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DENTAL HEALTH AND DIET IN THE MIDDLE AND LATE NEOLITHIC (4900–3400 BC): A STUDY OF SELECTED MICROREGIONS IN THE CZECH REPUBLIC

ABSTRACT: The aim of the paper is to evaluate selected dental characteristics during the Middle and Late Neolithic in the area of today's Czech Republic and extending into Lower Austria. Dental caries, antemortem tooth loss, dental wear and periodontal disease provided us with valuable information about dental health. With the help of dental microwear analysis, we were able to evaluate complementary evidence to reconstruct dietary patterns and gain insights into diet evolution of established farmers and herders. The analysed sample was divided into two newly proposed long chronological phases which are derived from frequency occurrence of C14 data as a population proxy: Neolithic B (4900–4000 BC) and Neolithic C (3800–3400 BC). The obtained data were compared with LBK (Neolithic A) and Final Neolithic samples to provide the actual picture of dental characteristics in Neolithic. As observed, the incidence of tooth decay tended to decrease during the Neolithic period in the studied area, while the ratio of the meat component in the diet tended to increase. However, the changes during the post-LBK period did not have a uniform character, as it might seem at first glance; there was high variability in the studied area caused not only by socio-economic changes in society, but these changes seem to reflect the approach to the food consumed. This variability was probably influenced by the chronological and geographical context as well.

KEY WORDS: Neolithic diet – Dental caries – Antemortem tooth loss – Dental wear – Periodontitis – Buccal dental microwear – Post-LBK period – Funnelbeakers – Czech Republic – Lower Austria

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1. INTRODUCTION

The Early Neolithic period (LBK) is characterised by the introduction of an agropastoral life way, which occurred rapidly in central Europe around 5400 BC. The new phenomena are represented in the archaeological record by traces of grain cultivation, the breeding of cattle, manufacture of pottery and polished stone tools and the construction of longhouses (for details, see e.g. Bickle 2016). Post-LBK populations, with the gradual development of the established agropastoral subsistence practices, are not as well researched. One of the main aims of this article is to try to describe the possible interactions of individual populations in a defined geographical and time frame in terms of dental characteristics, which could reflect the changes in behaviour and diet of the societies of the post-LBK period. In other words, with the help of the main characteristics of dentitions, i.e. caries, dental macro- and microwear and periodontitis, we would like to reconstruct the aspects of foods being consumed, focus on the health status of individuals and compare these data with chronologically and geographically analogous series.

Dental caries (caries dentis) can be defined in terms of etiopathogenesis as a microbial disease of calcified dental tissues characterised by the demineralisation of inorganic and destruction of organic components of dental tissues (Crawford 2002). Advanced caries can lead to a loss in the vitality of dental pulp and finally to tooth loss, or eventually to other pathological processes (Kilian *et al.* 1999). The emergence of caries depends on the susceptibility of dental tissues (constitutional and genetic factors, sex, age), the composition of oral microflora (dental plaque microorganisms are cariogenic), nutrition factors and time, i.e. the frequency and duration of interaction, which is also closely related to oral hygiene (Kilian *et al.* 1999). The dependence of dental cariosity on the composition of food in historical populations has been treated by many authors (e.g. Lillie 1996, 2008, Frayer 2004, Bertilsson *et al.* 2022 etc.). In general, Palaeolithic and Mesolithic populations show the lowest caries rates; in Early Neolithic populations that began to settle down and change over to an agricultural way of life, cariosity gradually increased. This was connected with a transition to another type of food, which, in contrast to preceding periods, contained more sugar, and was also more prepared and relieved of undesirable ingredients, whereby the roughage content in food was gradually reduced (e.g. Lillie 1996, Frayer 2004, Bertilsson *et al.* 2022).

Dental wear is the loss of dental surface caused by external mechanical forces, above all in connection with food. The degree of dental wear depends not only on the coarseness of particles but also on the condition of dental surfaces because particles stick easier to a roughened surface than to a smooth one (Mair *et al.* 1996, Mair 1999). Furthermore, there is also peculiar wear concentrated on one single tooth or a group of teeth. This type of wear is mostly caused by objects coming in contact with teeth, and we designate these processes cumulatively as professional influences.

Periodontal diseases are infectious, chronic inflammatory diseases that result both in the loss of alveolar bone and the destruction of connective tissue in periodontal regions. The bone resorption is triggered through immune responses and results from inflammatory reactions directed against periodontopathic bacteria. The periodontal lesion has been defined as a generalised horizontal loss of crestal bone resulting from host immune and inflammatory responses caused by the action of commensal bacteria, and the extension of gingivitis into the deeper periodontium to become periodontitis has been assumed to occur slowly but steadily over many years (Clarke *et al.* 1986).

To analyse the composition of the ingested food and consumption behaviour in bioarchaeological populations, we used microscopic analysis of tooth enamel because dietary trends can be reconstructed by quantifying enamel microwear patterns. Proven findings show that there is a tendency for fewer striations (NT = total number of all striations) and a higher frequency of vertical striations (NV, NV/NT) on the buccal dental surfaces in meat eaters as opposed to individuals with vegetarian diets (Lalueza *et al.* 1996). The high incidence of abrasive particles in plant foods (phytoliths) results in higher scratch densities (NT) and an increasingly horizontally-oriented (NH), vestibular microwear pattern in agricultural populations (Lalueza *et al*. 1996). The buccal dental microwear reflects the ingested food of examined individuals within a period of approximately a few months before death (depending on the abrasiveness of diets) (see the "turnover effect" stability of buccal microwear patterns in Romero *et al.* 2012).

