Epidemiology of Cleft Lip and Palate among Infants Born in Chandigarh

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ABSTRACT

Aim and objective: To determine the incidence of cleft deformity in Chandigarh by monitoring the total live births occurring at different birth facilities.

Materials and methods: This cross-sectional study was carried out at all birth facilities of UT, Chandigarh during the period between 1st January 2009 and 31st December 2010. Total 35 birth facilities, 6 government hospitals, and 29 private nursing homes were included in the study. This epidemiological study was based on monitoring of all the live births and recorded the incidence of type of cleft deformity, associated congenital malformations, birth order, family history, detection, and diagnosis with ultrasonography and folic acid intake during pregnancy.

Results: Forty eight babies with different types of cleft deformities were born with an incidence of 0.97/1,000 live births. Group- 1, group- 1(A), group- 2, and group- 3 (as per Balakrishnan classification) and miscellaneous group included eight (16.66%), 10 (20.84%), 13 (27.08%), 14 (29.16%) newborns, and three (6.26%) newborns (one with subcutaneous cleft and palate while two with midline cleft deformity of face), respectively. The frequency of cleft deformity was significantly more among males except isolated cleft palate group which showed equal distribution. About 15 (46.87%) newborns had cleft deformity on left side, 10 (31.25%) on right side while seven (21.87%) had bilateral cleft deformity. The overall percentage of subjects of cleft with associated major anomalies or syndromes was 22%.

Conclusion: The incidence of cleft deformity in Chandigarh region was found to be 0.97/1,000 live births. The frequency of cleft deformity was more among males as compared to females except isolated cleft palate group which showed equal distribution. The laterality of the cleft deformity was more on left side followed by right side and then bilateral. Improved training to radiologists and gynecologists could increase the detection rates of orofacial clefts during pregnancy.

Keywords: Cleft lip and palate, Epidemiology, Incidence.

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INTRODUCTION

Cleft lip and/or palate is one of the most common congenital malformations of the head and neck region.^{1,2} Orofacial clefts (OFCs) are usually associated with esthetic and functional problems that include difficulty in feeding, dental problems, abnormal facial growth, speech development, and hearing difficulties. The etiology of orofacial clefts is generally thought to be multifactorial involving both genetic and environmental factors.³ These clefts occur in individuals of all socioeconomic and ethnic backgrounds. The birth prevalence of orofacial clefts in different populations around the globe is in the range of 0.6–4.9 per 1,000 patients.⁴⁻¹⁷ Comparison of figures for birth prevalence is complicated by the different methodologies used to determine birth prevalence as some studies used only live births^{5,8} and others included live births, stillbirths, and abortions. The incidence of cleft deformity in various regions in India was reported in the range of 0.54–2.75 per 1,000 live births.¹⁸⁻³² Most of the Indian data comes from relatively small, local hospital-based studies and included stillbirths in recording the prevalence of birth defects of oral clefts.¹⁸ An earlier study conducted in Chandigarh by Saifullah et al.¹⁹ in a single birth facility on 1,000 consecutive births found one newborn with cleft lip and palate deformity with incidence of 1/1,000 births. In majority of the studies, the data on incidence is mostly based on hospital related figures and may not be a true representation of the actual occurrence of the birth defects related to clefts.¹⁸⁻²⁸

The feeding, aesthetics, dento-facial, and psychosocial problems in patients with cleft lip and palate need to be addressed extensively. Counseling and guidance to the parents of

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children born also require consideration for future treatment and comprehensive management of the defect and its related problems. Thus, it is important to conduct an epidemiological survey to investigate the incidence of cleft deformity in Chandigarh to predict the total burden of care and improve planning of health related services for the management of cleft deformity. Hence, the present study was planned with the objective to determine the incidence of cleft deformity in Chandigarh by monitoring the total live births occurring at different birth facilities over a period of 24 months.

