 were investigated.

The descriptive statistics and frequency distribution of the study variables are shown in Table 1.

Table 1. Dispersion and central indices of quantitative variables of mothers who have given birth in the maternity ward of Amir Al-Momenin Hospital, Shahreza city, according to the years 2016, 2017, and 2018.

Variable name	2016-2018			2016		2017		2018	
	Mean (SD)	Median (min-max)	Number of missing data	Mean (SD)	Median (min-max)	Mean (SD)	Median (min-max)	Mean (SD)	Median (min-max)
Mother's age (years)	(5.5) 29.1	(13-46) 28	77	28.7	(45-13) 29	(5.4) 29.2	(16-46) 29	(5.6) 29.5	(16-46) 28

Variable name	2016-2018			2016		2017		2018	
	Mean (SD)	Median (min-max)	Number of missing data	Mean (SD)	Median (min-max)	Mean (SD)	Median (min-max)	Mean (SD)	Median (min-max)
Baby age (weeks)	(4.6) 37.6	(22-42) 39	113	(1/2) 38.4	(22-42) 39	(1.9) 38.5	(22-42) 39	(1.8) 38.5	(24-42) 39
Birth weight (grams)	(506.9) 3102.2	(420-5320) 3140	59	(509.7) 30.89.7	(420-4660) 3120	(518.4) 3121	(500-5320) 3160	(488.8) 3098.4	(630-4400) 3135
Baby's height (cm)	(2.8) 48.5	(20-56) 49	76	(2.8) 5/48	(20-55) 49	(2.8) 48.4	(27-56) 49	(2.2) 39	(29-55) 49
Head circumference (cm)	(2.7) 34.5	(14-40.5) 34.5	77	(2.7) 4/34	(5/39-14) 5/34	(1.8) 34.4	(14-40.5) 34.9	(1.6) 34.4	(39.5-21.5) 34.5
Gravida	(0.1) 1.2	(1-8) 1	0	(0.95) 1	(7-1) 1	(1) 1.01	(5-0) 1	(1.2) 1.1	(0-8) 1

Table 2. Descriptive variables related to mother and baby

Variable	Classification	2016-2018		Year 2016		Year 2017		Year 2018	
		Number of births (percentage)	The number of anomalies	Number of births (percentage)	The number of anomalies	Number of births (percentage)	The number of anomalies	Number of births (percentage)	The number of anomalies
Mother's age (years)	<18	155 (3.4)	2	50 (2.7)	1	62 (4.3)	1	43 (3.4)	0
	-18-35	3575 (79.2)	66	1487 (81.3)	34	1120 (78.4)	19	968 (76.9)	13
	>35	788 (17.4)	23	293 (16)	13	246 (17.3)	7	247 (19.6)	3
Parental kinship ratio	Yes	1372 (30.4)	31	416 (22.7)	16	506 (35.4)	8	451 (35.9)	7
	No	3054 (67.6)	59	1379 (75.4)	32	898 (52.8)	18	777 (61.8)	9
	No information	90 (2)	0	35 (1.9)	0	24 (1.7)	0	30 (2.4)	0
Mother's blood group	A	1071 (23.7)	23	409 (22.3)	11	346 (24.3)	6	316 (25.1)	5
	AB	255 (5.6)	8	116 (6.3)	3	78 (5.5)	2	61 (4.8)	3
	B	722 (16)	16	284 (15.5)	6	209 (14.6)	7	229 (18.2)	3
	O	1606 (35.6)	38	597 (32.6)	22	539 (37.7)	12	470 (37.4)	4
	No information	862 (19)	0	424 (23.2)	6	256 (17.9)	0	182 (14.5)	0
Gravida	First pregnancy	1680 (37.2)	35	732 (40)	21	514 (36)	12	434 (34.5)	2
	Second pregnancy	1663 (36.8)	36	670 (36.6)	17	538 (37.7)	7	455 (36.2)	12
	Third pregnancy and more	1173 (26)	20	428 (23.4)	10	376 (26.3)	8	359 (28.5)	2
History of abortion	No	3677 (81.4)	75	1510 (82.5)	38	1168 (81.8)	24	999 (79.4)	13
	Yes	845 (18.6)	16	320 (17.5)	10	260 (18.2)	3	259 (20.6)	3

