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*International Journal of Current Research*
*Vol. 7, Issue, 08, pp.19160-19163, August, 2015*

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**

**ISSN: 0975-833X**

## RESEARCH ARTICLE

# ROLE OF COFFEE AND TEA IN THE FORMATION OF OROFACIAL CLEFTS

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**ARTICLE INFO**

***Article History:***
Received 05th May, 2015
Received in revised form
05th June, 2015
Accepted 03rd July, 2015
Published online 21st August, 2015

***Key words:***
Orofacial Cleft,
Tea,
Coffee

**ABSTRACT**

The aim of this prospective study is to determine the association of coffee and tea incidence as a factor for cleft lip and palate in Karnataka and Kerala population. This study took into account of mothers of 1000 non-syndromic oro-facial cleft subjects. They were questioned about their consumption of coffee –tea during first trimester and its frequency. Multiple logistic Regression for maternal coffee consumption during pregnancy shows that the odds ratio for mothers who consumed more than 3 cups was 1.84 ,1.31 and 1.23 with the confidence interval for the odds ratio was 1.46 to 1.99, 1.19 to 1.84, 1.06 to 1.45 in cleft lip, Cleft lip and palate and cleft palate group respectively. Whereas the odds ratio for tea is 1.65, 1.56, 1.33 with the confidence interval for the odds ratio being 1.28 to 1.93, 1.24 to 1.78 and 1.17 to 1.54 in CL, CLP, CP group respectively. Results from our study showed a dose dependent association between coffee and tea consumption during pregnancy and increased risk of oral cleft in their children.



***Citation***: Soumi Samuel, Rajendra Prasad, B., Suchetha Kumari *et al.* 2015. "Role of coffee and tea in the formation of Orofacial clefts", *International Journal of Current Research*, 7, (8), 19160-19163.

## INTRODUCTION

In India Coffee and Tea are one of the most commonly consumed Beverages. Caffeine which is found in tea and coffee is a central nervous stimulant and is teratogenic (Nehlig and Debry, 1994). Caffeine, a trimethylxanthine alkaloid, is readily available in coffee (containing from 85 to 110 mg/cup), tea (about 50 mg/cup) and cola beverages (30 to 45 mg/serving), as well as preservatives, analgesics and other pharmaceutical preparations (Knutti *et al*., 1982). Caffeine and its metabolites easily cross the placenta and reach fetus (Scott, 1983). Consumption of it by mother has shown to decrease fetal heart rate and placental blood flow (Kirkinen *et al*., 1983; Salvador and Koos, 1989).

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Homocysteine levels and decrease in insulin sensitivity have been observed after intake of caffeine or coffee (Ranheim and Halvorsen, 2005). Vascular disruption, increased levels of homocysteine, and oxidative stress associated with hyperglycemia are postulated mechanisms for various congenital malformations (Van Allen, 1981; Hobbs *et al*., 2005). Orofacial clefts are congenital abnormalities that comprise the phenotypes cleft lip, cleft palate, and cleft lip with cleft palate. The present study is undertaken to test the relationship of maternal tea and coffee consumption and oral cleft in Karnataka and kerala population.

## MATERIALS AND METHODS

This Study was carried out in Department of Oral and Maxillofacial Surgery, A.B. Shetty Memorial Institute of Dental Sciences. 1000 mothers of oro-facial cleft subjects coming from Karnataka –Kerala were questioned about their consumption of coffee and Tea. Only parents of non-syndromic cleft subjects were selected and 200 controls.