MATERIALS AND METHODS

This cross-sectional study was carried out at all birth facilities of UT, Chandigarh during the period between 1st January 2009 and 31st December 2010. Chandigarh (UT), the capital city of Punjab and Haryana, provides health facilities which are well planned and birth registration is centralized. All the births and deaths in Chandigarh are registered at Birth and Death Registration Department, Chandigarh administration (Sector-17, Chandigarh UT). Thus, it provides an optimum facility for conducting an epidemiological study specifically related to births and deaths. All the concerned authorities responsible for the birth and neo-natal care in Chandigarh city were explained the aim and objectives of study and were regularly visited by the investigator. Permission from the concerned authorities of all birth facilities was obtained before conducting this study. This study relied on data obtained from Neonatal Units at Departments of Gynaecology and Obstetrics from all birth facilities in Chandigarh. The list of all birth facilities in Chandigarh was collected from Birth and Death Registration Department (Sector-17, Chandigarh). Total 35 birth facilities, 6 government hospitals, and 29 private nursing homes were included in the study. This epidemiological study was based on monitoring of all the live births and recording the data related to newborns with cleft deformities. All the live newborns with the cleft deformity were recorded in the study during the above period. Before starting the study during the visits to the birth facilities, it was noticed that most parents of the newborn babies with cleft deformity were unaware on various aspects of this deformity like feeding method, treatment aspects and the overall management of babies with cleft deformity. Considering this, Information Education and Communication (IEC) Brochures were prepared for distribution to the parents in three languages (Hindi, English, and Punjabi) and they were distributed among doctors, nurses, and patients for general information regarding this congenital deformity. This brochure included description of cleft deformity, possible risk factors of cleft deformity, feeding problems, chances of ear infection and hearing loss, speech and language problems, dental problems, aesthetic and function problems, counseling regarding feeding technique, psychological aspects, regarding primary and secondary surgery, prevention of cleft deformity, and timing for different surgical and nonsurgical treatment protocol as per PGIMER guidelines.

Collection of data: Data collection was started from 1st January 2009. After getting telephonic information on birth of newborn with the cleft deformity from the birth facility or during weekly visit by the investigator to the birth facility, investigator visited the parents of newborns. The immediate concern about feeding the baby was addressed and counseling provided for different methods to feed the babies with cleft deformity. Along with interview, the parents were informed about all the treatment modalities and were guided for free surgical treatment at Post Graduate Institute of Medical Education and Research, a Smile Train partner. They were subsequently counseled and guided regarding the general health of the newborn, the severity of the cleft, speech, and growth of the orofacial region. The need for general dental awareness and the optimum orthodontic care for rehabilitation of the child with cleft were also explained.

The type of cleft and any associated deformity, any history of past abortions, presence of cleft in the family and other demographic data with regard to the parents of the newborn with cleft deformity were recorded on a standard Proforma. Along with

cleft deformity, other congenital malformations were also recorded in the Proforma, as observed and recorded by the attending pediatrician. The type of cleft deformity was recorded as per the classification given by C. Balakrishnan.³³ However, some rare clefts like oro-ocular, oro-auricular, midline facial cleft, subcutaneous cleft etc. were included in a separate miscellaneous group. Apart from recording the problems on a standard Proforma, facial photograph of each newborn with cleft deformity was also recorded by a digital camera for the validation of type of cleft deformity. Some newborns with cleft lip and palate who could not be recorded at primary birth facilities or who were born at home got recorded later when they reported to the tertiary healthcare center for surgery.

Statistical Analysis

The statistical analysis was carried out using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 15.0 for Windows). All quantitative variables were estimated using measures of central location (mean, median), measures of dispersion (standard deviation and standard error), and IQR. Qualitative or categorical variables were described as frequencies and proportions. Proportions were compared using Chi-square or Fisher's exact test whichever was applicable. All statistical tests were two-sided and performed at a significance level of 0.05.