Variable	Classification	2016-2018		Year 2016		Year 2017		Year 2018	
		Number of births (percentage)	The number of anomalies	Number of births (percentage)	The number of anomalies	Number of births (percentage)	The number of anomalies	Number of births (percentage)	The number of anomalies
Type of delivery	Cesarean	2201 (48.7)	52	966 (52.8)	30	662 (46.3)	10	573 (45.5)	12
	Normal	2303 (51)	39	857 (46.8)	18	764 (53.5)	17	682 (54.2)	4
	No information	12 (3)	0	7 (0.4)	0	2 (0.2)	0	3 (0.2)	0
Fetal age of the baby (week)	Preterm (less than 37 weeks)	458 (7.1)	5	195 (10.7)	44	150 (10.5)	26	113 (9)	1
	Term (37 weeks and more)	3941 (91)	85	1584 (96.6)	3	1259 (88.2)	1	1097 (87.2)	15
	No information	117 (2)	1	50 (2.7)	1	19 (1.3)	0	48 (3.8)	0
Gender of the baby	Boy	2290 (50.7)	50	931 (50.9)	24	712 (49.9)	17	647 (51.4)	9
	Girl	2226 (49.3)	41	899 (49.1)	24	716 (50.1)	10	611 (48.6)	7
Multiple births	Singleton	4408 (97.6)	91	1799 (98.3)	48	1390 (97.3)	27	1229 (97.7)	16
	Multiples	108 (2.4)	0	31 (17)	0	38 (2.7)	0	29 (2.3)	0
Birth weight (gram)	Abnormal	440 (9.7)	76	242 (13.2)	8	177 (12.4)	4	134 (10.7)	3
	Normal	4017 (89)	15	1574 (86)	40	1236 (86.6)	23	1095 (87)	13
	No information	59 (1.3)	0	14 (0.8)	0	15 (0.9)	0	29 (2.3)	0
Height of the baby (centimeter)	Abnormal	264 (5.84)	67	429 (23.4)	12	356 (25)	7	975 (77.5)	11
	Normal	4175 (92.44)	24	2014 (75.6)	36	1049 (73.4)	20	246 (19.6)	5
	No information	77 (1.7)	0	17 (1)	0	23 (1.6)	0	37 (2.9)	0
Head circumference	Normal	3876 (85.8)	77	1605 (87.7)	41	1222 (85.6)	23	1049 (83.4)	13
	Abnormal	565 (12.5)	14	208 (11.4)	7	184 (12.9)	4	172 (13.7)	3
	No information	76 (1.7)	0	17 (1)	0	22 (1.5)	0	37 (2.9)	0
Baby appeal	Born alive	4492 (98.2)	90	1819 (99.4)	47	1418 (99.3)	27	1255 (99.8)	16
	Stillborn Deceased	24 (0.5)	1	11 (0.6)	1	10 (0.7)	0	3 (0.2)	0

Table 3. Adjusted odds ratio of variables related to congenital anomalies in babies of Shahreza city in the years 2015 to 2017, using multiple logistic regression model.

