

Usage of Potential Teratogenic Chemical Preparations among Mothers of Children Attending the Multidisciplinary Cleft Clinic at the Komfo Anokye Teaching Hospital, Ghana

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ABSTRACT

Objective: The purpose of this study is to determine the usage of potential teratogenic chemicals among cleft lip and palate mothers attending a multidisciplinary cleft clinic at Komfo Anokye Teaching Hospital (KATH). **Method:** This is a retrospective study based on records of consecutive patients attending the multidisciplinary cleft clinic at KATH. Mothers of children with cleft lip and palate formed the study sample. Information on the use of chemical agents by the mothers either before or during the first three months of pregnancy was collected on to a specially designed form. The study period was from January 2006 to December 2012. **Setting:** The study was carried out in a multidisciplinary cleft clinic at Komfo Anokye Teaching Hospital in Ghana. The clinic is the main referral centre for the northern sector of Ghana for cleft lip and palate care. **Results:** Chemical preparations usage ranged from 0.2% for tobacco to 25.3% for skin lightening creams. Other agents used include, enema, non-proprietary concoctions and prednisolone tablets. 2.1% of the mothers ingested alcohol during pregnancy. **Conclusion:** There is a high level of usage of potentially teratogenic chemicals among cleft mothers attending the multidisciplinary cleft lip and palate clinic at the Komfo Anokye Teaching Hospital in Ghana. Further studies are, however, required to clarify any relationship this may have with the development of orofacial clefts.

KEYWORDS

Cleft; Lip; Palate; Chemical; Teratogenic

1. Introduction

Cleft lip and palate (CLP) affects approximately 1/700 live births, with wide variability across geographic origin, racial and ethnic groups, as well as environmental exposures and socioeconomic status. In general, the highest reported birth prevalence rates are among Asian and Amerindian populations, often as high as 1/500, European-derived populations have intermediate prevalence rates at about 1/1000, and African-derived populations

have the lowest prevalence rates at about 1/2500. These observations indicate the relative contribution of individual susceptibility genes may vary across different populations [1,2].

Traditionally, CLP has been divided into cleft palate only and cleft lip with or without cleft palate (CLP). However, recent epidemiologic studies suggest that cleft lip only may have unique etiologic features, including strong genetic associations, while some individuals with cleft palate only show evidence of sub-clinical cleft lip [3-5].

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Available evidence indicates that both genes and environmental factors, acting either independently or in combination, are responsible for facial clefting. Non-genetic risk factors implicated in cleft lip and palate include folic acid deficiency, use of anti-epileptic drugs, and maternal alcohol or cigarette use during pregnancy.

A lot of effort has also been concentrated on identifying the genetic contribution to clefting.

The high familial prevalence rates, recurrence risks and elevated concordance rates in monozygous versus dizygous twins provide evidence for a strong genetic component in CLP. Despite this, familial inheritance is complex and simple Mendelian inheritance is considered uncommon.

Maternal smoking has been associated with increased risk of CLP and meta-analysis strongly supports an overall odds ratio for having CLP of approximately 1.3 among offspring of mothers who smoke [6,7]. Maternal smoking exposure during the peri-conceptual period is a major risk factor and raises the possibility that genes in certain metabolic pathways may play a role in the development of CLP. Specifically, markers in the *GSTT1* (glutathione S-transferase theta) or *NOS3* (nitric oxide synthase) genes appear to influence risk of CLP in the presence of maternal smoking [6,7]. The *GSTT1* markers are a known gene deletion variant, which suggests deficiencies in detoxification pathways may underlie some of this susceptibility. Parents' occupation usually determines their exposure to many potentially environmental risk factors. Many studies have shown if mothers come in contact with certain chemicals, and this can increase the risk of cleft lip and palate in the child. Aliphatic aldehydes, ethyl ether, aliphatic acids, trichloroethylene and pesticides can increase risk of CLP [8,9].

Maternal alcohol consumption has also been suggested as a risk factor, but the evidence has been inconclusive [10]. Studies suggest that high doses of alcohol in short periods of time increase risk [11,12], and this is supported by associations with variation in the *ADH1C* alcohol dehydrogenase gene [13].

Nutritional factors, such as folate deficiency, have also been suggested to increase the risk of CLP, based on both observational studies and interventional trials using folate supplementation to prevent recurrences of CLP in families [14]. Studies of vitamin supplementation with folate remain controversial [3,15] and recent studies of levels of folate receptor antibodies did not find any significant association with CLP [16]. Furthermore, food fortification programs using folic acid have shown detectable decreases in the rates of clefting in some studies [17,14]. Besides nutrients and toxins, other environmental exposures have been implicated for their possible roles in clefting. These exposures include hyperthermia,

stress, maternal obesity, occupational exposures, ionizing radiation and infection. A study by Donkor *et al.* [18] in Ghana showed that cleft lip and palate was associated with low maternal income.

It is common knowledge that women of child-bearing age in Ghana are exposed to a variety of chemical preparations which are either applied topically or ingested systemically for a variety of reasons. These chemicals include contraceptives prescribed for the prevention of pregnancy. Other chemicals which are usually not prescribed include alcohol, skin lightening creams, enemas for a host of indications, prednisolone tablets for weight gain, and concoctions for self-induced abortion. The effect of these chemical preparations on the developing fetus is unknown. The purpose of this study is to determine the level of usage of chemical agents by mothers and orofacial clefting in their offspring.

