

Congenital Malformations of the Digestive System in Northern Iran (2018-19)

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ABSTRACT

Background: Congenital malformations of the digestive system (CMDS) are one of the major causes of newborn mortality, particularly in developing countries. This study was conducted to evaluate the prevalence, pattern, gender distribution of CMDS as well as ethnicity status among newborns in Golestan Province, northern Iran.

Methods: This descriptive and analytical study was conducted on 36,156 live births to identify all newborns with CMDS, born between March 2018 and March 2019 in Golestan Province, north of Iran. The type of CMDS according to the International Classification of Diseases (ICD-10), the gender and ethnicity status of the newborns were recorded. The prevalence rate was estimated and compared using the exact Poisson method and odds ratio with a 95% confidence interval. Data were analyzed using STATA 14.0 software.

Results: The prevalence rate of CMDS in newborns was 2.13 per 1000 live births. The risk of CMDS was significantly higher in males compared to females (OR=1.78, 95% CI: 1.12-2.85). The most common anomaly was Ankyloglossia (19.28%). The prevalence rate of CMDS among native Fars, Turkmen and Sistani ethnic groups was 2.15 [95% CI: 1.50-2.99], 3.05 [95% CI: 2.06-4.35] and 1.48 [95% CI: 0.64-2.91] per 1000 live births, respectively.

Conclusion: Due to the prevalence rate of CMDS and ethnic diversity in this region, effective prevention planning, early diagnosis and thorough screening are particularly important, especially in high-risk groups.

Keywords: Digestive system malformations, Ethnicity, Iran, Prevalence

Introduction

Congenital anomalies (also known as birth defects, congenital disorders or congenital malformations (CMs)), as the leading causes of neonatal death, childhood morbidity and long-term disability, are a global health problem with significant impacts not only on individuals but also on health care systems, societies and their families (1, 2). Since detection and prevention of the occurrence of CMs are more cost-effective than treatment and rehabilitation (3), CMs studies are essential to provide reliable information on the prevalence, pattern and risk factors in different areas (4). The prevalence and pattern of CMs may vary over time or geographical region, thereby

reflecting a complex interaction between genetic and environmental factors (5). A high proportion of infants with gastrointestinal anomalies have associated anomalies (6) and the mortality rate among these patients is higher than those patients with isolated gastrointestinal anomalies (7, 8). The majority of patients require surgery in the neonatal period to survive (9). A study of gastrointestinal malformations among Iranian newborns in Gorgan, the capital of Golestan Province, showed a different prevalence rate in the north of Iran compared to previous studies conducted in Iran and the Middle East (10). Golestan Province, located in the south-east of the Caspian Sea border, is one of the 31

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provinces of Iran with various ethnic groups and an area of 20,438 km². This study was undertaken to determine the prevalence, pattern and sex distribution of congenital malformations of the digestive system (CMDS) in live newborns in Golestan Province.

Methods

This descriptive and analytical study based on census sampling was conducted on 36,156 live births to identify all newborns affected by CMDS born between March 21, 2018, and March 20, 2019, in fifteen hospitals (Sayyad Shirazi, Falsafi, Masoud, Hakim Jorjani Hospitals (Gorgan); Beski, Shohada, Borzooye, KhatamolAnbia Hospitals (Gonbad-e Kavus); Amiralmomenin Hospital (Kordkuy); Shohada Hospital (Bandar-e Gaz), Fatemeh Alzahra Hospital (Minudasht), Ghaem Hospital (Aliabad-e Katul); Rasool Akram Hospital (Kalaleh); Imam Khomeini Hospital (Bandar-e Torkaman); Al-Jalil Hospital (Aq-Qala)) in Golestan Province, northern Iran.

Newborns were diagnosed with various types of digestive system malformations based on the clinical examination of the pediatrician at the first visit after birth.

CMDS were classified according to the 10th Revision of the International Classification of Diseases (ICD-10) (Q35–Q45). Gender, CMDS types and parental ethnicity were recorded for each subject in a checklist.

Statistical analysis

The prevalence rate was estimated per 1,000 live births overall and stratified by infant sex and ethnicity.

The annual prevalence of CMDS was calculated

as follows:

$$\text{Prevalence rate} = \frac{\text{Number of CMDS}}{\text{Total number of live births}} \times 1000$$

We used 95% confidence intervals (CIs) calculated by the exact Poisson methodology for prevalence estimates. Risks of CMDS were evaluated as odds ratios (ORs), determined with logistic regression and with 95% CIs. Data analysis was performed using STATA software (version 14.0). A p-value < 0.05 was considered statistically significant.

Ethical approval

Ethical approval was obtained from the Ethics Committee of Golestan University of Medical Sciences, Gorgan, Iran (ethical code: IR.GOUMS.REC.1397.081).

Results

Of the total 36,156 live births (18,427 males and 17,729 females), 77 newborns with 83 CMDS were detected during the period of study, giving a prevalence of 2.13 cases (95% CI: 1.68-2.66) per 1,000 live births and 2.30 (95% CI: 1.83-2.85) malformations per 1,000 live births.

The sex ratio was 185 to 100 (50 males, 27 females). 6 cases (4 males, 2 females) had more than one CMDS type. The prevalence of CMDS in males and females was 2.93 per 1,000 and 1.64 per 1,000, respectively.

The risk of CMDS was significantly higher in males compared to females (OR=1.78, 95% CI: 1.12-2.85, P=0.015).