2. MATERIALS

From a total number of 171 examined individuals dated to the Neolithic B and C periods, dental health characteristics were possible to evaluate in 141 individuals, 88 of which were adults (over 15 years of age) and 53 non-adults. In buccal dental microwear analysis, 113 individuals (74 adults and 39 non-adults) with an estimated age of over two years with well-preserved tooth enamel were included. To capture the geographical variability, we divided the study sample into three geographical units: central Bohemia, central Moravia and southern Moravia, focusing on the eleven microregions with the largest accumulation of buried individuals. The criterion for the selection of a site for detailed analysis was the presence of at least four individuals over 15 years of age with the dentition present. The term microregion is used in this study for several sites, clusters of sites or a microregion belonging to the same chronological period. The studied microregions were: Kolín and Pečky in central Bohemia (Beran-Cimbůrková 2016a, b, Brzobohatá, Likovský 2012), Přerov, Prostějov and Ivanovice na Hané in central Moravia (Šmíd 2011, Trampota *et al.* 2021, Drozdová 2011), Těšetice-Kyjovice, Dambořice, Modřice, Brno – Nový Lískovec and Podivín in southern Moravia, and Friebritz in Lower Austria (see Šmíd *et al.* 2018, 2021a,b, Dočkalová, Čižmář 2008, Neugebauer-Maresch *et al.* 2001).

The following comparative samples for dental health characteristics and buccal microwear analysis were used: 73 individuals belonging to the Linear Pottery culture (LBK 5400–4900 BC) representing individuals buried at settlements localised mainly in southern and central Moravia (Jarošová, Dočkalová 2008), and 162 individuals belonging to the LBK sample of the burial ground from Vedrovice (southern Moravia) and Nitra – Horné Krškany (western Slovakia) analysed by Frayer (2004) and Jarošová, Tvrdý (2017). Additionally, selected comparative data from a study conducted at the Vedrovice cemetery by Lillie (2008: 145–146) were used. In our terms, all of these series are linked to the Neolithic A period (5400–4900 BC; Early Neolithic).

As a supplementary comparative sample to terminate the timeline, the population from Hoštice I (central Moravia; 2470–2160 BC), including 123 individuals and belonging to the Bell Beaker culture, i.e. the Final Neolithic (Jarošová 2012a, b), was used. All comparative samples come from the Czech Republic (except for Horné Krškany near Nitra in Slovakia). For detailed radiocarbon data, please see Drtikolová Kaupová *et al.* (in preparation), Trampota, Pajdla 2022, Trampota, Květina 2020, Trampota *et al.* 2021, and Tkáč, Kolář 2021.

3. METHODS

The traditional chronological division of prehistory, which is based on so-called archaeological cultures (or symbolic systems), is suitable namely for studying the dynamics of symbolic systems. In contrast, the topic studied here is a reflection of dietary habits or, more generally, lifestyle. For the chronological classification of the period being studied, we turn to the frequency of occurrence of radiocarbon data from anthropogenic contexts in two separately occupied regions: the Morava River catchment and Bohemia in the area of today's Czech Republic, extending into Lower Austria (*Figure 1*). For the analysis of all available data, we used OxCal software (Bronk Ramsey 2009) working with a summed probability distribution (SPD), which is interpreted using kernel density estimation (KDE; Bronk Ramsey 2017). The result of the analysis of radiocarbon dates (*Figure 2*) in the Morava River catchment is three peaks representing three periods associated with significant concentrations of human activity. We call these periods Neolithic A, Neolithic B, and Neolithic C. Neolithic A (5400–4900 BC, Early Neolithic) is related to the LBK and is not the subject of this study, but we will use it as a comparative sample. Neolithic B (in a broader context known as the Middle Neolithic) includes the Stroked Pottery, Lengyel and Jordanów/Epi-Lengyel cultures (4900–4000 BC), and Neolithic C (in a broader context known as the Late Neolithic) corresponds to the Funnelbeaker and the Retz-type pottery traditions (3800–3400 BC) (Pajdla, Trampota 2021, Trampota, Květina 2020, Trampota *et al.* 2021). In Bohemia, SPD and KDE models are loaded by strong data biases and we do not use the model for understanding the dynamics of human activities. For the chronological division of the Neolithic (Early, Middle, Late, Final), we use classification commensurate with those of German-speaking countries. By using the terms Neolithic B and C, we also avoided the issue of the different periodisation and occurrence of archaeological cultures in Bohemia and Moravia (e.g. SBK was mainly found in Bohemia, while LgK in the area of Moravia).

The basic demographic categories (age-at-death and sex) were estimated following the recommendations of Buikstra and Ubelaker (1994) by all authors of this article (with exception of F. Trampota, who was responsible for the archaeological part of this study). Zdeněk Tvrdý performed a final cross-checking of all age-at-death and sex determined. The analysed anthropological sample included individuals with both deciduous and permanent teeth. Non-adults with mixed dentitions were included in the non-adult sample (0–14 years) and treated separately. Juveniles were also included in the group of adults, and this group was further divided into four subcategories: 15–19 yrs, 20–35 yrs, 35–50 yrs and over 50 yrs. For the purpose of this work, our understanding of the term "adult" is therefore based on a consideration of an individual as an adult primarily in terms of social rather than biological status.