RESULTS

A total of 48 babies with various types of cleft deformities were born in the city during the study period of 24 months. Total live births in Chandigarh city according data obtained from Birth registration office during the same period were 49,215. The incidence of cleft deformity was found to be as 0.97/1,000 live births. The distribution of various types of orofacial clefts is shown in Table 1. Among 48 newborns with cleft deformity, group- 1, group- 1(A), group-2 and group- 3 included eight (16.66%), 10 (20.84%), 13 (27.08%), and 14 (29.16%) newborns, respectively while three (6.26%) newborns, one (2.08%) newborn with subcutaneous cleft and palate while two (4.18%) with midline cleft deformity of face were included in miscellaneous group.

A total of 32 newborns, were classified according to the laterality of the clefts. Fifteen (46.87%) newborns had cleft deformity on left side, 10 (31.25%) on right side while seven (21.87%) had bilateral cleft deformity. Among 48 newborns with various cleft deformities, 33 (68.75%) were males and 15 (31.25%) were females. The frequency of cleft deformity was more among males as compared to females and the difference was statistically significant (Chi-square test = 4.51, *p* value- 0.033). All types of cleft were found more frequently in males than in females except group- 3 which was equally distributed in both the genders.

The distribution of the cleft according to the gender and sides (left and right) among different groups is shown in Table 1. Eight newborns had cleft lip deformity (group- 1) were all males. Of eight newborns, four (50%) newborns had cleft deformities on left side and three (37.5%) on right side and one (12.5%) was a bilateral cleft. Ten newborns had cleft lip and alveolus deformity [group- 1(A)], which included eight (80%) males and two (20%) females. Out of eight males, four (50%) newborns had cleft deformities on left side and three (37.5%) on right side and only one (12.5%) newborn had bilateral cleft. Among two female newborns with group- 1 (A) cleft deformity, one had cleft deformity on right side and one on left side. Thirteen newborns had isolated cleft palate deformity (group-2) and of these 13, eight (61.54%) were males and five

Table 1: Distribution of newborns with various cleft deformities and their laterality

	Male <i>n</i>		Female <i>n</i>	Total <i>n</i>
Number of total live births	26,312 (53.4%)		22,903 (46.5%)	49,215 (100%)
Number of newborns with cleft deformity	33 (68.7%)		15 (31.3%)	48 (100%)
Incidence of cleft deformity	1.25/1000		0.65/1000	0.97/1000
Acc. to laterality (<i>n</i> = 32)				
Unilateral	Right	7 (22%)	3 (9.2%)	10 (31.2%)
	Left	11 (34.3%)	4 (12.5%)	15 (46.8%)
Bilateral		5 (15.7%)	2 (6.3%)	7 (22%)
Total		23 (71.8%)	9 (28.2%)	32 (100%)
Distribution according to cleft type				
	Total			
Group- 1 (Unilateral)	Right	3 (6.3%)	0	8 (16.7%)
	Left	4 (8.3%)	0	
Group- 1 (Bilateral)		1 (2.1%)	0	10 (20.8%)
Group- 1(A) (Unilateral)	Right	3 (6.3%)	1 (2.1%)	
	Left	4 (8.3%)	1 (2.1%)	
Group- 1(A) (Bilateral)		1 (2.1%)	0	13 (27%)
Group- 2		8 (16.7%)	5 (10.4%)	
Group- 3 (Unilateral)	Right	1 (2.1%)	2 (4.2%)	14 (29.1%)
	Left	3 (6.3%)	3 (6.3%)	
Group- 3 (Bilateral)		3 (6.3%)	2 (4.2%)	3 (6.3%)
Miscellaneous (Rare clefts)		2 (4.2%)	1 (2.1%)	
Total		33 (68.7%)	15 (31.3%)	48 (100%)

Comparison cleft deformity (Male to Female): Chi-square test = 4.51, *p* value- 0.033

Group- 2: odds ratio of males-0.64, and odds ratio of females: 1.56

Group- 3: odds ratio of males-0.31, and odds ratio of females: 3.25

Group-1- Isolated cleft lip, group-1(A)- Cleft lip and alveolus, group-2- Isolated cleft palate, group-3- Cleft lip, alveolus and palate

(38.46%) were females. The male to female ratio was 1.6:1. Isolated cleft palate deformity was found more in males as compared to females but the frequency of having this deformity in female was more as compared to males as shown in odds ratio (odds ratio of males: 0.64, and odds ratio of females: 1.56). The cleft lip, alveolus and palate deformity (group-3) was equally distributed among males and females as seven (50%) newborns were males and seven (50%) females. However, according to the odds ratio the deformity was more frequent among females (Odds ratio of males: 0.31, odds ratio of females: 3.25).

