

# Prevalence of cleft lip and palate among four provinces in the West and North-West of Iran

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**Background:** One of the most common anomalies in newborn infants is cleft lip and/or cleft palate (CL/P). In spite of several studies about the prevalence of this, no investigation evaluated this prevalence in the West and North-West of Iran. With due attention to different ethnic groups in this area, the aim of this study is to investigate whether the distribution of CL/P live births varies regionally in this area of Iran. **Materials and Methods:** A cross-sectional study was conducted using hospital registry records to identify all children born with CL/P. The hospitals with a maternity unit were selected in the capital cities of four provinces in the West and North-West of Iran, East Azarbaijan, Kurdistan, Gilan, and Markazi. The population under study included all infants born alive from 2008 to 2012. **Results:** During the study period, 107,317 live births were registered in the hospitals with a maternity unit of four cities, and 52 infants (0.485/1000 live births) were born with CL/P. The prevalence in Rasht, Arak, Sanandaj, and Tabriz cities was 0.557, 0.352, 0.503, and 0.559/1000 live births, respectively ( $P < 0.05$ ), and in cleft types ( $P < 0.05$ ). Of the 52 infants who were born with CL/P, 24 (46.15%) were girls and 28 (53.85%) were boys ( $P > 0.05$ ), whereas the prevalence of CL/P based on sex was statistically different among the four provinces ( $P < 0.05$ ). **Conclusion:** This study shows regional variations in the birth prevalence of clefts and various cleft types. The different effects of gender on the birth prevalence of CL/P from city-to-city may be explained environmentally and/or by genetic factors affecting the development of oral clefts.

**Key words:** Cleft lip and/or palate, cleft type, Iran

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## INTRODUCTION

One of the most common anomalies in newborn infants is cleft lip and/or cleft palate (CL/P). CDC recently estimated that each year in the United States (US), about 2,650 babies are born with a CP and 4440 babies are born with a CL with or without a CP. Isolated orofacial clefts or clefts that occur with no other major birth defects are one of the most common types of birth defects in the US.<sup>[1]</sup> To understand the role of environmental and genetic factors in the development of clefts, many authors provide evidence in the form of epidemiological data on the prevalence of oral clefts.<sup>[2-5]</sup> Vanderas reviewed studies published in English and reported the incidence of CL and CP among different races.<sup>[6]</sup> The

American Indians showed the highest values and blacks showed the lowest values.

Cooper *et al.* reported Asian (Chinese, Japanese, and other Asian) oral-facial cleft birth prevalence based on the published reports.<sup>[4]</sup> The prevalence rates of CL/P were lower than 2/1000 live births, but the rates differed from population to population.<sup>[4]</sup> Some investigators have reported different prevalence rates of CL/P from region to region. Aljohar *et al.* reported a regional distribution of Saudi CL and CP cases.<sup>[7]</sup> The Riyadh region had more cases than the Asir and Eastern regions. The prevalence rates of CL/P in the Central Highlands of Madagascar were greater than those in the Coastal region.<sup>[8]</sup> Regional variation in cleft births among the nine Zambian provinces has also been reported.<sup>[3]</sup> Rozendaal *et al.* studied regional variations of live births

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with oral clefts in the Netherlands and found that the overall live birth prevalence was significantly higher in the Northern Netherlands than in the rest of the country.<sup>[2]</sup> In the Middle East, the incidence has variably been reported as 0.3-2.19/1000 live births.<sup>[9]</sup>

Iran is a large country in the Middle East, with many different ethnic groups. The major groups are Persian, Azari, Kurd, Lur, Baloch, Arab, Turkmen, Bakhtiari, Qashqai, Mazandaran, Gilan, Tali, and Pashtu.

