

Original Article

Maternal Occupational Exposure and Risk for Orofacial Clefts : A Prospective Study

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Background : Raising a child with an Orofacial Cleft is one of the most challenging responsibilities faced by a new parent. It has a great impact not only on the social competence of a child but also has psychological implications on their families who suffer both physical and emotional stress which require holistic family-based treatments. Even after successful treatment, it remains a matter of concern for the affected families and they find it difficult to cope with the situation. So to lessen both financial and emotional burdens it becomes altogether more important to search for the aetiologic factors which are responsible for these Orofacial Defects. Though the aetiology of these defects is not fully understood, recent studies have shown the involvement of genetic as well as certain environmental factors which include Smoking¹, Maternal Alcohol Consumption², Diabetes³, Teratogenic Medicines⁴ and Maternal Occupational Exposures⁵. More knowledge of these pre-disposing risk factors better in future will be the option for prevention, treatment and prognosis for individuals with these clefts.

Materials and Methods : A prospective study was conducted in the Department of Plastic Surgery at Christian Medical College, Ludhiana. All the patients with Orofacial Clefts who visited the OPD from 1st September, 2019 to 31st August, 2022 were included in the study. The medical records were analyzed and details regarding the demographic profile, occupation of the mother and occupational exposure during the periconceptual period were noted. The nature of the defect was noted following Nagpur classification⁶. Statistical analysis of the data obtained was analyzed by using proportions & chi-square tests.

Results : In our study which included 278 patients, 24.46% patients had mothers working as Housekeepers, 15.46% of patients had mothers working in the agricultural industry, 12.58% of patients had mothers working in the textile industry and 1.43% patients had mothers working in hair salons. A total of 53.93 % of patients' mothers had exposure to different chemicals which included Biocides, Pesticides, Dyes, Aldehydes & Lead Compounds.

Conclusions : With the increasing number of women now coming out from their homes to do various jobs, especially the poor strata working in the labour market, and in factories to improve the financial conditions of their families, it is important to identify various teratogenic factors in the workplace so that these can be avoided. We can decrease the chances of Oral clefts in offspring, saving the child & their families from future agony & pain. However, larger studies are needed to confirm the findings.

[J Indian Med Assoc 2023; 121(6): 47-50]

Key words : Cleft Lip, Cleft Palate, Maternal Occupational Exposure, Pesticides, Biocin, Working Women.

Raising a child with an Orofacial Cleft is one of the most challenging responsibilities of a new parent. It has psychological implications both for the patients and their families. Cleft Lip (CL) and Cleft Palate (CP) are one of the most common types of Orofacial Cleft malformations that cause child disability and morbidity⁷. The incidence of Cleft Lip Palate is about

Editor's Comment :

- This study was done in view to know the various occupational risk factors which are associated in causing the orofacial clefts.
- This will help the medical professional to properly guide the women to avoid the exposure to the causative agents and henceforth this may help to reduce the incidence of disease in near future.

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Received on : 12/05/2023

Accepted on : 13/06/2023

1 to 2 per 700 live births in developed countries. A Cleft Lip is two times more common in males than females where an isolated Cleft Palate is more commonly seen in females⁸. In India, the number of infants born with Cleft Lip, Cleft Palate and Cleft Lip Palate together is 28,600 per year. Since India is the second highest populated country in the World, it may consist of the highest number of cleft cases if no further steps are taken to control its occurrence⁹. The aetiology of Orofacial Clefts is not fully understood

but various studies have shown the association of various genetic and environmental factors. Large population-based case-control studies suggest a relationship between environmental factors like Maternal Smoking¹⁰, Maternal Alcohol Consumption¹¹, Maternal Pregnancy Body Mass Index¹², Maternal Occupational Exposure¹³ and risk of offspring with an Orofacial Cleft.