2. Methodology/Statistics

This is a retrospective study based on records of consecutive patients attending the multidisciplinary cleft clinic at KATH. Relevant information relating to the use of chemical agents by the mothers of the children with cleft lip and palate before and during the pregnancy was extracted from the medical records of the patients on to specially designed data collection forms. The study period was from January 2006 to December 2012. Data were entered into a Microsoft Excel spreadsheet, cleaned and analysed. Analysis was conducted using SPSS for windows V 170 (Chicago). Frequencies and descriptive statistics were calculated for all variables.

3. Results

A total of 1368 records were studied. The mean age of the mothers was 28 years with a range of 14 to 43 years. The majority of them were unemployed (**Table 1**). Only

Table 1. Occupation of mothers with cleft children.

Occupation	Percentage
None	27.3
Petty trading	18.0
Apprenticeship	17.3
Farming	15.7
Seamstress	12.3
Hairdresser	7.3
Teacher	1.3
Lawyer	0.3
Others	0.5

12.4% of the mothers attended antenatal clinic during pregnancy. Ten (10) of the mothers had a positive family history of orofacial clefting. Out of these, four (4) mothers had a cleft lip and palate deformity, three of whom also had more than one child with cleft. Chemical preparations most commonly used by the mothers were in the form of skin lightening creams, enema, non-proprietary concoctions for inducing abortion, and prednisolone tablets (Table 2). Only 2.1% of the mothers ingested alcohol during pregnancy.

4. Discussion

As a general model, it is thought that both genes and environmental factors, acting either independently or in combination, are responsible for facial clefting. In this current study 27.3% of mothers were unemployed and about 70.6% were involved in low income jobs like hair dressing, farming, apprenticeship and seamstress (Table 1). In a related study by Donkor *et al.* [19] at KATH, it was evident that CLP affected mostly mothers with low educational background and low socioeconomic status. This was corroborated by this study. Other worldwide studies [20,21] have also reported similar findings. The reason for this observation could be due to the fact people in Ghana with low educational background may also be handicapped in knowledge of maternal and reproductive health. This coupled with low socioeconomic status can affect mother's ability to access and afford health care.

Another concern which needs mention among our farming mothers which form 15.7% of the study population, is the increase indiscriminate usage of agro-chemical especially from vegetable and cocoa farmers. These high carbon compounds made up of aliphatic aldehydes, ethyl ether, aliphatic acids, trichloroethylene and pesticides can increase risk of CLP. More studies will be needed to know about how much these chemicals contribute to orofacial clefting among our farming folks.

Table 2. Chemical usage among mothers of cleft children.

Chemical type	Percentage
None	24.0
Skin lightening cream	25.3
Local enema	20.5
Contraceptive	5.2
Prednisolones	12.2
Chemical usage in self-induced abortion	10.5
Alcohol	2.1
Tobacco/smoke	0.2

The usage of skin lightening cream accounted for the highest (25.3%) potential teratogenic chemical used by cleft mothers. The observation that the use of skin lightening creams is widespread is due to the fact that, fair-skinned women in Ghana are considered to be beautiful which thus encourages the use of skin bleaching creams some of which contain high concentrations of mercury and steroid.

The use of local enema which contains mostly local herbs to cure all forms of ailments including waist pain and constipation is also very common in Ghana and accounted for 20.5% of chemical agents used by mothers. The enema concoction may also contain steroids which could be a potential teratogenic.

Another interesting observation among Ghanaian women is the use of an over-the-counter prednisolone tablet that is locally called "P" (Table 2) to gain weight, which is considered a sign of good living which accounted for 12.2%. Steroid usage is a known risk factor in the development of orofacial cleft. In this case if its usage is not directed by a qualified practitioner, then the user is even at a higher risk of developing orofacial cleft.

The role self-induced abortion with chemical concoctions in orofacial cleft formation is not known. It is, however, conceivable that all these chemicals could either directly induce genetic mutations or work in concert with genetic predisposition to cause cleft lip and palate.

Alcohol and tobacco usage accounted for 2.1% and 0.2% respectively. These are known risk factors to the development of orofacial clefts [22]. In Ghana, the use of tobacco by women has negative cultural connotation and this could mean the actual usage is likely to be higher than what is stated. Again, apart from tobacco smoking in the form of cigarette, some also use raw tobacco leaves which has been softened by heat under their tongue for recreational purposes.

The use of birth control pills and injectables accounted for 5.2%. This is also a known risk factor.

There was also low usage of antenatal care among the mothers which implies that they may not have benefited from the cleft potential protection offered by folic acid from development of cleft lip and palate. As observed by Donkor *et al.* [19], mothers from a low socioeconomic background are likely to be malnourished, and coupled with the high usage of self-administered and potentially teratogenic chemical preparations, are at an increased risk of giving birth to children with cleft lip and palate deformity.

5. Conclusion

There is a high usage of potentially teratogenic chemicals among cleft mothers attending multidisciplinary cleft lip and palate clinic at the Komfo Anokye Teaching Hospi-

tal in Ghana. For this reason, there is the need for public education of women of child bearing age against misuse of chemical preparations. Health practioners should also lead the nationwide campaign for free folic acid utilization among women of child bearing age to reduce the prevalence of CLP in our society.

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