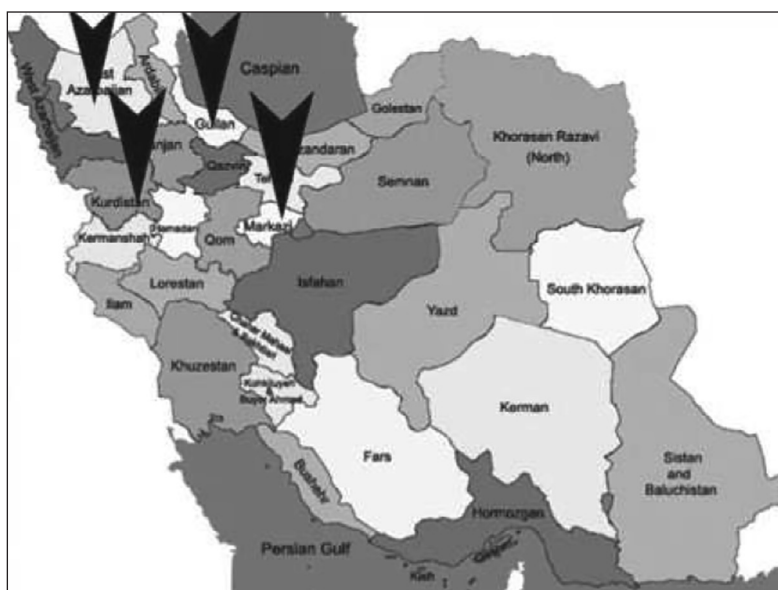
The reported prevalence of oral clefts among the Iranian population varies from 0.86 to 3.73/1000 births.<sup>[10]</sup> The prevalence at birth of clefts and associated malformations among the 19,369 live births in a maternity hospital in Shiraz City (South of Iran) was 1.03/1000.<sup>[11]</sup> A 7-year retrospective study in a maternity hospital in Tehran (capital of Iran) showed that the overall incidence was 2.14/1000 from 11,651 live births.<sup>[12]</sup> Golalipour *et al.* reported the birth prevalence of oral clefts among three main ethnic groups in Gorgan in the Northern of Iran. Of 37,951 live births in the largest hospital in Gorgan, the overall prevalence of oral clefts was 0.97/1000 live births. The prevalence of oral clefts in the Sistani was higher than that in the Fars and Turkmean group, 1.47, 0.86, and 0.88/1000, respectively.<sup>[13]</sup> The prevalence of CL/P among live births in Yazd province (center of Iran) was 0.86/1000 births.<sup>[14]</sup> A study was carried out in hospitals of Hamedan City (West of Iran) by Zandi and Heidari. The prevalence of CL/P was 1.016/1000 live births.<sup>[15]</sup>

CP is the second most common birth defect. In spite of several studies about the prevalence of this, no investigation evaluated this prevalence in the West and North-West area of Iran. Twelve provinces from 31 provinces of Iran are in

the West and North-West area, with different ethnic groups: Azari, Kurd, Lur, Bakhtiari, Qashqai, Guilak, and Fars. The aims of the present study are to ascertain the prevalence of CL/P among live births among four provinces in the West and North-West of Iran with different ethnic/cultural.

## MATERIALS AND METHODS

In a cross-sectional study; over 5 years from 2008 to 2012, we select four provinces such as [Figure 1] East Azarbaijan, Kurdistan, Gilan, and Markazi are different ethnic/cultural, and the prevalence of oral clefts was not reported in them until now. The population of these provinces ethnically is different. The people of East Azarbaijan, Kurdistan, Gilan, and Markazi are Azari, Kurd, Gilak, and Fars, respectively. The capital cities of them are Tabriz, Sanandaj, Rasht, and Arak City, respectively. At the 2011 census by The Statistical Center of Iran, the population of Tabriz, Sanandaj, Rasht, and Arak were, 1,695,094, 450,167, 918,445, and 599,634, respectively. The population under study included all infants born alive in the university hospitals from the medical universities with a maternity unit in each of the capital cities from these four provinces. The medical record center register of hospitals helped us with data collection. All hospitals have registered patients in the Iranian electronic hospital information system.<sup>[16]</sup> All hospitals have registered medical information of patients according to the code in the International Classification of Diseases (ICD 10<sup>th</sup> revision). In the hospital, the physicians report all birth defects, and the medical record center registers the code of defect and other information of patients. We gathered information of infants with CL/P who were born in hospitals, including the date and place of birth, gender, and type of clefts. The relevant ICD-10 diagnosis



**Figure 1:** Four West and North-West provinces of Iran that the capital city of them included in this study

codes of CP, CL, CL/P are Q35, Q36, and Q37, respectively.<sup>[16]</sup> The cleft birth/1000 live births was calculated separately for all provinces and all years, during 2008-2012.

