

# Childhood stress in medieval Portugal: Dental Enamel Hypoplasia in a sample from Coimbra and possible aetiologies

Liliana Matias de Carvalho<sup>1</sup> and Sofia N. Wasterlain<sup>2</sup>

<sup>1</sup>Centro de Investigação em Antropologia e Saúde, Department of Life Sciences, University of Coimbra (liliana\_m\_carvalho@yahoo.com.br)

<sup>2</sup>Centro de Investigação em Antropologia e Saúde, Department of Life Sciences, University of Coimbra (sofiawas@antrop.uc.pt)

## Introduction

Dental enamel hypoplasia (DEH) is a defect affecting the enamel (usually the buccal or labial surfaces) occurring when there is an interruption or disturbance over a band of ameloblasts in the developmental phase of the dental crown (Goodman and Armelagos, 1985). It records the physiological stress that occurred between the 5th month of intra-uterine life and 12/13 years of age. There are several causes and sometimes they can relate to each other: diet, disease, altitude, climate, genetics and socioeconomic factors (Hillson, 2005). Usually the anterior dentition (especially the upper central incisors and the lower canines) is more hypoplastic than the posterior (Lukacs, 1989).

## Objectives

- 1) To know the expression of DEH in a medieval Portuguese sample and what their possible causes.
- 2) To understand the frequency of DEH by sex and age group.
- 3) To realize what types of defects and which locations are more common.

## Material and Methods

### Sample:

We have studied 58 adult individuals (28 males, 20 females, 10 of unknown sex) divided into three age classes (young adults, adults and old adults) from the medieval/modern (12<sup>th</sup>-16<sup>th</sup> centuries) burial ground of *São João de Almedina* (Coimbra, Portugal). The analysed sample can be described as belonging to an urban middle class population who lived inside the walls of the city.

### Methodology

Since this study was part of a larger investigation on medieval dental pathology, Hillson (2001) recommendations were followed. All present teeth were observed under a strong direct light with the help of a magnifying glass. Localized horizontal enamel depressions on the labial surface of the teeth were classified as one of the three types of hypoplasia (groove, pit or plane). The location of each defect (cervical, contact region or occlusal) was also recorded. The data regarding the age of the defects' formation were assessed by Cunha (1994).



Figure 1 - DEH observed on the individual number 8 (30-40 years; male)

## Results

Thirty four individuals (58.6 %) and 180 (33%) teeth were affected by DEH. Grooves were the most common type of defect (31.4%, n 171), involving mostly the cervical crown (23%, n 122). Canines (53.2%, n 41) and premolars (1<sup>st</sup> - 48.1%, n 39; 2<sup>nd</sup> - 28.9%, n 22) were the most affected teeth. Groove defects occurred more often on upper teeth (36.3 %, n 73), women (37.6%, n 58) and young adults (38.8%, n 45).

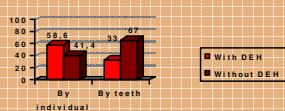


Figure 2 - Percentage of individuals and teeth with DEH

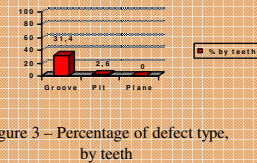


Figure 3 - Percentage of defect type, by tooth

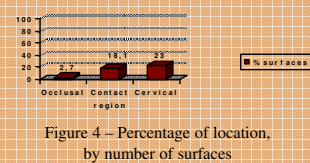


Figure 4 - Percentage of location, by number of surfaces

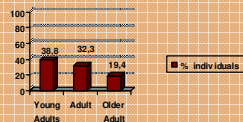


Figure 5 - Percentage of individuals with DEH, by age class

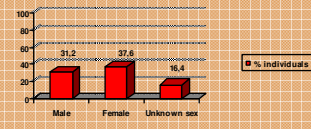


Figure 6 - Percentage of individuals with DEH, by sex

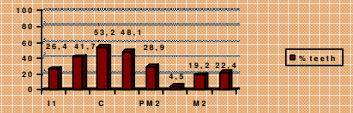


Figure 7 - Percentage of teeth with DEH, by type of teeth

## Discussion

DEH affect about 58.6% of the individuals and 33% of the observed teeth. There is an average of 5.4 defects per individual. It can be said that more than half of the analyzed sample – a middle class group – has suffered some period of stress during childhood or adolescence. The majority of the individuals (79.4%) with this condition had more than one tooth affected and most of the defects were located in the cervical region (23%). The most common defect was the groove. The defect type pit was rare and no plane defect was found. The groove type defects reach 31.4% of the observed teeth and the canine is the more affected tooth (53.2%). By opposition, the least affected teeth were the molars. There seems to be an inverse relationship with age, i.e., the number of defects decreases as the age group increases, which can be related to the action of wear which eliminates the dental crown and together the traces of the stress episodes. In the *São João de Almedina* sample women were more affected by DEH. This could be related to a greater vulnerability of females, differential parenting, or diet in comparison to the boys. Boys could also have had more physically demanding activities (scare away birds from crops, help lifting objects, be apprentices) and therefore receiving a more substantial diet than girls who usually stayed at home to help their mothers in small tasks (Oliveira, 2010). The first cause to the DEH could be weaning children without them to be physiologically prepared or with no suitable replacement diet. Such practices would probably result in malnutrition. The replacement foods in medieval times- flour porridge, semi-liquid foods at first - mashed bread crumbs, honey, milk and a little wine in a second moment – were not satisfactory. The breast milk replaced by goat's or sheep's milk could also create multiple intestinal or nutrient absorption problems (Oliveira, 2010). All these replacement practices are mentioned in the Portuguese medieval literature. Apart from the diet itself, a non-consolidated dentition could also have made it difficult to chew more solid foods (Oliveira, 2010). Cunha (1994), who has studied the same skeletal material, found that in 51.9% of the individuals with DEH the physiological stress had occurred between 4 and 6.5 years of age. This could mean a late weaning or another stress cause: continuous nutritional needs, disease or lack of hygiene. This could also contribute to the invisibility of children in the Portuguese medieval society.

## Conclusion

More than half of the analyzed sample was affected by hypoplasia revealing episodes of stress occurring during childhood. A decrease in groove type defects was observed with age, maybe because of the increasing wear rates. There was a tendency for more defects in the upper jaw. The most hypoplastic tooth in this population was the canine. Data suggests a slightly different diet between the sexes. Children may have undergone nutritional difficulties (perhaps around the time of weaning) but it is difficult to reach a definite conclusion about the causes in archeological material. The results should be, to the possible extent, confronted with historical data.

## Acknowledgments

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