A complete history of proper birth order could be obtained for 45, out of 48 newborns with cleft deformity and the distribution of all newborns with cleft deformity according to their birth order, heredity, maternal intake of folic acid during pregnancy, detection of cleft deformity in ultrasonography during intrauterine life and associated with any other systemic abnormalities are shown in Tables 2 and 3.

DISCUSSION

A total of 49,215 babies were born in Chandigarh UT during the study period of 24 months, out of which 48 babies had cleft deformity. In the present study, the incidence of cleft deformity in Chandigarh was 0.97 per 1,000 live births which is within range of 0.54–2.75 per 1,000 live births, incidence of cleft deformity in previous studies conducted in various parts of India.¹⁸⁻³² The incidence of cleft deformity in Caucasian populations varied

from 0.6–1.89 per 1,000 births, the mean incidence being approximately 1 per 1,000 births and was similar to the present study conducted among Caucasians.^{7,8,34-41} The reported incidence of cleft lip, cleft palate, and cleft lip and palate for American Indians however ranged from 0.79–3.74 per 1,000 live births.^{42-44,47} Black and Arab populations of the Middle East had a lower incidence of cleft deformity than Caucasians.⁴⁵⁻⁴⁹ Japanese have a higher incidence compared with the incidence of (Cleft lip and/or palate) CL ± P in Japanese of other parts of the world.^{50,51}

Most of the investigators around the world collected data from the hospital records. Saxen and Lahti⁵² in Finland, Will and Parsons⁵³ in Illinois and Murray et al.,⁵⁴ Taher et al.⁵⁵ in Tehran, Menegotto et al.⁵⁶ in South America, Al Omari and Al-Omari⁵⁷ in Jordan and Druschel et al.⁵⁸ in the New York State, Vallino-Napoli et al.⁵⁹ in Victoria, Australia, Gregg et al.⁶⁰ in Northern Ireland, Fels Elliott et al.⁶¹ in Zambia, and Coupland and Coupland¹³ in United Kingdom reported the incidence and prevalence from either hospital based survey or records of the hospitals visiting for surgery.

Distribution of Cleft Deformities

In the present study, CL comprised of 37.5% of total orofacial cleft deformities similar to studies conducted by Rajabian et al.¹⁴ in Iran (34.9%) and Jensen et al.⁸ in Denmark (33.5%) whereas in few studies the distribution of cleft lip among all other types of clefts was reported to be higher.^{45,47,60,62,63} Mestrovic et al.¹⁶ in Croatia (17.2%), Will and parsons⁵² in Illinois (8.33%), and Aljohar et al.⁶⁴ in Saudi Arabia (15.1%) reported very low frequency of cleft lip among all types

Table 2: Distribution of newborns with various cleft deformities according to heredity, intake of folic acid by mother at various stages of pregnancy, detection of cleft deformity in ultrasonography during pregnancy, associated with any other systemic abnormalities

Family history of cleft deformity						
Number of newborns with cleft deformity n (%)						
Positive maternal family history		Positive paternal family history			Negative family history	
1 (2%)		1 (2%)			43 (96%)	
Folic acid by mothers at various stages of pregnancy						
First month	Second month	Third month	After third month	Not taken	Total	
3 (6.66%)	2 (4.44%)	17 (37.77%)	7 (15.55%)	16 (35.55%)	45 (100%)	
Detection of cleft deformity in USG						
Number of pregnant women who delivered babies with cleft deformity [n (%)]						
Yes		No		USG not done		Data not available
3 (7%)		35 (77%)		7 (16%)		3
Systemic abnormalities						
Present				Absent		
10 (20.84%)				38 (79.16%)		