### Statistical analysis

The data were performed using SPSS Software V19. Prevalence was calculated by using the percentages of CL/P in the total sample. In addition, to study the effect of the place and date of birth, type of clefts, and gender that were tabulated from the infants with CL/P, prevalence was compared between the different groups using Chi-square and Fisher's exact test.  $P < 0.05$  were considered as statistically significant.

## RESULTS

During the study, 52 infants with CL with or without CP (CL/P) or CP were born alive in hospitals with a maternity unit in four cities in the West and North-West of Iran [Table 1]. In total, there were 107,317 registered live births during 2008-2012. Overall, the prevalence of clefts was 485/1,000,000 live births. The prevalence during 2008-2012 in Rasht, Arak, Sanandaj, and Tabriz cities was 557, 352, 503, and 559/1,000,000 live births, respectively ( $P = 0.000$ ) like prevalence of Arak is less than others significantly [Table 2].

According to the annual prevalence of clefts birth, the highest prevalence of clefts occurred in Rasht City, and the electronic reports of live-birth infants of Arak City had not any reports of children with clefts in 2011. Annual clefts birth prevalence among the four provinces was statistically different ( $P < 0.05$ ). Table 3 and Figure 2 demonstrate the incidence of clefts in the four provinces during 2008-2012.

Overall, of 52 infants with CL/P or CP, there was CP (23; 44.2%) more common, followed by CL/P (19; 36.6%) and CL (10; 19.2%). The prevalence of CLP was greater in Arak City and Tabriz City, and the incidence of CL was greater in Sanandaj City, and CP was greater in Rasht City, whereas we did not get any electronic reports of infants with CL in Rasht City among live births who were born in the hospital with a maternity unit during 2008-2012 [Table 2]. There were statistically significant differences among the four provinces in the prevalence of CL and palate based on the cleft types: CL, CP, and CLP like there were a statistically significant difference among the four provinces in prevalence of CP ( $P = 0.003$ ).

Of the 52 infants with clefts, 24 (46.15%) were girls and 28 (53.85%) were boys [Table 4]. The greatest prevalence of girls with clefts was in Rasht City and the boys with clefts was in Arak City. The prevalence of CL/P based on sex was statistically different between the four provinces ( $P < 0.05$ ).

There is a significant relationship between sex and cleft types ( $P = 0.017$ ). From 19 infants with CLP, 26.3% of infants

**Table 1: Frequency of clefts live births in four West and north-west cities of Iran from 2008-2012 Based on sex and cleft type**

Clefts Gender	2008						2009						2010						2011						2012						Total																								
	R	A	S	T	R	A	R	A	S	T	R	A	R	A	S	T	R	A	R	A	S	T	R	A	R	A	S	T	R	A	R	A	S	T	R	A																			
CP	1	1	-	-	-	-	8	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	8	1													
Boy	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
CL	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Boy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
CLP	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Girl	-	1	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Boy	1	8	4	1	8	1	8	1	8	1	8	1	1	8	1	8	1	1	8	1	8	1	8	1	1	8	1	8	1	8	1	1	8	4	1	4	6	4	4	4	4	4	4	1	1	1	1	1	1	1	1	1	1	1	1
Total	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

R = Rasht; A = Arak; S = Sanandaj; T = Tabriz; CP = Cleft palate; CL = Cleft lip; CLP = Cleft lip and palate

**Table 2: Frequency (Annual prevalence of clefts per 1000 live births) of CL/P in four West and North-West cities of Iran from 2008-2012**

