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Prevalence of Congenital Anomalies in Newborns in Zabol: A Single Hospital Based Study

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ABSTRACT

Background: Congenital anomalies are conditions of prenatal origin that are present at birth, potentially impacting an infant's health, development and survival. The birth of a newborn with congenital anomalies imposes financial and emotional burdens on families. The aim of this study was to investigate the epidemiology of congenital anomalies in 2014 in Zabol, Iran.

Methods: This cross-sectional study was carried out in the Amir Al-Momenin Hospital between May of 2013 and April 2014. All the live born were included, and we have examined all newborns for the presence of congenital anomalies.

Results: During the twelve months, 9,309 newborns were included to the study. Of them, 72 (0.8%) newborns were affected with a congenital malformation. The congenital anomalies affected significantly higher proportion of male newborns (66.7%) than female newborns (33.3%). Among Of them, musculoskeletal system abnormalities account for 45.9% of the total abnormalities allocating the highest frequency to itself. Subsequently, central nervous system abnormality (19.4%), gastrointestinal anomaly (15.3%), urinary tract abnormality (9.7%), chromosomal abnormality (2.8%), and multiple anomalies (1.4%) were frequent, respectively.

Conclusion: This study showed that prevalence of congenital anomalies is relatively high in Zabol city. The results of this study identify the necessity of genetic counseling and early diagnosis to prevention, care and surveillance.

Introduction

Congenital anomalies occur at the time of fertilization or during intrauterine development and appear at birth.[1, 2] Congenital anomalies have been defined as apparent birth defects; however, it has never been mentioned that its identification is merely observational or based on para clinical

and clinical examinations.[3, 4] Congenital anomalies have attracted more attention through controlling contagious diseases and reducing their prevalence, and improvement of patients' condition by early identification and proper planning.[5, 6] Concerning severity of malignancy, congenital anomalies are classified as severe and mild; and they can involve a single system or multiple systems.[7, 8] Severe congenital anomalies defined as structural or functional anomalies lead to functional disorders and reduce the normal life expectancy and surgery is required to address both the aesthetic and functional issues.[9] Abnormalities occur during the formation of body organs (for example, during organogenesis). These disorders may lead to a complete or partial loss of an organ or deformity of an organ.[10, 11] Abnormalities are induced from environmental or genetic factors independently or concurrently. Most abnormalities occur during the third to eighth weeks after fertilization.[12] Resulted from destructive processes, disruptions bring about morphological changes in pre-formed organs. Vascular injury associated with lower extremity fractions/ *dislocation* and the defects caused by amniotic strips are examples of destructive factors that lead to disruptions.[13, 14] The deformations are caused by nondisruptive mechanical forces and mold a part of the fetus. For example, pressure on the amniotic cavity can lead to clubfeet.[15, 16] The cause of congenital anomalies is unknown in 40-45% of patients.[17, 18] Genetic factors such as chromosomal abnormalities and gene mutations are responsible for approximately 28% of congenital anomalies, environmental factors account for 3-4% of cases, the combined effect of genetic and environmental factors (multifactorially inherited disorders) causes 20-25% of cases, and twin pregnancies account for 0.5-1% of congenital anomalies.[19]

Minor abnormalities are seen in about 15% of infants. These structural disorders, such as Microti (small ears), pigmented points, and short eyelid gaps are not harmful to individual's health, but structural disorders are accompanied by major defects in some cases. Mild abnormalities are clues to detect more serious underlying defects. In particular, ear abnormalities as an indicator of other defects can be easily identified and are observed almost in all children with syndrome malformation.[20]

Several studies have reported contradictory results on the role of environmental factors in the development of fetal abnormalities.[21, 22] Moreover, the use of electronic devices such as computers and cell phones are considered as possible causes of embryonic anomalies.[23, 24] Therefore, due to importance of this issue, insufficient statistics on the anomalies prevalence in this geographic region, and lack of a comprehensive study on the prevalence of embryonic anomalies and associated environmental factors in Zabol, this study aimed primarily to identify the prevalence of common anomalies and secondly to discover the possible causes. The general objective of this study was to determine the epidemiology of congenital anomalies in newborns of Zabol in 2014. In addition, we aimed to discover the prevalence of congenital anomalies in Zabol based on parents' age, occupation, dwelling place, history of smoking, alcohol and drug abuse, nutrition, ethnicity, and familial relation.