Variable name		2016-2018	Year 2016	Year 2017	Year 2018
		Adjusted odds ratio (OR) (CI = 95%)	Adjusted odds ratio (OR) (CI = 95%)	Adjusted odds ratio (OR) (CI = 95%)	Adjusted odds ratio (OR) (CI = 95%)
Mother's age (years)	Dangerous	1.3 (0.8-2.3)	1.3 (0.5-3.01)	1.9 (0.8-5.2)	0.9 (0.2-3.7)
	Normal	1	1	1	1
Parental kinship ratio	Yes	1.1(0.4-2.2)	1.9 (0.6-3.1)	1.7 (0.3-2.1)	0.7 (0.6-5.2)
	No	1	1	1	1
History of pregnancy	No	0.9 (0.6-1.5)	0.7 (0.3-1.9)	1.8 (0.6-5.8)	3.2 (0.2-2 1)
	Yes	1	1	1	1
History of abortion	No	0.7 (0.4-1.5)	0.2 (2.2-0.01)	0.3 (0.05-1.9)	0.4 (3.2-0.05) _
	Yes	1	1	1	1
Type of delivery	Cesarean	0.6 (0.4-0.9)	0.5 (0.2-0.9)	2.4 (0.7-8.7)	0.3 (0.9-0.1)
	Normal	1	1	1	1

Age of the baby (week)	Preterm	0.4 (0.2-1.2)	0.5 (0.1-1.04)	0.4 (0.05-3.3)	0.5 (0.05-4.5)
	Term	1	1	1	1
Gender of the baby	Boy	0.8 (0.5-1.3)	1 (0.5-1.9)	0.7 (0.3-1.5)	7.8 (0.1-559.4)
	Girl	1	1	1	1
Birth weight (gram)	Abnormal (less than 2500)	1.6 (0.8-3.2)	1.4 (0.4-3.9)	1.5 (0.5-5.1)	1.4 (0.4-5.3)
	Natural (more than 2500)	1	1	1	1
Height of the baby (centimeter)	Abnormal (less than 45 cm)	1 (0.6-1.7)	0.8 (0.4-1.7)	1.7 (0.5-6.3)	1.4 (0.4-5.4)
	Normal (more than 45 cm)	1	1	1	1
Around the baby's head (centimeter)	Abnormal	1.5 (0.8-2.9)	1.6 (0.6-4.4)	0.9 (0.4-2.3)	1.9 (0.6-5.8)
	Normal	1	1	1	1
Birthday season	Spring	0.7 (0.4-1.2)	0.9 (0.4-2.6)	0.3 (0.07-0.9)	1 (0.3-3.6)
	Summer	0.6 (0.3-1.2)	1.3 (0.5-3.2)	0.3 (0.08-1.04)	0.2 (0.02-1.9)
	Fall	1.1 (0.6-1.9)	1.3 (0.5-3.1)	0.9 (0.3-2.2)	1.1(0.3-4.07)
	Winter	1	1	1	1
Mother's blood group	A	1.5 (0.6-3.4)	0.9 (0.2-3.4)	1.7 (0.3-8.8)	3.6 (0.8-17.6)
	AB	1.02 (0.5-1.9)	0.7 (0.3-2.01)	1.8 (0.6-5.5)	0.9 (0.2-3.9
	B	1.04 (0.6-1.8)	1.2 (0.6-2.5)	1.1 (0.4-3.1)	0.5(0.1-1.8)
	O	1	1	1	1
Year of Birth	2016	0.3 (0.1-0.5)	-	-	-
	2017	0.4 (0.2-0.7)	-	-	-
	2018	1	-	-	-