Table 3: Description of various systemic abnormalities with cleft type, gender, and laterality

S. No.	Cleft deformity	Laterality	Sex	Systemic abnormality
1	Group-1(A)	Left	M	Weak bones
2	Group-2		M	Weak bones
3	Group-3	Bilateral	F	Hydrocephaly, multiple organomegaly
4	Group-2		F	Down syndrome
5	Group-1	Left	M	Ventricular septal defect
6	Group-2		M	Pierre Robin sequences, One foot deformity, Ventricular septal defect
7	Group-2		M	Stickler syndrome
8	Group-1(A), Group-1	Bilateral	M	Anophthalmus
9	Group-2		F	Pierre Robin sequences
10	Midline of face		M	Microcephaly, Proptosis

Group-1- Isolated cleft lip, group-1(A)- Cleft lip and alveolus, group-2- Isolated cleft palate, group-3- Cleft lip, alveolus and palate

of cleft deformities. CLP in the present study comprised of 29.16% of total orofacial cleft deformities comparable to the frequency of cleft lip and palate reported by Iregbulem⁴⁸ in Nigeria (32%) and Druschel et al.⁵⁸ in New York (28.9%) while most of the other studies found higher frequency of cleft lip and palate.^{8,14,16,55,57,62-65} Cleft of palate comprised of 27.08% of total orofacial cleft deformities in the present study similar to Jensen et al.⁸ in Denmark. While the distribution reported both higher^{14,47,55,57,60-62,64,65} and lesser frequency^{16,52,57,63,65} among other populations as compared to Chandigarh population. These differences in cleft type distribution in various populations may be due to difference in gene frequencies, a geographical clustering, differences in environmental factors, or methods of data collection as explained by Cooper et al.¹⁷

Cleft Deformities According to Their Laterality

The laterality of the cleft deformity in the present study was more on left side followed by right side and then bilateral, in agreement with the universal acceptance of left side predominance in cleft deformity. The results of many previous studies are similar to the results of current study.^{5,7,8,14,16,35,38,53,54,56,62,67} According to laterality of total CL cases in the present study, 50% of the clefts were on left side followed by right side (38.88%) and bilateral (11.11%) and the left: right: bilateral ratio was 1.31:1:0.29. Similar result was also

reported by Elliott et al.⁶⁰ in Zambia where they reported left: right bilateral ratio to be 1.14:1:0.30. The CLP was also predominant on left side. Among total cleft lip and palate cases, 42.85% were with cleft on left side followed by bilateral 35.71% and right side 21.42%. The ratio of left: right: bilateral was 1.2:0.6:1 similar to Mestrovic et al.¹⁶ in Croatia who reported left: right: bilateral ratio of 1.67:0.6:1. Elliott et al.⁶¹ in Zambia found left: right: bilateral ratios as 0.95:1:1.10 contradictory to the present study. The predilection for the left side in unilateral clefts has been a recurrent finding in the literature related to oral clefts, and this seems to be a feature in all ethnic groups. No convincing explanation for these differences has been advanced, but a proposed explanation is that blood vessels, supplying the right side of the fetal head, leave the aortic arch closer to the heart and are perhaps better perfused by blood than those going to the left side as reported by Johnston et al.⁶⁸

