Journal of Medical Sciences

ISSN 1682-4474

science alert

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Research Paper

J. Med. Sci., 13 (8): 834-838
15th November, 2013
DOI: 10.3923/jms.2013.834.838

Incidence and Pattern of Congenital Malformations in Gorgan-north of Iran

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Congenital malformations are emerged as a common cause of fetal death and one of the most important causes of prenatal mortality and morbidity. This study was done to determine the incidence and pattern of congenital malformations in a referral hospital in Gorgan, North of Iran. This cross-sectional study was done on 6204 live birth in Dezyani hospital in Gorgan, North of Iran during a 12-month period from January 1st to December 31st of 2007. Gender, type of congenital malformations according to International Classification of Diseases (ICD-10) and maternal ethnicity were recorded. Data for each newborn was filled in a questionnaire. Data analyzed by using SPSS software version 16 and χ^2 test. The overall incidence of congenital malformations among newborns was 17.7 per 1000 live births. The incidence of congenital malformations was 22.4 per 1000 in males (RR = 1.68 CI95%: 1.14-2.48) and 13.06 per 1000 in females. Anomalies of the central nervous system had the highest incidence (7.3 per 1000) followed by congenital heart defects (5.2 per 1000) and musculoskeletal system (3.7 per 1000) births. According to ethnicity the incidence rate of congenital malformations was 16.5, 17.2 and 20 per 1000 live births in native Fars, Turkman (RR = 1.04 CI95%: 0.65-1.67) and Sistani (RR = 1.2 CI95%: 0.78-1.85) groups, respectively. This study showed that the incidence rate of congenital malformations is increased from 10.1-17.7 per 1000 live birth in Northern Iran during an 8 years period.

Key words: Congenital malformations, gender, ethnicity, Iran

JMS (ISSN 1682-4474) is an International, peer-reviewed scientific journal that publishes original article in experimental & clinical medicine and related disciplines such as molecular biology, biochemistry, genetics, biophysics, bio-and medical technology. JMS is issued eight times per year on paper and in electronic format.

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INTRODUCTION

Congenital Malformations (CM) or birth defects are described as of structural, functional and metabolic abnormalities after birth (Chen *et al*., 2009). With control of infectious diseases and nutritional insufficiency through health program, congenital malformations are emerged as a common cause of fetal death and one of the most important causes of prenatal mortality and morbidity (Bielenska and Kiryluk, 2005; Golalipour *et al*., 2005). Two to three percent of all children are born with at least one major congenital malformation (Bielenska and Kiryluk, 2005). Congenital malformations have multifactorial origin and are affected by genetic and environmental factors (Tagliabue *et al*., 2007). Although, 40-60% of congenital malformations have unknown origin, but 15-20% are attributed to a combination of heredity and environmental factors, 10-20% chromosome abnormalities gene mutations and less than 10% environmental factors such as maternal illnesses, microorganism, medicine , nutritional and physical factors (Tagliabue *et al*., 2007). Also congenital malformations are affected by consanguineous marriages, race/ethnicity, low family income, poor education, lack of knowledge about reproductive health and poor psychological family support (Tomatir *et al*., 2009; Dutta *et al*., 2010; Gonzalez-Andrade and Lopez-Pulles, 2010). Incidence of congenital malformations varies in countries from 9.2-32 per 1000 (Patel, 2007; Riley *et al*., 1998). Incidence of congenital malformations varies in the different parts of Iran from 10.1 per 1000 in North of Iran (Golalipour *et al*., 2005) to 28 per 1000 in Yazd, central area of Iran (Karbasi *et al*., 2009). Therefore the present study was carried out to find the incidence and pattern of congenital malformations in Gorgan, Northern of Iran during 2007.