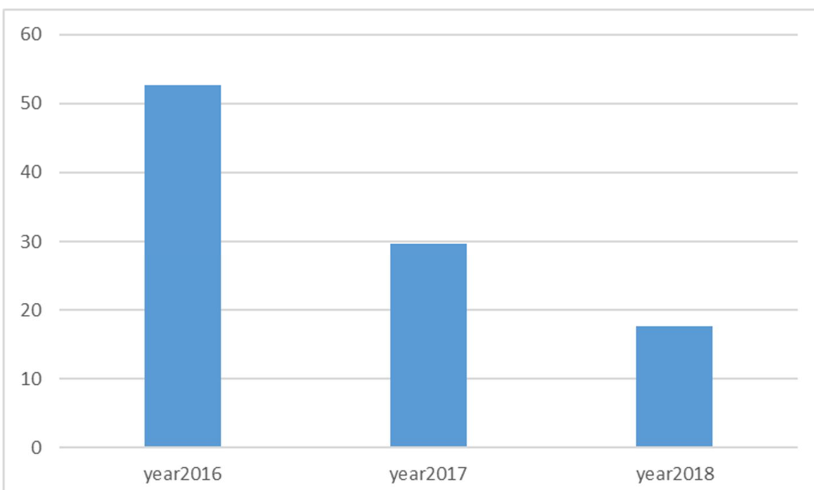

Fig. 1. The prevalence of major congenital anomalies in 2016-2018 in Shahreza County

Discussion

According to the results of the present study, the prevalence of major congenital anomalies in Shahreza County was 2.64% in 2016, 1.89% in 2017, 1.27% in 2018, and 2.01% between 2016 and 2018. In the studies conducted in different cities of Iran regarding major congenital anomalies, the occurrence of these anomalies in Dezful, Isfahan, Rasht, Tehran, Sabzevar, Rafsanjan, Bandar Abbas, Zanjan, and in two meta-analysis studies in Iran from 1992-2014 and from 1986-2016 (13- 22) was higher than that in the present study (2.01%). However, the occurrence rate in the studies conducted in Chaharmahal and Bakhtiari, Babol, Gorgan, Mashhad, Ardabil, Tabriz, and Sistan (3, 7, 23-26, 37) was lower than the 2.01% in the present study. Based on the reviewed research, the occurrence of congenital anomalies in Iran varied between 0.32% and 5.5%.

In studies outside Iran, in two studies conducted in Egypt in 2011 and 2019, and other studies in Turkey, Erbil city of Iraq, Rabat, UAE, and India, the prevalence of major congenital anomalies was less than the current study (28, 39, 40- 44) and in two other studies from India (2013 and 2015) and studies of Nigeria, Lebanon, Pakistan, and Europe (27, 29, 30, 45-47) were higher than that in the current research. The occurrence of congenital anomalies in the world varied between 0.29% and 8.6%.

It is important to note that the prevalence obtained in the present study was based on major congenital anomalies according to the results of physical examination recorded in the neonatal records, and anomalies that are diagnosed with increasing age, mild anomalies, and anomalies that cause abortion or death in the first trimester of pregnancy were not included in this study. Also, the variables that were not significant may have been due to the low study population of this study, which is a weakness point of this study.

In the present study, there was no significant relationship between maternal age and congenital anomalies, which was consistent with the studies conducted in Rasht, Isfahan, Chaharmahal and Bakhtiari, Tehran, Babol, Zanjan, Turkey, and Egypt (14-16, 20, 23, 24, 39, 40) and inconsistent with the results of the studies in Gorgan, Sistan, India, Egypt, and UAE (26, 37, 40, 43 ,44). In this study, similar to the study of Chaharmahal and Bakhtiari (23), there was no significant relationship between blood group and major congenital anomalies, while this relationship was significant in the study conducted in Isfahan (14).

Also, there was no significant relationship between congenital anomalies and consanguinity similar to the studies of Chaharmahal and Bakhtiari, Rasht, and Sistan (15, 23 ,26), but contrary to the results of the studies of Isfahan, Gorgan, Mashhad, Ardabil, Isfahan, Erbil city in Iraq, India, Egypt, and UAE (3, 14 ,24 ,29 ,37 ,40 ,41 ,45). In the present study, there was no significant relationship between parity and congenital anomaly, which was similar to the studies of Isfahan, Chaharmahal and Bakhtiari, and Zanjan (14, 20 ,23) and contrary to the studies of Hamedan, India 2016, India 2013, and UAE (43-45 ,48).