**Table 1. Median, Percentile and Percentage of tea and coffee consumption before and during pregnancy in cleft lip, cleft lip and palate, cleft palate and control groups**

| | CL (291) | | | CLP (531) | | | CP(178) | | | Control(200) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Median | ($25^{th}$ percentile, $75^{th}$ Percentile | % | Median | ($25^{th}$ percentile, $75^{th}$ Percentile | % | Median | ($25^{th}$ percentile, $75^{th}$ Percentile | % | Median | ($25^{th}$ percentile, $75^{th}$ Percentile | % |
| Coffee consumption- Before pregnancy | 0 | 0, 2 | 26.1 | 0 | 0 , 3 | 32 | 0 | 0,3 | 34 | 0 | 0, 4 | 39 |
| Coffee consumption –during pregnancy | 0 | 0, 2 | 24.8 | 0 | 0 , 2 | 29 | 0 | 0,2 | 32 | 0 | 0, 3 | 37 |
| Tea consumption- Before pregnancy | 3 | 0, 4 | 73.9 | 3 | 0, 4 | 65.5 | 3 | 0, 4 | 68 | 3 | 0, 4 | 72 |
| Tea consumption-During pregnancy | 2 | 0, 3 | 67.2 | 2 | 0, 3 | 64 | 2 | 0, 3 | 65 | 3 | 0,4 | 69 |

**Table 2. Odds ratio, $95^{th}$ percentile and p value for cleft patients consuming coffee and tea**

| | CL (291) | | | CLP (531) | | | CP(178) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds ratio | 95% CI | P for trend | Odds ratio | 95% CI | P for trend | Odds ratio | 95% CI | P for trend |
| Coffee before | | | | | | | | | |
| 1. 1 - 3 cup | 1.16 | 1.02, 1.2 | P=0.009 | 1 | 0.9 , 1.1 | P=0.065 | 1.01 | 0.95 , 1.08 | P=0.072 |
| 2. > 3 cup | 1.78 | 1.42, 1.92 | | 1.27 | 1.09, 1.45 | | 1.31 | 1.02, 1.57 | |
| Coffee during | | | | | | | | | |
| 1. 1 - 3 cup | 1.08 | 1.01, 1.62 | P<0.001 | 1.02 | 0.96, 1.19 | P<0.001 | 1.11 | 1.03 ,1.34 | P<0.001 |
| 2.> 3 cup | 1.84 | 1.46, 1.99 | | 1.31 | 1.19, 1.84 | | 1.23 | 1.06, 1.45 | |
| Tea Before | | | | | | | | | |
| 1. 1-3 cup | 1.18 | 1.04, 1.29 | P=0.007 | 1.11 | 1.01, 1.22 | P=0.058 | 1.08 | 0.95 , 1.22 | P=0.063 |
| 2.>3 cup | 1.72 | 1.23, 1.65 | | 1.62 | 1.34, 1.82 | | 1.23 | 1.00, 1.45 | |
| Tea | | | | | | | | | |
| 1- 3 cup | 1.2 | 1.01 , 1.57 | P=0.002 | 1.23 | 1.1, 1.62 | P<0.001 | 1.24 | 1.15, 1.32 | P<0.001 |
| >3 cup | 1.65 | 1.28, 1.93 | | 1.56 | 1.24, 1.78 | | 1.33 | 1.17 , 1.54 | |

P< 0.05 is significant

They were questioned about the demographic characteristics, reproductive history, and exposures during pregnancy (including smoking, alcohol consumption, coffee intake, medication use, and occupational and household exposures) and tea and Coffee consumed before and during first trimester of pregnancy and the frequency of consumption was also recorded. A cup of of coffee contains 150 mg per cup of coffee and tea as 60 mg. The analysis was done by using chisquare test and multiple logistics regression. A statistical package SPSS vers17.00 was used to do the analysis. The risk of delivering orofacial cleft patient was estimated by odds ratios with 95% confidence intervals in logistic regression models.

## RESULTS

The mothers of CLP was assessed for coffee and tea consumption before and during pregnancy. P value less than 0.05 is significant. Multiple logistic regression shows that the odds ratio for mothers who consumed more than 3 cups of coffee was 1.84 in CL group and the confidence interval for the odds ratio was 1.46 to 1.99.

The odds ratio for mothers who consumed more than 3 cups of coffee was 1.31 in CLP group. The confidence interval for the odds ratio was 1.19 to 1.84.

