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# The prevalence and distribution of dental caries in four early medieval non-adult populations of different socioeconomic status from Central Europe

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ABSTRACT

*Objectives:* The aim of the study was to map the dental health status in non-adult individuals and to verify whether and how the existence of caries in the non-adult age group is associated with the different socio-economic status of early medieval populations.
*Material and methods:* We studied the dental remains from the acropolis of the Mikulčice settlement agglomeration, where members of the higher social classes were buried, and from the Mikulčice hinterland. Overall, we evaluated 2544 teeth/3714 alveoli of deciduous dentition and 1938 teeth/2128 alveoli of permanent dentition. We determined the number of individuals with dental caries (i.e., caries frequency index, F-CE) and the proportion of teeth/alveoli with caries/ante-mortem tooth loss (i.e., caries intensity index, I-CE).
*Results:* We found no statistical significant difference in the F-CE values between the Mikulčice hinterland and the acropolis. In addition, we found no statistically significant difference in the proportion of teeth with carious lesions (I-CE) either in the case of deciduous dentition or in the case of permanent dentition between the hinterland and the acropolis. In the case of permanent dentition, the statistically significant highest proportion of carious lesions (I-CE) was found in Mikulčice I ($p \leq 0.05$). We confirmed an increase in the rate of caries with age.
*Conclusions:* The level of caries at all of the studied medieval locations was very low. We presume that lifestyle and the associated dietary habits and hygienic practices of the individuals or population groups had a greater influence on dental caries than did the socio-economic status of these individuals.



## 1. Introduction

Dental diseases represent a valuable source of information regarding the lifestyle,[1] social status,[2–4] diet and nutrition of past populations.[5–7] The structure and composition of dental components ensure the teeth's higher resistance to the effects of taphonomic factors and post-mortem damage. In contrast to bones, teeth are more often preserved undamaged, in their original state.[8,9]

Most researchers have studied dentition only in adult populations.[2–4,6,7,9] Increased interest in the course of

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ontogenesis of past populations has led to a rise in the number of studies based on non-adult individuals over the past two decades.[10,11] In children, teeth are an especially important source of information; the preservation of their skeletons is often worse than in the case of adults due to their gracile structure, excavation techniques and the manner of their burial, reflecting the cultural customs of past populations.[12,13] The importance of deciduous teeth as a source of information is supported by a number of works that studied the dental health of deciduous teeth in relation to the diet or social status of past populations.[14–17] Maternal milk represents a safe, hygienic and nutritionally balanced diet for very young children and it promotes the development of the child's immune system.[18] A milk-based diet is associated with a lower incidence of caries.[19,20] Weaning and the transition to solid foods represent a risk for the child, due not only to potential nutritional stress or the ingestion of pathogens from contaminated food but also to a higher probability of developing caries.[21,22] Saccharides, especially sucrose, fructose and glucose, play a key role in the development of caries in early childhood. These are present in honey and various sweets.[23,24] The development of caries during the first years of a child's life is influenced by living conditions, dietary habits, hygienic practices and overall care for dentition.[25] The research in recent populations has shown that one of the risk groups is children coming from families of a lower standard of living; in these children, poor hygiene practices have been proven.[26] Other groups include children whose mothers had a genetic predisposition for dental caries occurrence or children suffering from diseases accompanied by a higher predisposition for caries occurrence (e.g., calcium absorption disorder).[27] In addition, there are many possible causes that can lead to enamel development anomalies (e.g. inborn syphilis, endocrine and metabolic diseases and malnutrition).[24] Hypoplastic defects then occur on the teeth, the enamel is thinner and the decay more easily affects the dentition leading to caries.[25,28]

In this study, we evaluate the dental health status, expression and distribution of caries in non-adult individuals from several early medieval populations of different socio-economic origin, living in the same region. The archaeological research at the Great Moravian burial grounds in south Moravia (Czech Republic) has been going on for >50 years, now conducted by the Institute of Archaeology of Academy of Sciences of the Czech Republic in Brno. This research has provided an enormous amount of source material. It includes material from hundreds, exceptionally even thousands, of graves explored at Mikulčice and in the stronghold hinterland. In our study, the human skeletal remains originated from four burial grounds: (a) two 'urban-type' burial grounds from Mikulčice, the power centre of the Great Moravian Empire (Mikulčice I with 82 evaluated individuals and Mikulčice II with 168 evaluated individuals), and (b) two rural burial grounds from the hinterland of the Mikulčice settlement agglomeration (Josefov with 59 evaluated individuals and Prušánky I with 111 evaluated individuals).

The term Great Moravia denotes the West Slavic territorial and political entity existing in the 9th and at the beginning of the 10th centuries to the north of the Middle Danube area. The centre of this state was situated in the area of Moravia (part of today's Czech Republic), Western Slovakia and Lower Austria.[29] Mikulčice was one of the leading Great Moravian centres (Fig. 1). We distinguish between 'urban' burial sites situated in the main (fortified) centres and 'rural' sites spread across the hinterland (Figs. 2–6). Grave finds from the centre demonstrate especially burials of members of higher social strata, whereas the population buried at the rural cemeteries can be considered as part of the middle and lower classes of the Great Moravian society.[30,31]

When defining our aims, we drew from our previous study,[4] which compared the incidence of caries in the adult inhabitants of the Mikulčice centre and its hinterland. The results of that study indicated that socially differentiated


**Fig. 1 – Early medieval Central European sites evaluated. (Edited by P. Stránská according to the images available under licence Creative Commons—Author: Petr Graclík and Wikimedia Commons—Author: David Liuzzo.)**