This study found no association between the number of abortions and congenital anomalies, consistent with the findings of previous studies in Isfahan and Charmahal and Bakhtiari (14, 23). The study also revealed a significant association between Raiman type and major congenital anomalies, which is in agreement with the studies from Europe, Babol, and India (12, 24, 45), while this association was not significant in the studies from Isfahan, Charmahal and Bakhtiari, Gorgan, and Turkey (14, 23, 28, 37).

In contrast, there was no significant association between congenital abnormalities and gestational age in this study and the studies from Isfahan and Gorgan (14, 37), whereas this association was significant in the studies from Chaharmahal, Rasht, Rafsanjan, Babol, India, and the UAE (15, 18, 20, 23, 24). Similarly, the association between major congenital abnormalities and the sex of the baby was not significant, as reported by the studies from Chaharmahal, Rasht, Sistan, Tehran, Babol, Zanjan, and Turkey (15, 16, 20, 23, 24, 26, 28).

However, this association was significant in the studies from Hamedan, Dezful, Isfahan, Sabzevar, Gorgan, Pakistan, and UAE (13, 14, 17, 37, 43, 47, 48). Finally, there was no significant association between the birth weight of the newborn and major congenital anomalies, which contradicted the results of the studies in Isfahan, Rasht, Tehran, and Babol (14-16 ,24) and concurred with the study of Tehran, Chaharmahal and Bakhtiari, Zanjan, India 2016, India 2013, and UAE (23 ,12 ,20 ,43 ,44 ,45).

This study also found no association between the height of the baby and major congenital anomalies, in line with the studies from Chaharmahal and Bakhtiari, Tehran, and Babol (16, 23, 24), but unlike the study from Isfahan (14) where this association was significant.

The association between major congenital anomalies and head circumference was similar to the study from Isfahan (14) and different from the study from Chaharmahal and Bakhtiari (23), showing no significant association with congenital anomalies. The study observed a decrease in the number of major congenital anomalies over the years, and a significant association between the data of 1995 and 1996 and 1997, which could be attributed to the government's policies in screening for fetal congenital anomalies. The results of this study were consistent with the study from Turkey (28). The association between the season of birth and congenital anomalies in this study was not significant, as reported by the studies from Isfahan, Chaharmahal Bakhtiari, and Tehran (14, 16, 23).

One of the limitations of this study was that the results were derived from the data of the mother and newborn files, and some mothers may have delivered in other hospitals of the province (especially those who were transferred to the provincial hospitals), which could lead to a small sample size. Another limitation was that some malformed children may have been misclassified as healthy due to incorrect diagnosis of the malformation, and some aborted fetuses may have had congenital anomalies that were not recorded. Therefore, to generalize the results of the study to all births and considering the incomplete information about some of the relevant factors in the hospital files, more caution is needed.

The strengths of the study included covering all the files in Amir Al-Momenin Hospital and accessing the household information registration (Sib) system, which facilitated identifying and correcting inconsistencies.

Conclusion

Birth defects may be the result of one or more genetic, infectious, nutritional, or environmental factors, and it is often difficult to identify the exact causes. But some birth defects can be prevented. A small number of major anomalies are so problematic that they cause death, but in the rest, with early diagnosis and treatment, disability can be prevented. Factors such as lifestyle, reduction of family marriages, genetic counseling, vaccination, adequate intake of folic acid or iodine through food fortification or supplements, and adequate care before and during pregnancy are examples of prevention methods.

Acknowledgments

We would like to thank the research assistant of the university and the community education group in the health system, who prepared the arrangements for the thesis, and all the heads and staff of the departments of medical records, operating rooms, maternity and newborns of Amir Al-Momenin Hospital in Shahreza city, who assisted us in data collection.

Conflict of interest

The authors have no conflict of interest in this study.

Funding/support

None declared.

Data availability

This study is financially supported by vice chancellor of research of Isfahan University of Medical Sciences as a thesis of MSc.