The odds ratio for mothers who consumed more than 3 cups of coffee was 1.23 in CP group. The confidence interval for the odds ratio was 1.06 to 1.45. The odds ratio for maternal consumers of tea who consumed more than 3 cups was 1.65 in CL group. The confidence interval for the odds ratio was 1.28 to 1.93.

The odds ratio for maternal consumers of tea who consumed more than 3 cups was 1.56 in CLP group. The confidence interval for the odds ratio was 1.24 to 1.78. The odds ratio for mothers who consumed more than 3 cups was 1.33 in CP group. The confidence interval for the odds ratio was 1.17 to 1.54.

## DISCUSSION

In our study tea consumption was found to be more than coffee in both case and control groups. Among 291 mothers of cleft lip patient, 73.9% consumed tea before pregnancy and 67.2% during pregnancy. Whereas coffee consumption is 26.1% and 24.8% before and during pregnancy respectively in mothers of cleft lip patient. Tea consumption in cleft lip and palate is 64% and 65 % in cleft palate during pregnancy. However coffee consumption is 29% in cleft lip and palate and 32% in cleft palate during pregnancy. Coffee and tea contains caffeine with antioxidant being more in coffee. Evidence suggests that maternal hyperhomocysteinemia may be linked to increased risk of CLP (Verkleij-Hagoort *et al*., 2007). Caffeine intake increases the plasma concentration of homocysteine (Grubben *et al*., 2000; Refsum *et al*., 2006; Urgert *et al*., 2000), as does smoking (Refsum *et al*., 2006), a well-established risk factor for CLP (Urgert and 2000).

Few epidemiological investigations have reported an association between coffee and tea consumption and defective pregnancy outcome (Mau *et al*., 1974; Borlee *et al*., 1978; Weathersbee and Lodge, 1979). Daily intake of more than 3 cups of tea have odds ratio 1.65(95%CI: 1.28, 1.93) for cleft lip, 1.56(95%CI: 1.24, 1.78) for cleft lip and palate and 1.33 (95%CI: 1.17, 1.54) for cleft palate and inspection of categories of tea intake confirmed that there was a trend in risk by dose (P trend < 0.001). Contrary to our studies, caffeine containing tea had shown reduced risk of clefts due to increase antioxidant (Mukhtar and Ahmad, 2000), but antioxidant is in higher quantity in coffee than tea (Halvorsen *et al*., 2006). In our study coffee consumption before pregnancy had shown no association with the development of cleft lip and palate. Coffee consumption during pregnancy has strong relation with the development of cleft lip with or without palate and cleft palate. 1-3 cups of coffee per day during pregnancy has odds ratio of 1.08 and for more than 3 cups, it is increased to 1.84 in mothers of cleft lip patients. We found a significant association between coffee intake and cleft lip with or without palate which is in accordance to Rosenberg (Rosenberg *et al*., 1982) and Macdonald (McDonald *et al*., 1987). According to McDonald *et al*., more than 3 cups of coffee daily resulted in an adjusted odds ratio of 1.4 (95% CI: 0.7, 2.7). In contrary to our studies, Kurppa *et al*. (1983) found no significant relation between coffee intake and oral clefts. In the report by Kurppa *et al*., drinking more than 4 cups of coffee a day had no association with risk of clefts (unadjusted odds ratio ¼ 1.0, 95% CI: 0.6, 1.6).

To summarize, our study has shown the association between maternal consumption of coffee and tea during the developmental stage of the child**.** There is no significant relation between Tea and coffee consumption before pregnancy and cleft lip with or without palate in this study.

We had found a dose dependent relationship between coffee and tea consumption during pregnancy and increased risk of oral cleft in the delivering offspring. Thus it could not be assured that maternal tea or coffee consumption is safe for developing foetus. Further studies should be carried out to know the actual mechanism and association of tea and coffee with clefts.

**Acknowledgements**

Dr. Vikram Shetty – Director – Department of Craniofacial

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