The state of preservation of teeth and jaws was assessed using two indices – the comparative alveolar index (CAI) and the comparative dental index (CDI). CAI is characterised as the relationship between the number of preserved alveoli and the number of all burials multiplied by 32 [CAI = A/(n × 32)], and CDI

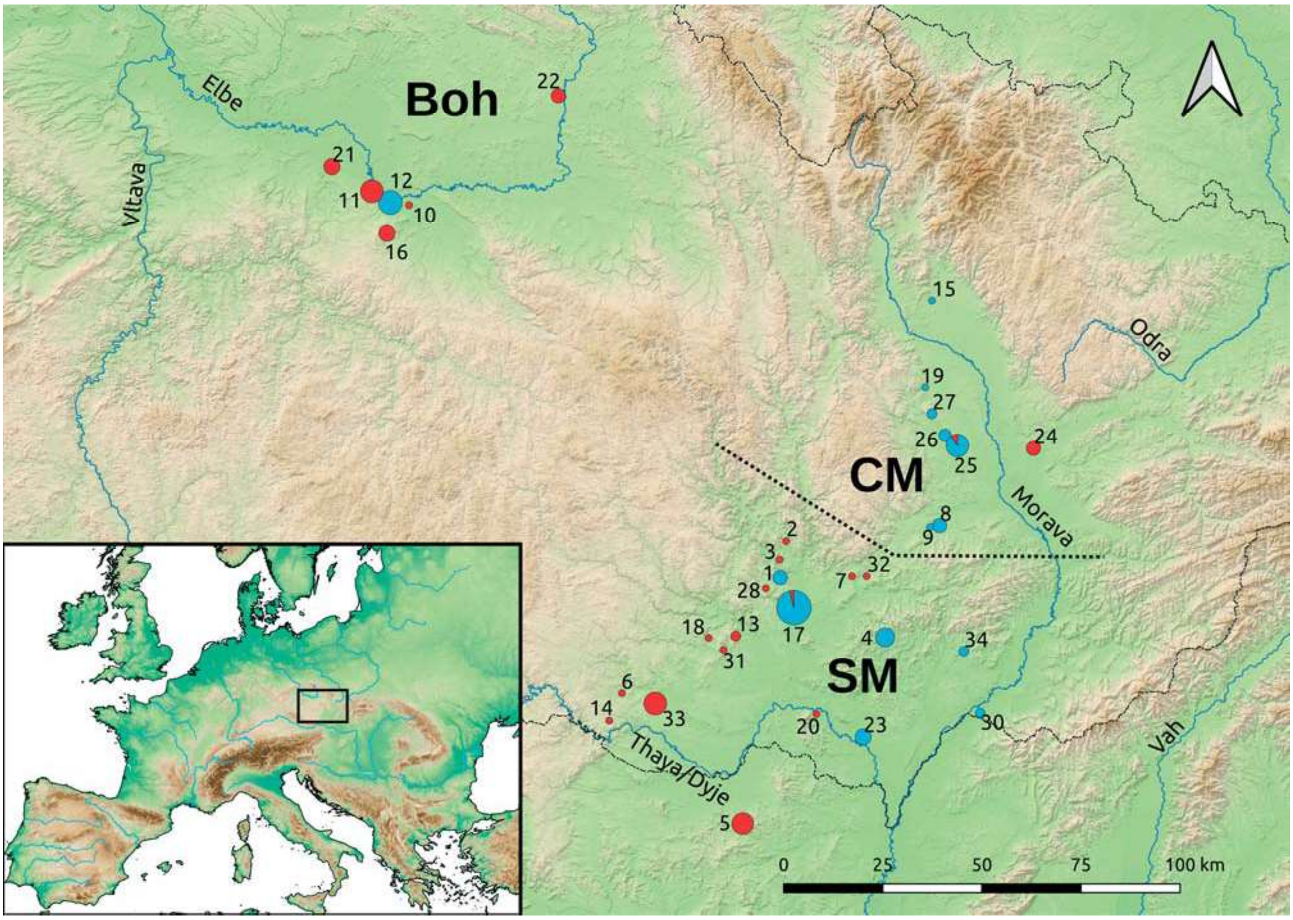


FIGURE 1: Overview of studied sites in the Czech Republic: 1 Brno - Nový Lískovec – Kamínky st., 2 Brno-Ivanovice – Na dílech, 3 Brno-Komín – Nivy, 4 Dambořice-Spálený, 5 Friebritz-Süd (Lower Austria), 6 Hluboké Mašůvky – Panská cihelna, 7 Holubice, 8 Ivanovice na Hané - Za střediskem, 9 Ivanovice na Hané – Padělky za cihelnou, 10 Kolín – návrší u kostela Všech svatých, 11 Kolín – obchvat, 12 Kolín-Šťáralka, 13 Moravský Krumlov – Krumlovský les, 14 Mašovice – Pšeničné, 15 Medlov – U pískoviště, 16 Miskovice – Velký Patera, 17 Modřice – Rybníky, 18 Moravský Krumlov, 19 Náměšť na Hané – Za hřbitovem, 20 Pavlov – Horní pole, 21 Pečky – Kandie, 22 Plotiště nad Labem – Součkova cihelna, 23 Podivín – Rybáře, 24 Přerov-Předmostí – Široký, 25 Prostějov-Čechůvky – Kopaniny, 26 Prostějov-Držovice – U hřbitova, 27 Slatinky – Kosíř, 28 Střelice u Brna – Prostřední trať, 29 Sudoměřice – Horní chmelnice, 30 Těšetice-Kyjovice – Sutny, 31 Vedrovice – Široká u lesa, 32 Velešovice – Padělky, 33 Žádovice – Dolní újezd. Regions: Boh – Bohemia (site 22 is located in eastern Bohemia, all other sites belong to central Bohemia), CM – central Moravia, SM – southern Moravia. The list of sites here represents the full name of the sites as stated in the archaeological sources. The size of the points represents the number of buried individuals at a particular site; the colour of the points distinguishes Neolithic B from C (Neolithic B in red, Neolithic C in blue).