References

1. Sarrafan N, Mahdinasab A, LA Evaluation of prevalence of congenital upper and lower extremity abnormalities in neonatal live births in Imam and Razi hospitals of Ahvaz. Jundishapur Sci Med J 2011;10(70):13-9.
2. Aghajani H, Samavat A, Haghazali M, Valizadeh F, Sarbazi G. Primary health care: an approach to community control of genetic and congenital disorders. Iran J Public Health 2009;38:113-4.
3. Alijahan R, Mirzarahimi M, Ahmadi Hadi P, Hazrati S. Prevalence of congenital abnormalities and its related risk factors in Ardabil, Iran, 2011. The Iranian Journal of Obstetrics, Gynecoly Infertil 2013;16(54):16-25.
4. WHO. Congenital anomalies. Geneva: WHO; 2016.
5. Organization WH. Fact sheet no. 370. October 2012. 2013.
6. Bhalerao A, Garg R. Pattern of congenital anomalies at birth. Int J Obstet Gynecol Res 2016;3(7):420-6.
7. Khatami F, Mamuri GA. Survey of congenital major malformation in 10,000 newborns. 2005.

8. Abdi-Rad I, Khoshkalam M, Farrokh-Islamlou HR. The prevalence at birth of overt congenital anomalies in Urmia, Northwestern Iran. Arch Iran Med 2008;11(2):148-51.
9. Chuang CH, Doyle P, Wang JD, Chang PJ, Lai JN, Chen PC. Herbal medicines used during the first trimester and major congenital malformations. Drug safety 2006;29:537-48. https://doi.org/10.2165/00002018-200629060-00006
10. Loane M, Dolk H, Kelly A, Teljeur C, Greenlees R, Densem J, et al. Paper 4: EUROCAT statistical monitoring: identification and investigation of ten year trends of congenital anomalies in Europe. Birth Defects Research Part A: Clin Mol Teratol 2011;91(S1):S31-S43. https://doi.org/10.1002/bdra.20778
11. Daliri S, Sayehmiri K, Asadollahi K, Rezaei N, Saroukhani D. Prevalence of congenital anomalies in Iran: a systematic review and meta-analysis. Iran J Neonat 2018;9(2):21-32.https://doi.org/10.1080/14767058.2018.1465917
12. Lorente C, Cordier S, Goujard J, Ayme S, Bianchi F, Calzolari E, et al. Tobacco and alcohol use during pregnancy and risk of oral clefts. Occupational Exposure and Congenital Malformation Working Group. Am J Pub Health 2000;90(3):415. https://doi.org/10.2105/ajph.90.3.415
13. Khoshhal-Rahdar F, Saadati H, Mohammadian M, Hafar-Rangchi M, Mohazzab-Torabi S, Khabazkhoob M. The prevalence of congenital malformations in Dezful-2012. Iran J Pediatr 2014;2(S2):S48.