Gender Wise Distribution of Cleft Deformities

In the present study, CL deformity was more predominant in males as compared to females with the ratio of 8:1. This finding was in concordance to the results of many previous studies.^{5,7,8,15,16,38,53,54,56,59,61,63,68,69} However, Tretsen⁷⁰ reported equal distribution of CL among males and females, and few studies have also reported a predominance of CL among females.^{14,34,71} In the

present study, bilateral cleft lip was present only in males and similar result were also reported by Stoll⁶ and Akker.^{72,73} However Rank et al.⁷⁴ reported bilateral cleft lip only among females. Meskin et al.⁷⁵ and Henriksson⁷⁶ reported bilateral cleft lip more among females than among males. An equal distribution of CLP was found among males and females in the present study, which was different from many previous studies reported in the literature and majority of them were in favor of male predominance for CLP.^{7,8,14-16,35,38,55,57,58,61,64,74,76} Isolated cleft palate (CP) deformity in the present study was predominantly present in males as compared to females with the ratio of 1.6:1 similar to results of few studies.^{15,54} However, this finding was different from many previous studies, which reported higher frequency of CP among females than among males.^{3,5,7,8,12,14-16,35,51,57,62,64,68} Gregg et al.⁶⁰ however found equal distribution of CP among males and females. Although CP was predominant in males in the present study but the chances of having this deformity was more among females as described in odds ratio. (Female odds ratio: 1.56) The difference in sex ratio with the other studies could be due to smaller sample of the present study. An explanation for the majority of clefts affecting the males more may be due to different threshold values in the two sexes; that is, more additive disposing factors are required for the manifestation of a cleft in females as compared to males.⁸ Tolarova and Cervenka³⁶ claimed that there is a threshold level, dependent on the sex of the proband, which means that girls need more polygens to express the anomaly. This hypothesis assumes that girls have a greater chance to transmit the defect to the next generation.

Distribution of Newborns with Cleft Deformities According to Birth Order

The history of birth order could be elicited for 45 babies from the mothers and maternal history of three babies was not possible as these babies had been abandoned by their parents. Among 45 children with various cleft deformities, 20 (44.44%) were first in their birth order, 19 (42.22%) were second, five (11.11%) third, and one (2.22%) was fourth in the birth order. Few studies^{38,51,70,77,78} have reported a positive association between increasing birth order and oral clefts while some studies^{79,80} reported no association between the two. However, in present study no attempt was made to determine an association between cleft deformities and birth order.

Cleft Deformity and History of Folic Acid Intake by Mothers during Pregnancy

In the present study, folic acid intake by mothers started when they first reported pregnancy to the doctor. Most of them reported at 3rd month of their pregnancy and only three mothers started folic acid at 1st month of pregnancy. Available data regarding the history of folic acid intake by mothers is not reliable because of recall bias by mothers after delivery. The current evidence with nutrition and OFC, however, remains equivocal, and it is still not clear (1) whether any effect is due to folic acid or other aspects of the multivitamin supplementation, (2) whether there is a therapeutic effect, dependent on vitamin or folic acid dosage, and (3) whether there is a genetic predisposition to OFC that can be explained in part by genetic polymorphisms in the foliate or multivitamin metabolic pathways.^{81,82} The protective role of folic acid would best be studied by prospective, randomized, clinical studies.

Detection of Cleft Deformity in Ultrasonography during Pregnancy

The present study revealed that 38 babies (out of 45 babies whose history was recorded) had USG at their intrauterine life. Out of these