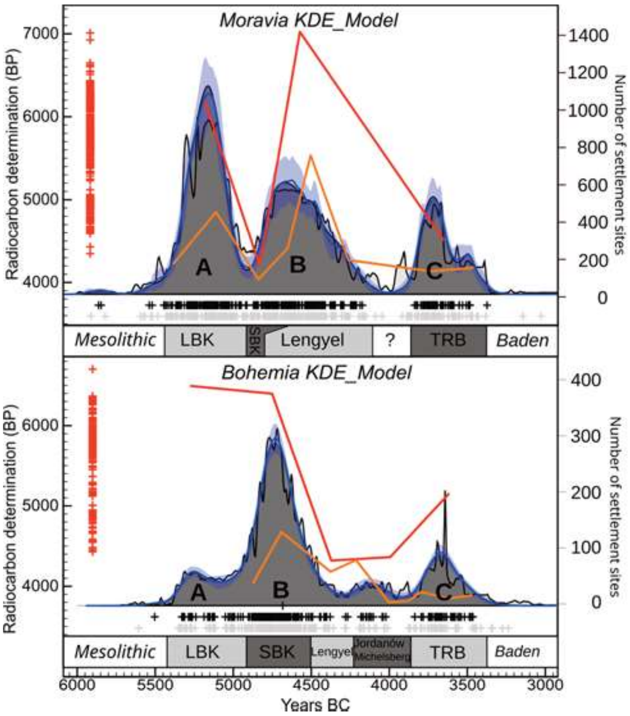


FIGURE 2: Summed probability distribution (SPD) and kernel density estimation (KDE) of 14C data from anthropogenic contexts in the Morava River catchment (above, n = 516) and in Bohemia (below, n = 299). The red curve shows the number of settlement sites defined by pottery traditions; the orange curve shows the number of sites based on a more detailed pottery typo-chronology.

is described as the relationship between the number of preserved erupted teeth, the number of teeth lost intravitam (i.e. antemortem) and the number of all burials multiplied by 32 [CDI = (Z + E)/(n × 32)] (Hanáková, Stloukal 1966).

The presence or absence of caries (C) was evaluated macroscopically. A general evaluation of caries intensity (I-CE) and frequency (F-CE) was performed following the method developed by Stloukal (1963; for a detailed description see also Jarošová, Dočkalová 2008). This processing involved the data concerning healthy teeth/individuals (i.e. intact), carious teeth (C), teeth lost intravitam (i.e. antemortem) (E), and teeth lost postmortem, which were all included in the total number of alveoli (A) examined. If antemortem tooth loss (E) occurred, it could be due to dental caries or this loss possibly originated from other reasons caused by strong wear, abscess, periodontal disease or trauma (Andrik, Müncnerová 1961). The teeth lost post-mortem were not included in the general evaluation of caries intensity and frequency, but can be easily recognised by CDI and CAI.

Following the recommendations of Buikstra and Ubelaker (1994), the type of caries was evaluated macroscopically in permanent teeth (adult sample only) using the simplified numerical codes adapted by Moore and Corbett (1971): 1 = occlusal surface caries; 2 = smooth surface caries (this includes mesial, distal, buccal/labial and lingual/vestibular surfaces); 3 = cervical caries (all surfaces at the cemento-enamel junction – CEJ); 4 = root caries (below CEJ).

The dental wear for incisors, canines and premolars was recorded according to an eight-point scale based on the amount of exposed dentine (Smith 1984). Since the Smith system shows only a poor level of discrimination when attrition rates are moderate to low, Buikstra and Ubelaker (1994) prefer the standards developed by Scott (1979) for molars. In Scott's system, each molar occlusal surface is divided into quadrants, and the amount of observable enamel is scored on a scale from 4 to 40. If any quadrant was not observable, then this tooth was not recorded.

The degree of periodontal bone loss associated with periodontitis (or periodontal disease) was evaluated macroscopically on each alveolar region of the tooth examined according to Tal (1985) and Clarke *et al.* (1986). We measured the distance between the cemento-enamel junction (CEJ) and the highest reaching edge of the alveolar bone crest (ABC): a positive finding of periodontal disease is defined as 2 mm or more, while a value below 2 mm indicates the absence of periodontal disease.

Negative impressions of the tooth's buccal surface were obtained and replicas of the tooth were made. SEM images at 226× magnification were obtained with a Tescan Vega TS 5136XM scanning electron microscope at Masaryk University, Brno. SigmaScan Pro 5.0 image analysis software was used to quantify microwear patterns for the length (X), the standard deviation of the length (SD), and number (N) of all observed striations present in a 0.56 mm^2 square surface area. Finally, four categories of orientation from 0° to 180° – in 45-degree intervals – were determined with respect to the given tooth's orientation: V = vertical; MD = mesio-occlusal to disto-cervical; DM = disto-occlusal to mesio-cervical; and H =horizontal. Mean values for each individual's tooth were characterised by a sum of 15 variables (Lalueza *et al.* 1996, Pérez-Pérez *et al.* 1994, 1999, 2003). All micrographs were analysed by one single researcher, Ivana Jarošová. For a detailed description of methods of buccal microwear analysis, see Jarošová, Tvrdý (2017) or Drtikolová Kaupová *et al.* (in preparation), where all steps are described.

The non-parametric tests (Kolmogorov-Smirnov, Kruskal-Wallis and Mann-Whitney test) were used to analyse the relationship between examined variables. Next, a two-sample Mann-Whitney test (for the small sample sizes) was performed to evaluate intra-population differences. Principal component analysis (PCA) was used to explore the interrelationships between dental caries and dental wear. All tests were performed at a 95 % confidence interval (CI). Only samples dated to Neolithic B and C were statistically processed; data from comparative samples (Neolithic A and Final Neolithic) are not available, and only average values were compared.

4. RESULTS

4.1 State of preservation of teeth and jaws

The state of preservation of alveoli and teeth in individuals from the Neolithic B and C samples was characterised by the comparative dental index CDI and comparative alveolar index CAI. In both the Neolithic B and C series, more than three-thirds of the teeth (67.7 %) and more than three-quarters of alveoli (77.5 %) were available for further analyses. To compare, for Moravian LBK settlements we have CDI = 57.7 % and CAI = 68.2 % (Jarošová, Dočkalová 2008) and for the Hoštice sample (Final Neolithic) we have CDI = 74.5 % and CAI = 79.4 % (Jarošová 2012a).