Materials and Methods

In this analytical cross-sectional study, medical records of neonates born in Amiralmomenin Hospital of Zabol were selected using census method. The data on diagnosed congenital anomalies in Zabol in 2014 were collected using patients' medical records. The data were recorded using a questionnaire. Then, data were analyzed by applying SPSS and running analytical statistics to determine distribution frequency and means of all variables. The patients' information was kept confidential.

Results

Out of 9309 neonates born in Amiralmeninin hospital in Zabol, Iran, during the study, 72 neonates had an apparent congenital anomaly; that is, the prevalence of congenital anomaly was 7.73 per 1,000 live births.

Table 1. Congenital anomalies prevalence based on ICD10 international classification

Variables		Frequency	Percent
	Anencephaly	3	4.2
	Hydrocephalus	7	9.7
CNS	others	1	1.4
	Microcephaly	2	2.8
	Total	13	18.1
	Clubfoot	15	20.8
	Congenital deformity of the foot	4	5.6
	Polydactyly	6	8.3
	Lower limb defect	1	1.4
Musculoskeletal system	Upper limb deficiency	2	2.8
	Osteocondroplasia	1	4.2
	head and neck anomalies	3	4.2
	Ear abnormalities	1	1.4
	Total		
	Congenital nasal anomalies	1	1.4
Respiratory system	congenital pulmonary	3	4.2
	Total		
	Intestinal atresia and stenosis	7	9.7
Digestive system	Cleft palate and cleft lip	2	2.8
	Total	11	
	Hermaphrodite	1	1.4
	Hypospadias	3	4.2
Genitourinary system	uterus and cervix anomalies	2	2.8
	The testes do not descend	1	1.4
	Total	8	8
Chromosomal	Down syndrome	2	2.8
Multi anomaly	1	1	1.4
Total	72		100

The frequencies of anomalies according to the variables are shown in Tables 1 to 5. Considering sex prevalence among these 72 afflicted neonates, 48 neonates (66.6%) were boys and 24 (33.4%) were girls. The mean age of mothers was 28.27 ± 6.67 and the mean age of fathers was 32.94 ± 7.27 years. In this study, 30 (41.6%) of the neonates were born vaginally and the rest by cesarean section. Musculoskeletal abnormalities allocated the highest frequency to itself (45.9%). The frequency of nervous system abnormality was 19.4%, gastrointestinal tract abnormality was 15.3%, genitourinary anomalies were 9.7%, respiratory system abnormality was 5.6%, chromosomal anomalies were 2.8%, and multiple abnormalities were 1.4%. Clubfoot was the most common abnormality among anomalous born babies. Moreover, 9.7% of mothers had a history of drug abuse.

Most abnormalities were found in infants of mothers aged less than 25 years. Chi-square test showed a significant relationship between

Table 2. Frequency of anomalies based on mother and fathers characteristic

Variable	Frequency	Percent
Mother's education		
Illiterate	8	11.1
Elementary	20	27.8
Junior School	37	51.4
High school	6	8.3
Academic	1	1.4
Father’s education		
Illiterate	6	8.3
Elementary	26	36.1
Junior School	27	37.5
High school	8	11.1
Academic	5	6.9
Living place		
Urban	10	13.9
Rural	62	86.1
Mother's job		
Employee	2	2.8
Housewife	85	97.2
Mother's age		
≥ 35 yrs.	63	87.5
< 35 yrs.	9	12.5
Father's age		
> 35 yrs.	51	70.8
< 35 yrs.	21	29.2
Consanguineous marriage		
+	17	23.6
-	55	76.4

maternal age and the incidence of anomaly (P = 0.03), but the relationship between father's age and the type of anomaly was not significant. Interfamily marriage/ consanguineous marriages are relatively high in Iran with prevalence of 75%.

Table 3. Frequency of anomalies based on the study variables

Variable	Frequency	Percent
Drug use		
Positive	7	9.7
Negative	65	90.3
Smoking		
Positive	6	8.3
Negative	66	91.7
Anomalies in ultrasound		
Positive	20	27.8
Negative	52	72.2
Folic Acid Use		
Positive	40	55.6
Negative	32	44.4
Familial History of an anomalies		
Positive	8	11.1
Negative	64	88.9
Contraceptive		
Positive	9	12.5
Negative	63	87.5
CT Scan		
Positive	7	9.7
Negative	65	90.3
Abortion history		
Positive	5	6.9
Negative	67	93.1
Parity		
Positive	8	11.1
Negative	64	88.9

The present study shows that 45.6% of the neonates with abnormalities had parents with familial relationship. 23.6% of the parents of neonates with anomalies had consanguineous marriage. A significant relationship was observed between parental relationship and congenital anomalies (P = 0.008).