	Rasht			Arak			Sanandaj			Tabriz		
	Live birth	Clefts	Prevalence	Live birth	Clefts	Prevalence	Live birth	Clefts	Prevalence	Live birth	Clefts	Prevalence
2008	1410	1	0.112	6101	8	0.138	4210	4	0.123	4874	1	0.183
2009	1117	8	0.132	4721	1	0.180	1412	8	0.136	1211	1	0.116
2010	4180	1	0.188	6670	8	0.182	1162	1	0.112	1762	4	0.162
2011	3218	1	1.186	6781	-	-	1308	8	0.137	1406	4	0.173
2012	4871	4	0.123	7011	6	0.121	1112	4	0.177	1411	1	0.121
Total	83314	13	0.111	31828	11	0.131	81217	13	0.110	86214	11	0.111

**Table 3: Frequency (prevalence of clefts per 1000 live births) in four West and north-west cities of Iran from 2008-2012**

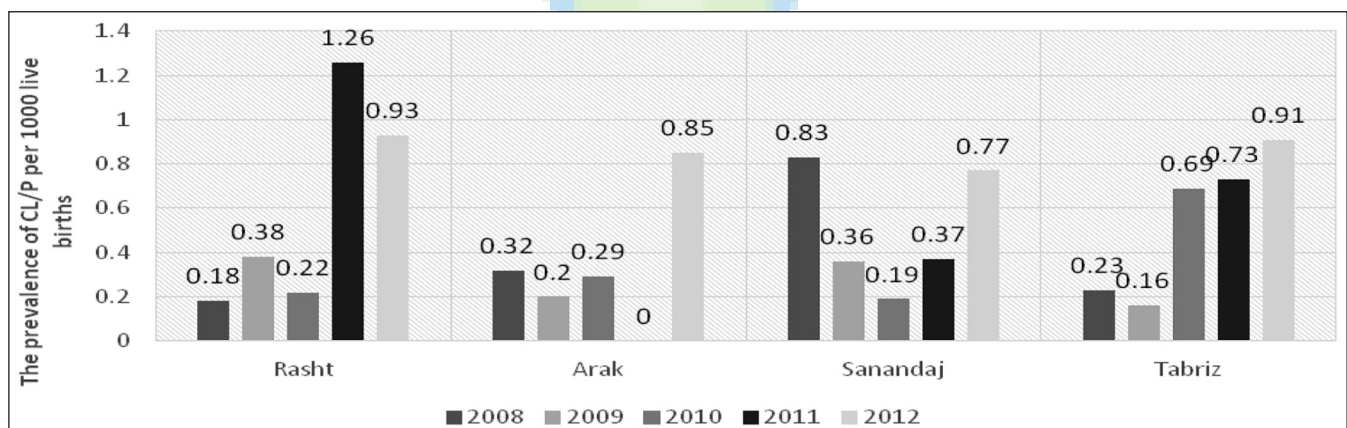
Cities	Rasht	Arak	Sanandaj	Tabriz	Total	P*
Live births	83314	31828	81217	86214	107317	
CL	0 (0)	1 (0.1038)	1 (0.1123)	4 (0.1142)	10 (0.1023)	0.1062*
CP	18 (0.1114)	8 (0.1064)	4 (0.1111)	1 (0.1126)	83 (0.1814)	0.1003
CLP	1 (0.1043)	2 (0.1816)	4 (0.1111)	6 (0.1884)	12 (0.1172)	0.1876
CL/P or CP	13 (0.1117)	11 (0.1318)	13 (0.1103)	11 (0.1112)	18 (0.1421)	0.1638

CL = Cleft lip; CP = Cleft palate; CLP = Cleft lip and palate; \*Chi-square test; \*(24845) have expected count less than 2

**Table 4: Frequency (prevalence of clefts per 1000 live births) in four West and north-west cities of Iran from 2008-2012 by gender**

Cities	Girl	Boy	Total	P*	P*
live births	18801	11116	107317		
CL	7 (0.1134)	3 (0.1014)	10 (0.1023)	0.181	
CP	13 (0.842)	10 (0.121)	83 (0.1814)	0.41	0.017
CLP	4 (0.1077)	11 (0.1878)	12 (0.1172)	0.1016	
CL/P or CP	84 (0.1460)	82 (0.1102)	18 (0.1421)	0.178	

CL = Cleft lip; CP = Cleft palate; CLP = Cleft lip and palate; \*Chi-square and Fisher test



**Figure 2: The annual prevalence of CL/P in four West and North-West cities of Iran from 2008-2012**

were females, and 73.7% were males, CLP was found most frequently in males ( $P = 0.016$ ). And of 23 infants with CP, 56.5% of infants were females and 43.5% were males ( $P = 0.45$ ). Of 10 infants with CL, 70% of infants were female [Table 4].