4.2 Dental caries

The evaluation of cariosity could be performed in 88 individuals over 15 years of age with 1,830 teeth and in 53 non-adults with 826 teeth. The occurrence of caries in the dentition of adults included the testing of two mutually independent criteria, i.e. sex and age, and it was carried out as follows: 1. caries intensity (I-CE) and caries frequency (F-CE) and 2. type of dental caries.

4.2.1 Caries intensity (I-CE)

In the Neolithic B and C periods, 48 of the total 1,830 permanent teeth examined in individuals over 15 years were carious (2.6 %). Seventy-six of the total 2,182 preserved alveoli (A) were detected as intravital losses (3.5 %). The final I-CE is therefore 6.1 (see *Table 1*). Non-parametric tests (Kolmogorov-Smirnov and Mann-Whitney) did not show statistically significant differences in the variables %C, %E and I-CE between the Neolithic B and C samples. To compare, I-CE of the oldest Neolithic phase (LBK) examined in adults 20+ years showed the highest value of 13.3 (%C = 4.1; %E = 9.2) (Jarošová, Dočkalová 2008), while in the Final Neolithic sample I-CE examined in adults 20+ years had the lowest value of 4.7 (%C = 2.6; %E = 2.1) at the Hoštice site (Jarošová 2012a). *Figure 3* presents a comparison of caries intensity according to tooth type. At the burial ground of Vedrovice (LBK), %C = 6.6, while at Horné Krškany (LBK) it was 5.4 (Frayer 2004); unfortunately %E and I-CE are difficult to assess at these sites from the published data. Even though we do not have these data, we consider that the presence of abscesses and antemortem tooth losses are the result of caries, so we assume that in the early stages of the Neolithic the caries incidence was much higher in all studied samples than in the subsequent Neolithic periods. For consideration, it is possible to mention a general absence of caries in skeletal series from Mesolithic and Neolithic sites in Ukraine (Lillie 1996).

4.2.1.1 Caries intensity with regard to sex

In adult males over 15 years of age from the Neolithic B period, 2.9 % of carious teeth and 1.7 % of antemortem loss were determined (I-CE = 4.6), while in females there were 3.8 % of decayed teeth and 4.6 % of antemortem loss (I-CE = 8.4). In Neolithic C, the occurrence of carious teeth was lower, but the percentage of antemortem tooth loss was higher than in Neolithic B: in males, %C = 2.0 and %E = 2.0 (I-CE = 4.0) and in females %C = 2.4 and %E = 5.8 (I-CE = 8.3) (*Table 1*). Non-parametric tests did not show any statistically significant sex-related differences in the variables %C, %E and I-CE between the Neolithic B and C samples. To compare, the values for analysed females of LBK date were %C = 2.9 and %E = 9.7 (I-CE = 12.6), while in males it was %C = 8.5 and %E = 10.9 (I-CE = 19.4) (Jarošová, Dočkalová 2008). At the LBK burial ground from Vedrovice, %C = 6.0 in males and 7.8 in females, for Horné Krškany (LBK) this variable took the same value in males as for Vedrovice (6.0), while in females was %C = 5.2 (Frayer 2004). *Figure 4* presents a detailed overview of the occurrence of carious teeth compared to the occurrence of individuals affected with caries. For the LBK population of Vedrovice, Lillie (2008) described a lower incidence of dental caries than Frayer (2004). According to Lillie, females exhibit higher incidences of caries compared to males: 18 of 32 females have caries (%nC = 56.25) with 31 of 739 teeth carious (%C = 4.19) and 5 of 17 males have caries (%nC = 29.4) with 9 of 480 teeth carious (%C = 1.88).

TABLE 1: Caries intensity (I-CE) and caries frequency (F-CE) in adults (15+ yrs) in Neolithic B and C with regard to sex.

Dental caries in adults	Neolithic B (4900–4000 BC)				Neolithic C (3800–3400 BC)				
Individuals (15+ yrs)	Males	Females	?	All individuals	Males	Females	?	All individuals	All B+C
Number of examined teeth (n)	410	448	72	930	401	455	44	900	1830
C	12	17	0	29	8	11	0	19	48
%C	2.9	3.8	0.0	3.1	2.0	2.4	0.0	2.1	2.6
E	8	25	0	33	9	34	0	43	76
A	473	538	86	1097	457	582	46	1085	2182
%E	1.7	4.6	0.0	3.0	2.0	5.8	0.0	4.0	3.5
I-CE	4.6	8.4	0.0	6.1	4.0	8.3	0.0	6.1	6.1
Number of examined individuals (N)	17	20	8	45	19	22	2	43	88
nC	3	6	0	9	1	5	0	6	15
%nC	17.6	30.0	0.0	20.0	5.3	22.7	0.0	14.0	17.0
nE	2	2	0	4	1	3	0	4	8
%nE	11.8	10.0	0.0	8.9	5.3	13.6	0.0	9.3	9.1
nCE	0	4	0	4	1	1	0	2	6
%nCE	0.0	20.0	0.0	8.9	5.3	4.5	0.0	4.7	6.8
intact	12	8	8	28	16	13	2	31	59
% intact	70.6	40.0	100.0	62.2	84.2	59.1	100.0	72.1	67.0
F-CE	29.4	60.0	0.0	37.8	15.8	40.9	0.0	27.9	33.0