14. Saberi M, Hosseinpour M, Khaleghnejad Tabari A, Soori H, Maracy M. Evaluation of Incidence and Main Risk Factors of Major Congenital Anomalies in Hospitals Affiliated with Isfahan University of Medical Sciences during 2015. Iran J Epidemiol 2020;16(1):48-56.
15. Jalali SZ, Fakhraie SH, Afjaei SA, Kazemian M. The incidence of obvious congenital abnormalities among the neonates born in Rasht hospitals in 2011. J Kermanshah Univ Med Sci 2015;19(2).
16. Shajari H, Mohammadi N, Aghai MK. Prevalence of congenital malformations observed in neonates in Shariati Hospital (1381-1383). Iran J Pediatr 2006;16(3):23-308.
17. Rahnama F, Hasehmiyan M, Akbarzadeh R, Akabari A. The incidence of apparent congenital anomalies in neonates in Mobini Maternity Hospital in Sabzevar Iran. in 2005-6. J Sabzevar Univ Med Sci 2008;15(4):231-6.
18. Masoodpoor N, Arab-Baniasad F, Jafari A. Prevalence and pattern of congenital malformations in newborns in Rafsanjan, Iran (2007-08). J Gorgan Univ Med Sci 2013;15(3):114-7.
19. Gheshmi A, Nikuei P, Khezri M. The frequency of congenital anomalies in newborns in two maternity hospitals in Bandar Abbas: 2007-2008. Genet 3rd Mill 2012;9(4):2554-9.
20. Marzban A, Sadeghzadeh M, Nasab N. Incidence of gross congenital anomalies in newborns in Zanjan. J Mazandaran Uni Med Sci 2005;9:33-8.
21. Irani M, Khadivzadeh T, Asghari Nekah SM, Ebrahimipour H, Tara F. The prevalence of congenital anomalies in Iran: A Systematic Review and Meta-analysis. Iran J Obstetr Gynecol Infertil 2018;21(Suppl):29-41. https://doi.org/10.4103/ijnmr.ijnmr_97_18
22. Vatankhah S, Jalilvand M, Sarkhosh S, Azarmi M, Mohseni M. Prevalence of congenital anomalies in Iran: A review article. Iran J Pub Health 2017;46(6):733.
23. Mohammadi-Dashtaki N, Hosseinpour M, Maracy MR. The Incidence and Factors Associated with Major Congenital Malformations Recorded in Newborns Born in Chaharmahal and Bakhtiari Province, Iran, in 2016. J Health Sys Res 2020;16(4):257-64.
24. Hajian K, Sharifi FS, Sharifzadeh-baii M, Shareapour M. Prevalence of Major Abnormality and Some of Its Related Factors in Newborns in Shahid Yahyanejad Hospital in Babol (2001). J Guilan Univ Med Sci 2005;14(55):70-5.
25. Mashhadi Abdolahi H, Kargar Maher MH, Afsharnia F, Dastgiri S. Prevalence of congenital anomalies: a community-based study in the northwest of Iran. ISRN Pediatr 2014;2014:920940. https://doi.org/10.1155/2014/920940
26. Hosseini S, Nikravesh A, Hashemi Z, Rakhshi N. Race of apparent abnormalities in neonates born in Amir-Almomenin hospital of Sistan. J North Khorasan Univ