Pattern and sex distribution of CMDS in newborns are depicted in Table 1. Ankyloglossia

Table 1. Pattern and sex distribution of CMDS (Golestan Province-Iran, 2018–2019)

ICD-10 Classification	Type of CMDS	Number	
		Male (CMDS)	Female (CMDS)
Q35-Q37 Cleft lip and cleft palate	Cleft lip	6 (6)	1 (1)
	Cleft palate	4 (4)	4 (4)
	Cleft palate with cleft lip	3 (3)	5 (5)
	Ankyloglossia (Tongue tie)	8 (10)	6 (6)
	Congenital absence, atresia and stenosis of duodenum	1 (1)	1 (1)
	TEF	3 (3)	1 (1)
	Imperforate anus	9 (9)	1 (2)
	Congenital absence, atresia and stenosis of jejunum	0 (0)	1 (1)
	Esophageal atresia	2 (2)	0 (0)
	Hirschsprung disease	9 (10)	2 (3)
Q38-Q45 Other CMDS	Atresia of pyloric and the beginning of the duodenum	0 (0)	1 (1)
	Multiple small intestine atresia	0 (0)	1 (1)
	Congenital hypertrophic pyloric stenosis	1 (1)	2 (2)
	Congenital stenosis of anus	1 (1)	1 (1)
	Congenital absence, atresia and stenosis of ileum	1 (1)	0 (0)
	Others	2 (3)	0 (0)
		50 (54)	27 (29)
	TEF-Tracheo-oesophageal fistula		

(Tongue tie) (19.28%) was the most common form of CMDS, followed by Hirschsprung disease (15.66%), Imperforate anus (13.25%), Cleft palate and Cleft palate with cleft lip (9.64%) (Table 1).

The prevalence rate of CMDS among the three major ethnic groups, including native Fars, Turkmen and Sistani in Golestan Province was 2.15 [95% CI: 1.50-2.99], 3.05 [95% CI: 2.06-4.35] and 1.48 [95% CI: 0.64-2.91] per 1,000 live births, respectively. The risk of CMDS was not significant in all ethnic groups.

Discussion

The prevalence rate of CMDS in newborns over the study period in Golestan Province, northern Iran was 2.13 per 1,000 live births, which is comparable to the results of other studies. The prevalence rate in this study compared to other parts of the world and Iran (11-18) is shown in Table 2.

Compared to the studies presented in Table 2, this rate was higher than that reported by Ahmadzadeh et al.'s study conducted in Ahwaz (southwestern Iran) (1.1 per 1,000 live births in 2003–2006) (16) and Abdi-Rad et al.'s study conducted in Urmia (northwestern Iran) (1.3 per 1,000 births in 2001–2005) (17), but lower than that of another study conducted in Yazd (central Iran) where the prevalence rate was 5.0 per 1,000 live births (15).

In addition, it was higher than that of the study

in Barbados (1.2 per 1,000 live births in 1993–2012) (14) and lower than the survey in the UK (6 per 1,000 births in 1980–1997) (18).

The male preponderance of CMDS found in this study confirms the findings of other studies (11, 13). According to ethnicity, the prevalence rate of CMDS in the Turkmen group was higher than the other groups in this area. The impact of ethnicity on the prevalence of birth defects has been reported in other studies (19, 20); however, a significant association between anal atresia and maternal race/ethnicity was not evident in the study by Forrester *et al.* in Hawaii (21).

Regarding the pattern of CMDS in the study, the most common malformation was Ankyloglossia (Tongue tie) (19.28%) followed by Hirschsprung disease (15.66%), Imperforate anus (13.25%), Cleft palate (9.64%), Cleft palate with cleft lip (9.64%) and Cleft lip (8.43%). In Abdi-Rad et al.'s study conducted in Urmia (northwestern Iran) (17), Imperforate anus was the third most common CMDS, which is consistent with our findings.

Differences in the prevalence and pattern of CMDS among populations in various parts of the world can be due to differences in racial, ethnic, social, geographical, nutritional and socioeconomic factors, as well as the population studied, type of classification, and inclusion criteria such as live births and stillbirths during the study and observation period.

Table 2. Prevalence rate of CMDS in newborns among the various regions of the world

Author(s), Year	Date of study	Duration	Population	Location	Prevalence of CMDS (per 1,000)		
					Digestive system malformations without cleft lip/cleft palate category	cleft lip/cleft palate category	Total
Present study	2018-2019	1-year	Live births	Golestan, Iran	1.5	0.6	2.1
Song, et al. 2022 (11)	2015-2019	5-year	Births (live births and stillbirths)	Jiaying, China	1.6	NR	NR
Abdu, et al. 2019 (12)	2015-2017	3-year	Live births	South Wollo and Oromia zones of Amhara regional state, Addis Ababa, Ethiopia	0.8	1.5	2.3
Kumar, et al. 2014 (13)	1993-2012	20-year	Live births	Barbados	0.7	NR	NR
Singh, et al. 2014 (14)	1993-2012	20-year	Live births	Barbados	0.8	0.4	1.2
Tayebi, et al. 2010 (15)	2008	9-month	Live births	Yazd, Iran	0	5.0	5.0
Ahmadzadeh, et al. 2008 (16)	2003-2006	3-year	Live births	Ahwaz, Iran	0.7	0.4	1.1
Abdi-Rad, et al. 2008 (17)	2001-2005	4.5-year	Births (live births and stillbirths)	Urmia, Iran	0.2	1.1	1.3
Dastgiri, et al. 2002 (18)	1980–1997	18-year	Births (live births and stillbirths)	Glasgow, UK	4.7	1.3	6

NR: not reported

Conclusion

This study has highlighted the prevalence and pattern of CMDs in Golestan Province, northern Iran. Given the prevalence rate of CMDs and ethnic diversity in this region, a strategic planning approach for effective prevention, early diagnosis and timely management is important.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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