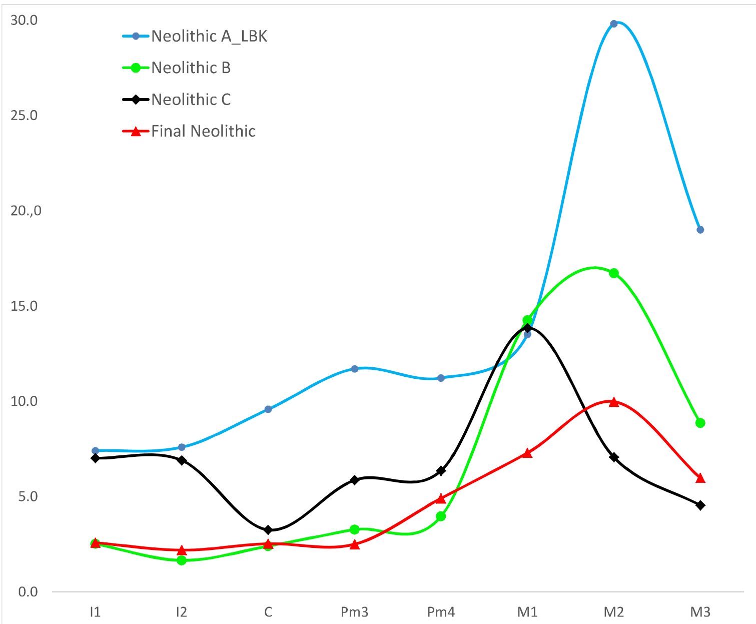


FIGURE 3: Caries intensity (I-CE) in adults over 20 years of age in analysed groups from Neolithic according to tooth types. Neolithic A sample represents only data from LBK settlements in Moravia.

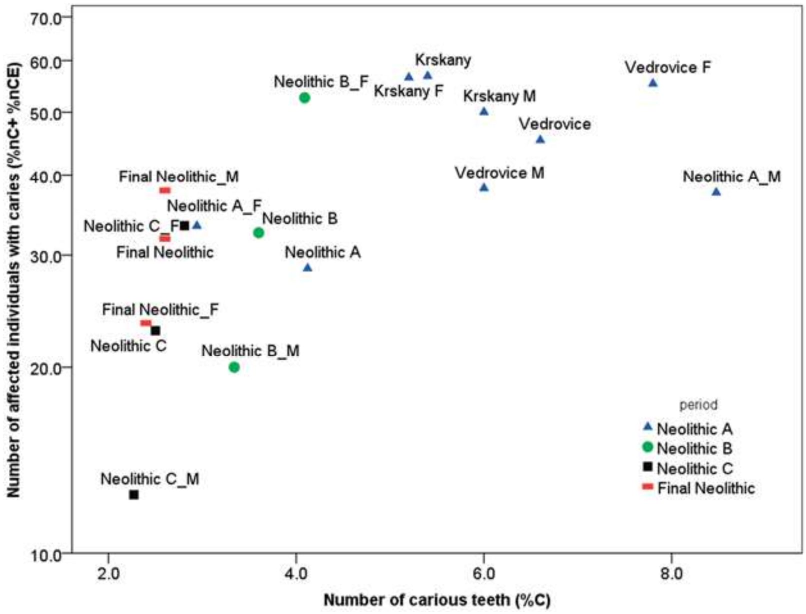


FIGURE 4: Carious teeth incidence (%C) compared to the percentage of individuals affected with caries (%nC+ %nCE) in adults over 20 years of age during the Neolithic period. Neolithic A sample is represented with data from LBK settlements in Moravia; (Nitra-) Krškany and Vedrovice represent cemeteries dated to LBK; Final Neolithic sample represents data from Hoštice site.

4.2.1.2 Caries intensity with regard to age categories

During the assessment of dental cariosity, consideration was given to particular age categories, since cariosity increases with age, which was also proven in our sample. It can be seen from the collected data that women from Neolithic B and C have a higher tendency of tooth decay and intravital loss with increasing age (*Table 2)*. The age category of 15–20 years of Neolithic B and C samples coincides with zero values of I-CE, which means a completely healthy dentition of the individuals involved (except for the youngest males in Neolithic B, where two cases of intravital tooth losses occurred). To conclude, caries intensity in Neolithic B and C was nearly identical in adults over 15 years of age; however, in adults over 20 years of age, the values of caries intensity were higher in Neolithic B compared to Neolithic C.

4.2.2 Caries frequency (F-CE)

The frequency of caries, i.e. percentage of caries and intravital losses, could be evaluated in 28 adults of the LBK (Neolithic A; Jarošová, Dočkalová 2008), in 45 adults of Neolithic B and 43 adults of Neolithic C. Among the individuals from LBK settlements, less than half were affected by caries or antemortem tooth loss (LBK: F-CE = 42.9; Jarošová, Dočkalová 2008), while in the Neolithic B and Neolithic C periods, caries or antemortem loss occurred in more than a third of the sample (Neolithic B: F-CE = 37.8; Neolithic C: F-CE = 27.9; *Table 1*). Kolmogorov-Smirnov and Mann-Whitney non-parametric tests did not show any statistically significant differences in the variables nC, nE and nCE between the Neolithic B and C samples. No sex-related differences were observed. In the Final Neolithic period, 29 individuals of 75 examined were affected by pathological changes in the teeth and jaws (F-CE = 38.7) (Jarošová 2012a).

Due to the small number of males and females in particular investigated periods, the result of F-CE values are only of an informative character. Despite this, it can be determined that in the sample from Moravian LBK settlements, 50.0 % of males (F-CE = 50.0; %nC = 12.5 & %nCE = 25.0) and 53.3 % of females (F-CE = 53.3; %nC = 13.35 & %nCE = 20.0) were affected by dental caries or antemortem tooth loss. From another LBK series, we dispose of only %nC, i.e. the representation of affected individuals in the sample. Using the "total" (M+F+?) category, 56.8 % of the

TABLE 2: Caries intensity (I-CE) in adults (15+ yrs) in Neolithic B and C with regard to age groups.