38 babies with cleft deformity, a positive indication (detection) was there in only three cases. It appears that routine USG does not concentrate on OFC detection and there is a need for a special effort to detect the cleft deformity. A detailed examination of the fetal face may not occur routinely in the absence of risk factors,⁷⁹⁻⁸⁴ although most of the clefts deformities occur in patients with no known risk factors,⁸³ prenatal cleft detection rate appeared to be higher when there are other developmental anomalies detected, compared with isolated clefts,⁸⁵ possibly because a more detailed facial investigation was likely to be undertaken or when clefts were larger and more readily visualized. There is some evidence that suggested that improved training to radiologists and gynecologists could increase the detection rates of orofacial clefts during pregnancy.⁸³ Alternative techniques, such as transvaginal sonography, are also worth considering in the detection of orofacial cleft. This later technique is not routinely used but is reported to allow earlier visualization of the face and better image resolution.^{84,85} Very high sensitivity (92–96%) and specificity (100%) for prenatal cleft detection have been reported, but this did not include isolated cleft palates.⁸⁶ As an unfortunate consequence of the diagnosis of a prenatal cleft, some families may choose to terminate the pregnancy, even in the absence of any other malformations. Others contend that because cleft is rarely life threatening and does not, by and large, involve mental impairment, termination should not usually be offered.⁸⁷ In one parental survey, 47% chose a prenatal diagnosis but if positive would probably or definitely not consider termination.⁸⁸ Facial clefts are often described as minor cosmetic malformations, but most parents of affected children perceive the defect as severe. Prenatal cleft diagnosis by ultrasound has been a possibility for some time, but the sensitivity has remained generally low.⁸³ Advances in ultrasound technology, improvements in training and routine visualization of the fetal face are likely to be key in increasing the sensitivity of such an investigation. A positive advantage however, of detecting a cleft in USG is to prepare the parents for accepting the newborn with a cleft and provide counseling so as to minimize the trauma of the unexpected arrival of a baby with cleft.

Cleft Deformity Associated with Other Systemic Abnormalities

In the present study, 10 newborns out of 48 newborns with cleft deformity had congenital malformation. The overall percentage of subjects of cleft with associated major anomalies or syndromes was 22% in the present study. The results were in close agreement with that reported by other authors.^{49,58,83} Calzolari⁶⁷ reported musculoskeletal anomalies were the most frequent associated defects (43.5%) followed by 29.2% of central nervous system, 28.9% of the cardiovascular system, of which ventricular and atrial septal defects were the most common, followed by tetralogy of Fallot. Stoll and Roth⁸³ reported, out of 406 newborns with cleft deformity, 118 were associated with 237 malformations other than cleft deformity, in these 10 had ventricular septal defect, 13 hydrocephaly, seven had clubfoot, eight had polydactyly, five had syndactyly, 20 had trisomy of either 13 or 18.

In the present study isolated cleft palate group comprised of 50% of associated malformation, similar to results of many previous studies.^{39,92,43} In the previous investigations, the frequency of other congenital defects ranged between 7.5 and 26.2%.^{55,89,90-93} In Denmark, approximately 10% of children with isolated cleft palate had the Pierre Robin triad as reported by Christensen et al.⁵⁵ while in the present study 23% of children with isolated cleft palate had Pierre Robin sequence. Stark⁸⁴⁻⁹³ found clubfoot to be the most

common malformation. Shprintzen et al.⁹⁴ reported an increased number of malformations in the head region, Lilius⁹⁰ of extremity deformities, while Abyholm,⁴³ malformations of central nervous system more frequently. Stoll et al.⁶ reported 8.8% of the infants, who had cardiovascular malformations defects, ventricular septal defects were the most frequent heart anomalies in the present study the total spectrum of other malformation could not be seen, because of the sample being limited in number. However, the associated malformations seen in the present study were Pierre Robin sequences, Stickler syndrome, Ventricular septal defect, multiple organomegaly, and Weak bones, Hydrocephaly, Microcephaly, Anophthalmus, and Down syndrome.

Future direction: Improved training to radiologists and gynecologists to sensitize them towards prenatal diagnosis of cleft lip and palate which may result in an increase in the detection rates of orofacial clefts during pregnancy. Possibilities could be explored to add one column in birth register to specify birth anomalies.

CONCLUSION

The incidence of cleft deformity in Chandigarh UT was found to be 0.97/1,000 live births. The frequency of cleft deformity was more among males as compared to females except isolated cleft palate group which showed equal distribution. The laterality of the cleft deformity was more on left side followed by right side and then bilateral. The overall percentage of subjects of cleft with associated major anomalies or syndromes was 22%. Out of these 38 babies with cleft deformity, a positive indication (detection) was there in only three cases.

Limitations of the study: The present study was done on the basis of records obtained from medical birth facilities. There could be some unnoticed patients with cleft lip and palate deformity which were born at their respective homes.

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