## DISCUSSION

This study was conducted to explore the prevalence of CL/P in the capital cities of four provinces in the West and North-West of Iran by using electronic medical

information from the hospitals. Until now, the prevalence of oral clefts was not reported for the population of four provinces: Markazi, East Azarbaijan, Kurdistan, and Gilan. Several studies have reported the prevalence of CL/P in the Iranian population since 1986. The prevalence of CL/P ranges from 0.86 to 3.73/1000 live births.<sup>[10-14,16-18]</sup> The main purpose of the current study is to explore the distribution and prevalence of CL/P and type of clefts in the capital city of four provinces synchronously from 2008 to 2012. The overall prevalence of CL/P in the population

of four capital cities of four provinces in the West and North-West of Iran was 0.48/1000 live births. The lowest prevalence of clefts in Iran was reported as 0.86/1000 live births.<sup>[10]</sup> We used only electronic records (hospital-based) of children who were born in hospitals and eventually were diagnosed. So probably those children who were not diagnosed at birth in the hospital were not registered. There was a wide variation in the incidence of CL/P from 2008 to 2012, and from city-to-city. The highest incidence of CL/P occurred in Rasht City of Gilan Province (1.27/1000) in 2011. Zandi and Heidari also reported the prevalence of cleft anomalies, ranging from 0.42/1000 in 1994 to 1.70/1000 in 1998 from Hamedan City in Iran.<sup>[15]</sup> With respect to ethnicity, the prevalence of oral cleft in Gorgan City (in Iran) has been reported. In Fars, Turkamean, and Sistani, the prevalence of CL/P was 0.86, 0.88, and 1.47/1000, respectively.<sup>[13]</sup> According to Cooper *et al.*, the prevalence of live births with cleft anomalies is different from population to population.<sup>[4]</sup> In this study, there were statistically significant differences among the four provinces in the frequency of clefts ( $P = 0.000$ ) and cleft types ( $P = 0.000$ ). The prevalence of CP in Rasht was more than that of other types of clefts. Similarly, Elliott *et al.* reported that there was regional variance in clefts within nine Zambian provinces.<sup>[3]</sup> In the present study, overall, CP was more common (44.2%), followed by CL/P (36.6%) and CL (19.2%). Most previous studies, reported that the prevalence of CL/P was higher than other types of oral clefts<sup>[4,5,7,19-22]</sup> as well as the Iranian investigators reported that the prevalence of CL/P was higher.<sup>[11,13-15]</sup>

Some studies reported the equal distribution of males and females with CL/P.<sup>[12,23]</sup> In the present study, differences in distribution among boys and girls with various types of cleft, CL, CP, and CL/P, CP was found most frequently in females, and CL/P was found most frequently in males. The majority of the studies similarly reported that CL/P was significantly more common in males than in females, and CP was more common in females than in males.<sup>[7,11,15,19-21]</sup>

## CONCLUSION

We explored the prevalence of CL/P in four capital cities of the West and North-West provinces of Iran synchronously from 2008 to 2012. Overall, there were differences among the four cities in the prevalence of oral clefts. The prevalence of various cleft types differs from city-to-city. Conversely, the effect of gender on the prevalence of CL/P also showed regional differences. The different gender effects on the prevalence of CL/P from city-to-city may be explained by environmental and/or genetic factors affecting the development of oral clefts.

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## Conflicts of interest

There are no conflicts of interest.

## AUTHOR'S CONTRIBUTION

NJ contributed in the conception of the work, conducting the study, revising the draft, approval of the final version of the manuscript, and agreed for all aspects of the work. ShJ contributed in the conception of the work, drafting and revising the draft, approval of the final version of the manuscript, and agreed for all aspects of the work.

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