	Dental caries in adults (15+ yrs)		Number of examined teeth (n)	C	%C	E	A	%E	I-CE	Number of examined individuals (N)
Neolithic B (4900–4000 BC)	Males	15–19 yrs	51	0	0.0	2	63	3.2	3.2	2
		20–35 yrs	257	12	4.7	0	290	0.0	4.7	10
		35–50 yrs	84	0	0.0	0	91	0.0	0.0	3
		50+ yrs	18	0	0.0	6	29	20.7	20.7	2
	Females	15–19 yrs	31	0	0.0	0	32	0.0	0.0	1
		20–35 yrs	218	8	3.7	2	254	0.8	4.5	10
		35–50 yrs	167	8	4.8	4	196	2.0	6.8	7
		50+ yrs	32	1	3.1	19	56	33.9	37.1	2
Neolithic C (3800–3400 BC)	Males	15–19 yrs	42	0	0.0	0	47	0.0	0.0	3
		20–35 yrs	228	2	0.9	2	260	0.8	1.6	10
		35–50 yrs	89	0	0.0	0	92	0.0	0.0	4
		50+ yrs	42	6	14.3	7	58	12.1	26.4	2
	Females	15–19 yrs	65	0	0.0	0	78	0.0	0.0	4
		20–35 yrs	181	7	3.9	0	197	0.0	3.9	7
		35–50 yrs	192	4	2.1	1	241	0.4	2.5	8
		50+ yrs	17	0	0.0	33	66	50.0	50.0	3

individuals from Horné Krškany (%nC: males = 50.0; females 56.5) and 45.3 % from Vedrovice (%nC: males = 38.1; females 55.3) had at least one caries. F-CE values are not possible to calculate from the published data (Frayer 2004), but these are much higher than the F-CE in LBK settlements. In the LBK sample, the differences between males and females are not statistically significant, as is the case in Neolithic B and C. It is not possible to evaluate sex differences in F-CE values statistically, as this is only a calculated value for the studied population. In Neolithic B, F-CE for females is twice as high as for males (60.0 and 29.4, respectively), and the trend continues in Neolithic C (F-CE of 40.9 for females and 15.8 for males – see *Table 1*). In the Final Neolithic, there was a shift, as F-CE for females decreased to 32.4 while for males it increased to 43.2 (Jarošová 2012a).

4.2.3 Caries intensity (I-CE) and frequency (F-CE) in selected regions

When we observed the incidence of dental caries at the eleven sites selected for study, we can say that we found six caries-free skeletal series: Kolín (Neolithic C) in central Bohemia, Prostějov and Ivanovice (both Neolithic C) in central Moravia and Těšetice-Kyjovice, Friebritz (both Neolithic B) and Dambořice (Neolithic C) in southern Moravia, where not a single caries was found in any of the 30 adults studied (%C = 0 and %nC = 0). Among these, only a single case of intravital tooth loss was recorded, otherwise, their dentitions are completely intact. On the other hand, the highest values of I-CE were found in the southern Moravia sites of Modřice, Podivín and Brno – Nový Lískovec (all Neolithic C), while in the sites dated to Neolithic B (Kolín and Pečky in central Bohemia), the values of caries intensity were very low. Differences in %C (N = 67; p = 0.03) and I-CE (p = 0.02) between the sites were statistically significant, as proved by Kruskal-Wallis ANOVA. For a detailed evaluation of caries intensity and frequency concerning selected sites, see *Table 3* and *Figure 5*. The large variability of I-CE ranks across sites may be due to the small number of buried individuals, which, from a socio-economic point of view, could probably represent a selection of the total population (e.g. Brno-Nový Lískovec) or, conversely, might reflect the actual status of long-term settled populations (e.g. Modřice).

TABLE 3: Caries intensity (I-CE) and caries frequency (F-CE) in adults (15+ yrs) in selected Neolithic B and C sites. CB – Central Bohemia, CM – Central Moravia, SM – South Moravia, LA – Lower Austria.

Dental caries in adults (15+ yrs)	Neolithic B (4900–4000 BC)					Neolithic C (3800–3400 BC)						
	Kolín (CB)	Pečky (CB)	Přerov (CM)	Těšetice-Kyjovice (SM)	Friebritz (LA)	Kolín (CB)	Ivanovice (CM)	Prostějov (CM)	Dambořice (SM)	Modřice (SM)	Podivín (SM)	Brno-N. Lískovec (SM)
Number of examined teeth (n)	166	106	108	168	67	79	115	72	94	295	93	99
C	6	4	10	0	0	0	0	0	0	14	2	3
%C	3.6	3.8	9.3	0.0	0.0	0.0	0.0	0.0	0.0	4.7	2.2	3.1
E	1	0	3	0	0	0	1	0	0	22	18	2
A	183	128	122	187	79	100	128	104	107	358	118	104
%E	0.5	0.0	2.5	0.0	0.0	0.0	0.8	0.0	0.0	6.1	15.3	1.9
I-CE	4.2	3.8	11.7	0.0	0	0.0	0.8	0.0	0.0	10.9	17.4	5
Number of examined individuals (N)	7	5	4	7	4	6	5	4	4	12	5	4
nC	2	3	1	0	0	0	0	0	0	1	1	1
%nC	28.6	60.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	20.0	25.0
nE	1	0	2	0	0	0	1	0	0	3	1	0
%nE	14.3	0.0	50.0	0.0	0.0	0.0	20.0	0.0	0.0	25.0	20.0	0.0
nCE	0	0	0	0	0	0	0	0	0	0	0	1
%nCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
intact	4	2	1	7	4	6	4	4	4	8	3	2
% intact	57.1	40.0	25.0	100.0	100.0	100.0	80.0	100.0	100.0	66.7	60.0	50.0
F-CE	42.9	60.0	75.0	0.0	0.0	0.0	20.0	0.0	0.0	33.3	40.0	50.0