Discussion

In the present study, the prevalence of congenital anomalies was 7.24%, and muscular skeletal abnormalities account for 40% of the total abnormalities allocating the highest frequency to it. Subsequently, central nervous system abnormality, gastrointestinal anomaly, urinary tract abnormality, and chromosomal abnormality were frequent, respectively.

Table 4. Frequency of congenital anomalies based on drug use

Variable	Frequency	Percent
History of drug use		
Positive	6	8.3
Negative	66	91.7
Type of medication		
Cefixime	1	1.4
Metronidazole	2	2.8
Ciprofloxacin	1	1.4
Insulin	2	2.8
Total	6	8.3

Alijahan et al., 2011 reported that the prevalence of congenital anomalies was 8.2%, musculoskeletal abnormalities 35.1%, central nervous system abnormalities 22.8%, gastrointestinal tract abnormalities 17.5%, urinary tract abnormalities 15.8%, and chromosome abnormalities 8.8% in Ardabil.

Table 5. Congenital anomalies based on underlying illness

Variable	Frequency	Percent
Disease		
Negative	66	91.6
Epilepsy	1	1.4
Cutaneous	1	1.4
Diabetes	2	2.8
Blood pressure	2	2.8

They have found that polyhydramnios, oligohydramnios, preeclampsia, unwanted pregnancy, urinary tract infection, and consanguineous marriage were the most important risk factors associated with congenital anomalies, respectively. They also revealed that the prevalence of musculoskeletal system and the central nervous system abnormalities had the highest frequencies in comparison with other abnormalities.[25]

According to Karbasi et al., 2009 study congenital anomalies (2.8%), musculoskeletal abnormalities (0.8%), central nervous system

(0.5%), and genitourinary system (0.4%) were the most common congenital malformation observed in infants born in Yazd.[26] Mamouri et al., reviewed 10450 births occurred in two main hospitals in Mashhad for two years. In their study with excluding stillbirth or those who died after birth, 9200 newborns were investigated. They have reported that the prevalence of major congenital anomalies was 1.8%. The effect of gender was not significant and the presence of abnormalities was unaffected by delivery method and preterm labor either. However, the mother's advanced age (< 30 years), consanguineous marriage, and history of abnormalities in other family members were presented as main risk factors.[27] In a study conducted on 1000 neonates to determine the prevalence of congenital anomalies at birth in 2003, Hematyar et al., suggested that the prevalence of congenital anomalies was 5.2%, occurring mostly in male newborns. The most common congenital anomalies were undescended testis. In terms of abnormalities in systems, the musculoskeletal system, genitourinary system, cardiovascular system, central nervous system, and gastrointestinal tract system were involved. Among musculoskeletal disorders, cacaneovalgus; and among genitourinary anomalies, undescended testis was the most frequent.[28] Shokouhi et al., selected 122 newborns with apparent congenital abnormalities out of 4252 neonates born in the first 6 months of 2000. They compared these selected newborns with 500 infants without congenital malformation. They reported a prevalence of 2.8% for congenital abnormalities. The most common abnormalities were related to genitourinary tract (48.7%), musculoskeletal system (23.1%), craniofacial anomalies (8.5%), skin (6.6%), and nervous system (2.6%). The prevalence of abnormalities was higher in male newborns and a significant relationship was observed between anomalies and medicine use during pregnancy.[29] Shajari et al., studied all newborns in Shariati Hospital in Tehran between 2002 and 2003. A total of 3840 newborns were recruited, of which 118 had at least one minor anomaly. The prevalence of anomalies in all newborns was 3.1% in 3 years with higher frequency in male. The most common abnormalities were related to musculoskeletal system, nervous system, genitourinary system, and cacaneovalgus, respectively. The relationship between anomalies and maternal age, infant's height and weight, and the birth season was not statistically significant.[30] Movahedian et al., investigated the prevalence of congenital anomalies in familial and non-familial marriages. Out of 3,529 neonates born during the study, parents of 768 cases (21.8%) had consanguineous marriage and parents of 2761 cases (78.2%) had non-consanguineous marriage. Among 768 neonates born from a family marriage, 54 cases (7.02%) had anomalies, of which 39 parents (72.3%) had consanguineous marriage and 15 (27.7%) had non-consanguineous marriage. Out of 2761 infants born from non-familial marriage, 55 cases (2%) had anomalies. Out of 54 cases of anomalies born from familial marriage, 33 cases (68.1%) had major anomalies, 18 cases had minor anomalies, and 3 cases had major and minor ones. Out of 55 cases of anomalies born from non-familial anomalies, 21 cases (38.2%) had major anomalies and 34 cases (68.8%) had minor anomalies. Among 33 cases of major anomalies in family marriages, parents of 25 cases (75.7%) had close consanguineous marriage and parents of 8 cases (24.3%) had non-consanguineous marriage. Out of 18 minor anomalies in family marriages, 11 cases (61.1%) were found in close family marriages and 7 cases in far family marriages. All 3 cases with major and minor anomalies occurred in close family marriages.[31] Finally, they concluded that the percentage of family marriages was higher in their study and the incidence of newborns anomalies was higher in these marriages. The incidence of anomalies increased in close family marriages. Moreover, mostly the anomalies were major in close family marriages.[31] The prevalence of congenital anomalies in Tehran was 3.2% according to Resetar (2003) study.