MATERIAL AND METHODS

This hospital based cross-sectional study was carried out on 6024 live birth in Dezyani hospital during a 12- month period, from January 1st to December 31st of 2007. Ethical approval for the study was obtained from the ethics committee of Golestan University of Medical Sciences. Dezyani Hospital is the largest hospital with a labor facility in Gorgan a capital city in the Golestan province in northern Iran. This hospital is a referral hospital with an annual rate of more than 6000 deliveries accounting for the largest portion of deliveries in the city. Golestan province Located in south-East Caspian Sea border and in Northern Iran. The region has a population of about 1.6 million and Covers an area of about 20460 km^2. Patients are usually from moderate to low socioeconomic class families with various ethnic backgrounds. Fars, Turkman and Sistani are the three main ethnic groups in Gorgan. Native Fars is the predominant in habitant and has the most members, Turkman is the ethnic group that emigrated from central Asia more than three century ago and the Sistani group emigrated from southeastern Iran half a century ago. All live newborns delivered in this hospital during the investigation were examined and screened for birth defects by a pediatrician. Consent form completed by parents of newborns. Date of birth, Gender, type of congenital malformations according to International Classification of Diseases, (ICD-10) and maternal ethnicity were recorded. Data for each newborn was filed in a questionnaire.

Statistical analysis: Data analyzed by using SPSS-16 and were compared with the χ^2 test. The 95% confidence interval for prevalence was estimated. The p-value of 0.05 or less was considered statistically significant.

RESULTS

During the 12-months period, 6204 newborns were delivered and admitted to Dezyani hospital from which 3102 were males and 3102 females. Out of these, 108 newborns were diagnosed with congenital malformations, giving an incidence of 17.7 per 1000 live births. The incidence of congenital malformations was 22.4 per 1000 in males (RR = 1.68 CI 95%: 1.14-2.48) and 13.06 per 1000 in females. According to ethnicity, the incidence rate of congenital malformations was 16.5, 17.2 and 20 per 1000 live births in native Fars, Turkman and Sistani groups, respectively. Also the Turkman to Fars and Sistani to Fars relative risk for congenital malformations were obtained 1.04 and 1.2, respectively which was not statistically significant (Table 1).

Table 1: Incidence and relative risk of congenital malformations according to sex and ethnicity in northern Iran

Variable	Category	No. newborns delivered	No. with congenital malformations	Rate per 1000	Relative risk	95% CI
Sex	Female	3102	40	13.06	1.00	-
	Male	3102	68	22.40	1.68	1.14-2.48
Ethnicity	Fars	2831	46	16.50	1.00	-
	Turkman	1537	26	17.20	1.04	0.65-1.67
	Sistani	1836	36	20.00	1.20	0.78-1.85

Table 2: Incidence rate of congenital malformations in Northern Iran

Malfor mations/system	No. of (CM)	%	Rate per 1000 births
Central nervous system			7.30
Meningomyelocele	2	1.10	
Meningocele	9	5.30	
Hydrocephaly	11	6.50	
Anencephaly	8	4.60	
Microcephaly	3	1.70	
Encephalocele	2	1.10	
Spina bifida	7	4.06	
Others	3	1.70	
Musculoskeletal system			3.70
Clubfoot	5	2.80	
Polydactlyia	6	3.40	
Meromelia	3	1.70	
Achondroplasia	5	2.80	
Syndactyly	1	0.50	
Others	3	1.70	
Cleft lip and palate			2.20
Cleft lip and cleft palate	3	1.70	
Cleft lip	4	2.30	
Cleft palate	7	4.06	
Digestive system			2.20
Imperforated anus	3	1.70	
Omphalocele	4	2.30	
Gastroshysis	3	1.70	
Pronbely syndrome	2	1.10	
Esophagus Artesia	1	0.50	
Inguinal hernia	1	0.50	
Chromosomal anomalies		2.09	
Down syndrome	9	5.30	
Pier robin syndrome	2	1.10	
Chromosomal anomalies	1	0.50	
Hyroshprong syndrome	1	0.50	
Genitourinary system			1.70
Hypospadias	2	1.10	
Ambiguous genitalia	5	2.80	
Kidney disease	3	1.70	
UDT	1	0.50	
Cardiovascular anomalies			5.20
PDA	5	2.80	
VSD	8	4.60	
ASD	9	5.30	
PFO	1	0.50	
MVP	1	0.50	
Pulmonary stenosis	2	1.10	
aorta Coarctation	1	0.50	
TOF	1	0.50	
Tricuspid regurgitation	2	1.10	
Pulmonary regurgitation	1	0.50	
Pulmonary hypertension	1	0.50	
Eye, ear, face, neck	8	4.60	1.30
Other anomalies			3.07