Increasing outdoor jobs especially by women to improve their financial conditions is exposing them to various teratogenic chemicals. Women working as industrial labourers who are more exposed to various chemicals like Biocides, Pesticides, Dyes, Aldehydes and Lead Compounds have increased association with Orofacial Clefts. Henceforth, it is important to know about the exposure of the various teratogenic compounds at the workplace. Prevention is always better than cure. Better knowledge of the possible aetiologic variants will open doors for better preventive measures, treatment facilities and the best prognosis for the individual with these defects. The present study was conducted in the Department of Plastic Surgery, CMC Ludhiana to find possible maternal risk factors and their association with clefts in patients.

MATERIALS AND METHODS

A prospective study was conducted in the Department of Plastic Surgery CMC Ludhiana from 1st September, 2019 to 31st August, 2022. It included all the patients registered during this period of one year. The medical records were analyzed and details regarding the demographic profile, occupation of the mother and occupational exposure during the periconceptional period were noted. All the patients were grouped into various types of cleft as per the Nagpur Classification of Cleft Lip and Palate.

Statistical Analysis :

Statistical analysis of the data obtained was analyzed using proportions and Chi-square.

RESULTS

A total number of 278 patients were included in the study. The patients of the study were divided as per the Nagpur classification of Cleft Lip and Cleft Palate. Group I included 28 patients, Group IA had 36 patients, Group II included 109 patients and 105 patients were included in Group III. In our study, the minimum age of the patient was one month with a maximum age of 8 years. Of the total 278 patients included in the study, 181 patients were males and 97 patients were females. Group II mainly included isolated Cleft Palate and Group I and IA included Cleft Lip of the 278 patients included in the study the maternal occupations were analysed (Table 1).

Group I :

- 7 patients' had non-working mothers
- 6 patients' mothers worked in housekeeping
- 4 patients' mothers worked in the agricultural industry
- 10 patients' mothers worked in the textile industry.
- 1 patient's mother worked in a hair salon.

Group IA :

- 21 patients' had non-working mothers
- 12 patients' mothers worked in housekeeping
- 3 patients' mothers worked in the agricultural industry

Group II :

- 51 patients' had non-working mothers
- 23 patients' mothers worked in housekeeping
- 22 patients' mothers worked in the agricultural industry
- 10 patients' mothers worked in the textile industry
- 3 patients had mothers working in hair salons

Group III :

- 49 patients had non-working mothers,
- 27 patients' mothers worked in housekeeping
- 14 patients' mothers worked in the agricultural industry
- 15 patients' mothers worked in the textile industry

Of the 278 patients included in the study occupational exposure to chemicals was included in the analysis. Chemicals included in the study were Biocides, Pesticides, Lead Compounds, Aldehydes and Dyes. Group I included 16 patients with mothers having no history of occupational exposure. In 14 patients with a history of maternal exposure to Biocides. 6 patients with history of maternal exposure to

Occupation	Group I	Group IA	Group II	Group III	Total
Non-working mothers	7	21	51	49	128 (46.04%)
Housekeeping	6	12	23	27	68 (24.46%)
Agriculture	4	3	22	14	43 (15.46%)
Textile industry	10	0	10	15	35 (12.58%)
Hair salons	1	0	3	0	4 (1.43%)
Total	28 (10.07%)	36 (12.94%)	109 (39.20%)	105 (37.76%)	

Pesticides. In 2 patients with mothers with a history of exposure to Lead Compounds Aldehydes or Dyes. Group IA included 19 patients with mothers having no history of maternal occupational exposure, 12 patients with mothers having a history of occupational exposure to Biocides and 7 patient with mothers having history of maternal occupational exposure to Pesticides. 3 patients with mothers with a history of exposure to Lead Compounds Aldehydes or Dyes. Group II included 39 patients having mothers with no history maternal occupational exposure, 20 patients with mothers with a history of maternal occupational exposure to Biocides, 21 patients with having mothers with occupational exposure to Pesticides, 6 patients with mothers having a history of occupational exposure to Lead Compounds, Aldehydes and Dyes. Group III included 53 patients having mothers with no history of maternal occupational exposure, 29 patients with mothers having a history of maternal occupational exposure to Biocides, 15 patients with a history of mothers having maternal occupational exposure to Pesticides, 16 patients with a history of mothers having maternal occupational exposure to Lead Compounds, Aldehydes and Dyes (Table 2).