Abnormalities in musculoskeletal system (26.3%), central nervous system (16.2%), and genitourinary system (14.1%) reported as the most common congenital anomalies.[32] Based on the findings of Watkins et al., (2009) study, the prevalence of congenital anomaly was 2.9% and musculoskeletal system anomaly was the most common abnormalities in Turkey[33], which is in line with the results of the study performed by Dutta et al., in India.[34]

Consanguineous marriage is relatively high in Iran and sometimes reaches 75 percent. The present study showed that 45.6% of the neonates with abnormalities born in families whose parents had consanguineous marriage. In order to reduce the incidence of embryonic anomalies, appropriate measures and planning are necessary. In this line, genetic counseling plays a significant role in the reduction of fetal abnormalities. Afterwards, screening for early diagnosis of fetal abnormalities is recommended. Additionally, healthcare personnel who are responsible for women at reproductive age should recommend them to: Do not use medicinal and herbal medicines without physicians prescription, Do not expose to environmental toxins such as cigarette smoke, alcohol, and narcotics, choose their dwelling place away from high voltage power stations, have intended pregnancy especially those with higher risk of fetal abnormalities, and take folic acid before pregnancy up to end of the fourth month of pregnancy. Health authorities are also suggested to take measures for enriching flour with folic acid.

The relatively high prevalence of congenital anomalies in the studied population in comparison with other studies in Iran suggests the necessity of attention and planning to reduce the birth rate leading to congenital anomalies that can be achieved by eliminating the underlying factors. Awareness raising, intervention, monitoring rural health care centers, premarital genetic counseling are suggested as the most important inhibitory factor in the occurrence of congenital abnormalities. In the second place, planning for education, increasing the awareness about the congenital abnormalities risk factors, avoiding the arbitrary use of herbal and synthetic drugs during pregnancy, preventing consanguineous marriage, and increasing the awareness of families about the complications induced by consanguineous marriage are necessary. Considering the inadequate consumption of folic acid in pregnant women in the present study, planning and monitoring by health care staff especially in rural health care centers and increasing the awareness of pregnant mothers about the risks of non-use of acid folic are recommended. In addition, consanguineous marriage should be avoided; and in case of consanguineous marriage, genetic counseling must be done before pregnancy. It is necessary to carry out serious measures to improve the future generation by increasing the awareness of people about the risks of congenital anomalies and suggesting genetic counseling before marriage with the aim of preventing and controlling disabilities. In general, improving the quality of life, increasing the general welfare level in the region to reduce stress, improving diet, and providing more health care are recommended.

Conclusion

According our finding, prevalence of congenital anomalies is relatively high in the population in comparison with other studies in Iran. Therefore, it is suggests the necessity of attention and planning to reduce the birth rate leading to congenital anomalies that can be achieved by eliminating the underlying factors.

Conflict of Interests

Authors have no conflict of interests.

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