Based on our results, some newborns had a multiplicity of malformations, so that the total number of congenital malformations exceeded the number of affected newborns. Altogether, 179 anomalies were documented in 108 newborns. The central nervous system was the most affected, involving 45 out of 108 patients. Among this group, the most frequent lesions were Hydrocephaly, Meningocele and Anencephaly. The congenital heart defects came second in frequency, involving 32 newborns and ASD was most common in this group. The musculoskeletal system came third in frequency, involving 23 newborns. Polydactlyia, followed by Clubfoot and Achondroplasia were the most prominent musculoskeletal system lesions. Oral clefts involved 14 out of 108 patients; the most common anomaly was Cleft palate. Digestive system problems involved 14 patients and Omphalocele was the most common lesion detected. The numbers and occurrence rates of congenital anomalies are shown in Table 2.

DISCUSSION

The aim of this study was to estimate the incidence rate of congenital malformations, using the database of Dezyani hospital in North of Iran. The overall incidence of congenital malformations among newborns was 17.7 per 1000 births. The incidence rate of birth defects was higher than our pervious study in this area with 10.1 per 1000 (Golalipour *et al*., 2005). The incidence rate of anomalies in this study was higher than the occurrence rate in Turkey with 2.9/1000 (Tomatir *et al*., 2009), Oman with 8.1/1000 (Patel, 2007), Brazil with 17/1000 (Costa *et al*., 2006) and Saudi Arabia with 11.4 per 1000 births (Al Bu Ali *et al*., 2011).

In the other hand, the incidence rate of birth defects was lower than several studies including European countrieswith 23.9/1000 (Dolk *et al*., 2010) and in Egypt with 20 per 1000 births among children aged 0-18 years (Shawky and Sadik, 2011). Incidence rate of Congenital Malformations (CM) in the different studies in Iran and Worldwide is depicted in Table 3.

In this study, the congenital malformations in central nervous system were the commonest birth defects. Whereas, a study in Zanjan (West of Iran) showed that Malformations in genitourinary system, musculoskeletal system and nervous system are the most common birth defects (Marzban *et al*., 2002). Also in Noraihan´s study in Malaysia, central nerves and genitourinary systems were the most prevalent birth defects (Noraihan *et al*., 2005). Indeed, based on a Study in Ecuador, Cleft lip was the most prevalent birth defect in children less than 1 year of age and the second most common defect in children 1 to 5 years of age (Gonzalez-Andrade and Lopez-Pulles, 2010).

According to EUROCAT report in European countries, Congenital Heart Defects (CHD) were the most common non-chromosomal sub group, with 6.5 per 1,000 births, followed by limb defects (3.8 per 1,000), anomalies of urinary system (3.1 per 1,000) and nervous system defects (2.3 per 1,000) (Dolk *et al*., 2010).

Also, the common occurrence rates of congenital anomalies in Taiwan were eyes and face (1.86 per 1,000), cardiovascular (1.47 per 1,000) and musculoskeletal (2.05 per 1,000) (Chen *et al*., 2009).

Table 3: Incidence rate of congenital malformations (CM) in the different studies in Iran and Worldwide

Location	Time span of study	CM Rate per 1000 birth	References
Turkey	2000-2004	2.90	Tomatir *et al.* (2009)
Taiwan	2000	7.33	Chen *et al.* (2009)
Ecuador	2001-2007	7.23	Gonzalez-Andrade and Lopez-Pulles (2010)
Oman	2003-2005	8.10	Patel (2007)
Gorgan, Iran	1998-1999	10.10	Golalipour *et al.* (2005)
Saudi Arabia	2005-2007	11.40	Al Bu Ali *et al.* (2011)
Brazil	1999-2007	17.00	Costa *et al.* (2006)
North-West of Iran	2010	17.00	Dastgiri *et al.* (2010)
Yazd, Iran	2003-2004	28.30	Karbasi *et al.* (2009)
Italy, Lombardy	1999	20.49	Tagliabue *et al.* (2007)
Present study	2007	17.70	

Table 4: Comparison of the common type of congenital malformations (CM) in north of Iran with other studies