Med Sci 2014;6(3):573-9. ttps://doi.org/10.29252/jnkums.6.3.573

27. Morris JK, Springett AL, Greenlees R, Loane M, Addor MC, Arriola L, et al. Trends in congenital anomalies in Europe from 1980 to 2012. PloS One 2018;13(4):e0194986. ttps://doi.org/10.1371/journal.pone.0194986
28. Tomatir A, Demirhan H, Sorkun H, Köksal A, Ozerdem F, Cilengir N. Major congenital anomalies: A five-year retrospective regional study in Turkey. Genet Mol Res 2009. https://doi.org/10.4238/vol8-1gmr506
29. Francine R, Pascale S, Aline H. Congenital anomalies: prevalence and risk factors. mortality. 2014;1:2. https://doi.org/10.13189/ujph.2014.020204
30. Malhotra P, Thapar K. Pattern of major congenital anomalies and their outcome. Int J Med Dent Sci 2015:577-81. https://doi.org/10.19056/ijmdsjssmes/2015/v4i1/79945
31. Sitkin NA, Ozgediz D, Donkor P, Farmer DL. Congenital anomalies in low- and middle-income countries: the unborn child of global surgery. World J Surg 2015;39(1):36-40. ttps://doi.org/10.1007/s00268-014-2714-9
32. Baldacci S, Gorini F, Santoro M, Pierini A, Minichilli F, Bianchi F. Environmental and individual exposure and the risk of congenital anomalies: a review of recent epidemiological evidence. Epidemiol Prev 2018;42(3-4):1-34.
33. Shahnazi M, Azari S. Contributing factors in major malformations in neonates born in Alzahra medical-educational hospital, Tabriz. 2010.
34. Martin J. Births: final data for 2010. National vital statistics reports. http://www cdc gov/nchs/data/nvsr/nvsr61/nvsr61_05 pdf. 2012;61(1).
35. Duong HT, Hoyt AT, Carmichael SL, Gilboa SM, Canfield MA, Case A, et al. Is maternal parity an independent risk factor for birth defects? Birth Defects Res A Clin Mol Teratol 2012;94(4):230-6. https://doi.org/10.1002/bdra.22889
36. Gheisari R, Ghoreishian M, Bijan M, Amrolah R. The association between blood groups and maxillofacial deformities. Indian J Plast Surg 2008;41(02):138-40. https://doi.org/10.1055/s-0039-1699254
37. MJ.Golalipour, M.Ahamadpour, MAVakili Gross congenital malformations in 10000 births (Gorgan Dezyani Hospital 1997-99). J Gorgan Univ Med Sci 2002;4(2):42-7.
38. Naderi S. Congenital abnormalities in newborns of consanguineous and nonconsanguineous parents. Obstetr Gynecol 1979;53(2):195-9.
39. Abdou MSM, Sherif AAR, Wahdan IMH. Pattern and risk factors of congenital anomalies in a pediatric university hospital, Alexandria, Egypt. J Egypt Pub Health Assoc 2019;94(1):1-9. https://doi.org/10.1186/s42506-018-0004-3
40. Shawky RM, Sadik DI. Congenital malformations prevalent among Egyptian children and associated risk factors. Egypt J Med Hum Genet 2011;12(1). https://doi.org/10.1016/j.ejmhg.2011.02.016
41. Ameen SK, Alalaf SK, Shabila NP. Pattern of congenital anomalies at birth and their correlations with maternal characteristics in the maternity teaching hospital, Erbil city, Iraq. BMC Pregn Childbirth 2018;18(1):1-8. https://doi.org/10.1186/s12884-018-2141-2
42. Forci K, Alami MH, Bouaiti E, Slaoui M, Mdaghri Alaoui A, Thimou Izgua A. Prevalence of congenital malformations at the "les Orangers" maternity and reproductive health Hospital of Rabat: descriptive study of 470 anomalies. BMC Pediatr 2020;20(1):1-10. https://doi.org/10.1186/s12887-020-02179-6
43. Hosani A, Salah H, Zeid A, Farag H, Saade H. The national congenital anomalies register in the United Arab Emirates. 2005.
44. Bhat A, Kumar V, Bhat M, Kumar R, Patni M, Mittal R. The incidence of apparent congenital urogenital anomalies in North Indian newborns: A study of 20,432 pregnancies. Afr J Urology 2016;22(3):183-8. https://doi.org/10.1016/j.afju.2015.05.007
45. Sarkar S, Patra C, Dasgupta MK, Nayek K, Karmakar PR. Prevalence of congenital anomalies in neonates and associated risk factors in a tertiary care hospital in eastern India. J Clin Neonat 2013;2(3):131. https://doi.org/10.4103/2249-4847.119998
46. Obu HA, Chinawa JM, Uleanya ND, Adimora GN, Obi IE. Congenital malformations among newborns admitted in the neonatal unit of a tertiary hospital in Enugu,

South-East Nigeria-a retrospective study. BMC Res Notes 2012;5(1):1-6. https://doi.org/10.1186/1756-0500-5-177

47. Hussain S, Asghar I, Sabir M, Chattha MN, Tarar SH, Mushtaq R. Prevalence and pattern of congenital malformations among neonates in the neonatal unit of a teaching hospital. J Pak Med Assoc 2014;64(6):629-34.

48. Eghbalian F, Sabzehei MK, Karimi R, Monsef AR. Frequency of congenital malformations and its associated factors in newborn infants in fatemiyeh and besat hospitals of Hamedan in 2012. Stud Med Sci 2018;29(4):5-240.