DISCUSSION

Orofacial Clefts are the most common Oral congenital deformities worldwide. Various studies have been done to evaluate clinical profile of Cleft Lip and Cleft Palate patients and have identified various predisposing risk factors. In the present study total of 278 patients were evaluated. In our study, out of 278 patients, 65.1% were males and 34.89% females. Similar results were seen by Angulo Castro, *et al*¹⁴ in their study which included 66.66% males and 33.4% females. In our study, out of the 278 patients included in the study, 128 (46.04%) patients had non-working mothers, 68 (24.46%) patients had mothers working as housekeepers, 43 (15.46%) patients had mothers working in the agriculture industry, 35 (12.58%) patients with mothers working in the textile industry and 4 (1.43%) patients had mothers working in hair salons. In 128 (46.04%) patients had non-working mothers, hence no history of occupational exposure, 68 (24.46%) patients had mothers working as housekeepers, thus, with a history of exposure to Biocides and 43 (15.46%) patients had mothers working in the agriculture industry, thus history of exposure to pesticides. 35 (12.58%) and 4 (1.43%) patients had mothers working in the textile industry and hair salons respectively with a history of exposure to dyes, Aldehydes and Lead Compounds.

Occupational exposure	Group I	Group IA	Group II	Group III	Total
No exposure	16	19	39	53	134 (48.20%)
Biocides	14	12	20	29	67 (24.1%)
Pesticides	6	7	21	15	48 (17.26%)
Lead compounds, Aldehydes and Dyes	2	3	6	16	29 (10.43%)
Total	38 (13.67%)	41 (14.74%)	86 (30.93%)	113 (40.64%)	

Lorente, *et al*¹⁵ evaluated the maternal occupation in the 1st trimester of pregnancy of the women in the housekeeping profession 25% had children with cleft Lip and Cleft Palate. Of the mothers in the agricultural profession 16% had an offspring with CL with/without CP. Of the mothers working in the textile industry, 16.6% had mothers with children with Cleft Lip with/without Cleft Palate. In a study conducted by Lorente, *et al*¹⁵ evaluated occupational exposure in the 1st trimester of pregnancy in 100 women, 19.6% of the women had a history of exposure to Biocides, 1.2% had a history of exposure to Pesticides and 6.5% of the mothers had a history of exposure to Lead Compounds, Aldehydes and Dyes. In a study done by NykeSpinder, *et al*¹³ a total of 387 cases were studied. Oral Clefts had significantly increased odd ratios of maternal occupational exposure to Pesticides and Dust. Prevalence of maternal occupational exposure to all agents was 43.9 % and 41%/ 37.7% among cases and control respectively. Yang, *et al*¹⁶ in their study also found a positive relationship between herbicide exposure and Oral Clefts. However, Romitti, *et al*¹⁷ found small increases in risk with maternal exposure to organic solvents. Maternal occupations related to transportation and communications were significantly associated with Oral Clefts (OR: 1.94; p < 0.05) in a study by Hemminki, *et al*¹⁸, who analyzed a potential association between parents' occupation and these three groups of malformations (Central Nervous System and Muscular-skeletal) in their offspring. Referring to solvent use, Holmberg, *et al*¹⁹ indicated that mothers of cases were more exposed to this heterogeneous group of substances than mothers of controls, especially to aliphatic and aromatic hydrocarbon and their mixtures.

CONCLUSIONS

Working women especially those working as labourers in industries, factories or as housekeepers

are at increased risk of exposure to harmful organic solvents and mineral dust which are exposed in the form of Biocin, Pesticides, Dyes, Lead etc. Preventive measures should be taken at workplaces to avoid maternal exposure. This small effort from our side will not only save society from the trauma of a child with Orofacial Cleft but also help in reducing the financial burden on poor families in developing countries.

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