	Rate of CM per 1000 birth					
Location	Central nervous system	Cleft lip and palate	Chromosomal anomalies	Cardiovascular anomalies	Musculoskeletal anomalies	References
Present study	7.30	2.2	2.09	5.20	3.70	
Gorgan, Iran	3.60	1.4	0.60	-	4.70	Golalipour *et al.* (2005)
Yazd, Iran	5.40	4.4	1.80	1.80	15.40	Karbasi *et al.* (2009)
Oman	1.00	1.4	1.20	1.90	2.60	Patel (2007)
Taiwan	0.67	-	0.79	1.47	2.05	Chen *et al.* (2009)

In china, 4.46 per 1000 births suffer from congenital heart diseases, 0.92 per 1000 from congenital hydrocephalus, 0.38 per 1000 from intestinal atresia/stenosis, 0.43 per 1000 from anorectal malformations, 1.78 per 1000 from kidney malformations, 3.31 per 1000 from Hypospadias, 2.12 per 1000 from orofacial clefts and 2.24 per 1000 from polydactyli (Sun *et al*., 2011), whereas in a study in Egypt, common occurrence rates of congenital anomalies were central nervous system with 5.5/1000, chromosomal abnormalities with 5.1/1000, genital organs anomalies with 2/1000, musculoskeletal with 1.8/1000, urinary system anomalies with 1.8/1000, circulatory system anomalies with 0.13/1000, cleft lip and palate 0.3/1000 and respiratory system anomalies 0.1/1000(Shawky and Sadik, 2011).

Furthermore, a study in Brazil reported that neural tube defects were the most frequent major malformations which followed with cleft lip and/or palate and Gastroshysis and Omphalocele (Costa *et al*., 2006).

Indeed, in Indonesia the most frequent of malformations were seen in the musculoskeletal system (19.6%), followed by the nervous system (18.8%), the digestive system (18.7%), the circulatory system (12.9%) and cleft lip and cleft palate (8.2%)(Kadri *et al*., 1995).

Comparison of the common type of Congenital Malformations (CM) in north of Iran with other studies is depicted in Table 4.

In this study the incidence of congenital malformations was 22.4 per 1000 in males (RR = 1.68 CI95%: 1.14-2.48) and 13.06 per 1000 in females.

The incidence rate of congenital malformations in Ecuador was 4.04 in males and 3.04 in females per 1000 births (Gonzalez-Andrade and Lopez-Pulles, 2010).

A study in India (Dutta *et al*., 2010) showed that males were affected more than females (65.4% vs. 34.6%).Also, in Taiwan (Chen *et al*., 2009) the fetal male: female sex ratio of the total population was 1.10. Similarly, in several studies in Italy, Brazil and Egypt have shown that males were more affected than females (Tagliabue *et al*., 2007; Costa *et al*., 2006 ; Shawky and Sadik, 2011).

In this study according to ethnicity, the rate of birth defects was 16.5, 17.2 and 20 per 1000 live births in native Fars, Turkman and Sistani. Also based on Metropolitan Atlanta Congenital Defects Program (MACDP) Prevalence of defects generally was lower among births to black mothers (PR = 0.94, CI = 0.93-0.95) and Hispanic mothers (PR = 0.89, CI = 0.86-0.93) than to white mothers (Rynn *et al*., 2008).

Also in a study in Netherlands (Anthony *et al*., 2005), Mediterranean women had a 20% higher risk of having a child with a congenital malformation than Dutch women. They showed an increased risk of malformations in several organ systems such as the central nervous system and sensory organs, the urogenital system and skin and abdominal wall. Further, they had an increased the risk of the group of chromosomal malformations/multiple malformations/syndromes. Also the Black group showed a significantly increased the risk of skeletal and muscular malformations (Anthony *et al*., 2005).

The differences in the incidence rate and pattern of congenital malformation in various parts of worldwide can be due to racial/ethnic background, nutritional factors, socioeconomic conditions, medical care and diagnosis and methods of studies.

CONCLUSION

This study showed that the incidence rate of congenital malformations is increased from 10.1 to 17.7 per 1000 live birth in Northern Iran during an 8 years period. The increase of birth defects can be due to improvement of diagnosis methods particularly in the congenital heart diseases.

ACKNOWLEDGMENT

This study was done with Grant No.: 35/6987 from research Department of Golestan University of medical sciences in Iran. We would like to thank the personnel at Dezyani hospital for their participation in this study.

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