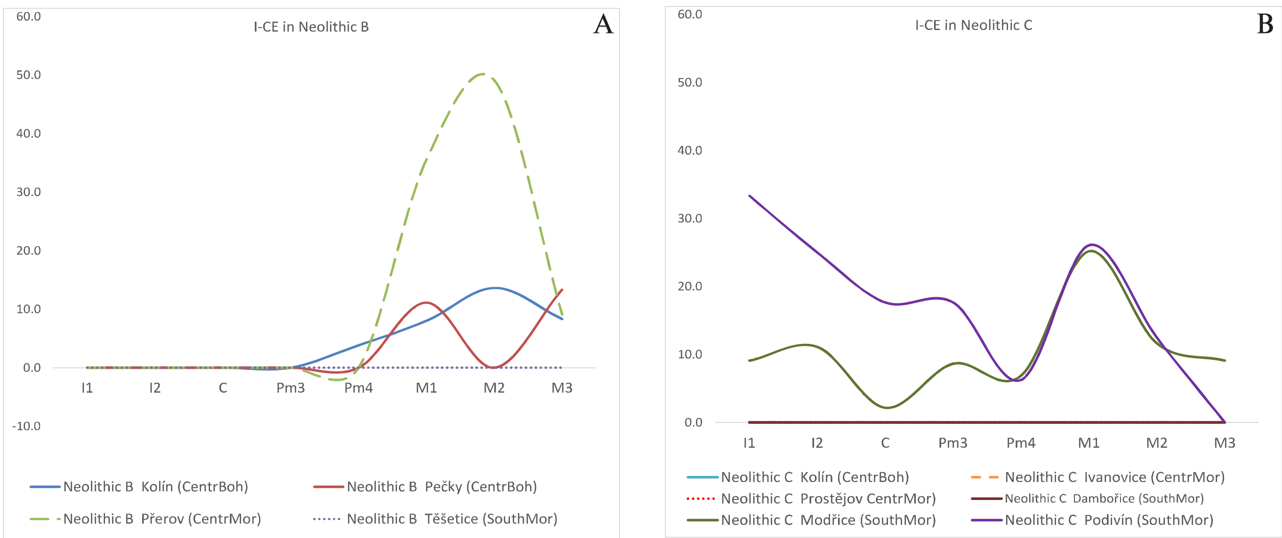


FIGURE 5: Caries intensity (I-CE) in Neolithic B (A) and Neolithic C (B) based on selected microregions and tooth types in adults over 15 years of age. Těšetice-Kyjovice, Friebritz dated to Neolithic B and sites Kolín, Ivanovice, Prostějov and Dambořice dated to Neolithic C represent caries-free regions (see *Table 3*). (Brno – Nový Lískovec dated to Neolithic C was excluded due to the small sample size).

4.2.4. Type and location of caries

In the Middle and Late Neolithic samples, 48 examples of caries were detected on permanent teeth (*Table 4*). In 28 (58.3 %) cases this was coronal caries, in 18 (37.5 %) cases cervical, and 2 (4.2 %) cases root caries. In 14 cases (29.2 %) from the total of 48 findings, caries were located on the occlusal surface of a crown. If we divide the incidence of dental caries and their localisation by period, in Neolithic B samples we can see that 24.1 % of all caries were present on the occlusal surface of the tooth, while in Neolithic C samples it was already 36.8 %. In the Moravian LBK skeletal series, for comparison, only 3.7 % of caries (out of 27 cases of caries) were detected on the occlusal surface (Jarošová, Dočkalová 2008). This can be interpreted as the presence of increased continuous dental wear in Neolithic A (LBK), which resulted in the absence of this type of caries in the Early Neolithic period, and a tendency towards a softer diet in the Late Neolithic.

In Neolithic A (Moravian LBK series) we detected 48.2 % of cervical caries, in Neolithic B it was 44.8 % and in Neolithic C only 26.3 %. This may be connected with poor oral hygiene in the LBK period, or the atrophy of alveoli due to advanced age in the examined individuals. In the Final Neolithic, we found 15.2 % occlusal caries and 10.9 % of cervical caries out of 46 caries studied in the population from Hoštice I (Jarošová 2012a). Here, therefore, we can infer a renewed increase in diet abrasiveness associated with a decrease in the number of caries on the occlusal surface. It is possible to conclude that the localisation of dental caries might reflect the effect of the introduction of new diets and their composition, which began to change in terms of diet diversification.

TABLE 4: Dental caries in adults (15+ yrs) according to its type and localisation.

Dental caries		Neolithic B (4900–4000 BC)										Neolithic C (3800–3400 BC)									
Type	Localisation	I1	I2	C	Pm3	Pm4	M1	M2	M3	all	%	I1	I2	C	Pm3	Pm4	M1	M2	M3	all	%
crown	occlusal surface (O)	0	0	0	0	0	1	4	2	7	24.1	0	0	0	1	1	5	0	0	7	36.8
crown	smooth surface caries (M,D,B,V)	0	0	0	1	0	4	3	0	8	27.6	0	0	0	0	1	2	2	1	6	31.6
cervix	cervical caries (M,D,B,V)	0	0	0	0	0	5	6	2	13	44.8	0	0	0	0	0	3	0	2	5	26.3
root	root caries	0	0	0	0	0	1	0	0	1	3.4	0	0	0	0	1	0	0	0	1	5.3
	all examined dental caries	0	0	0	1	0	11	13	4	29		0	0	0	1	3	10	2	3	19	

4.2.5 Caries in children up to 15 years of age

In the series of 53 Neolithic B and C children (age categories infans I, II and III (0–14 yrs)) with 389 deciduous and 437 permanent teeth examined, we found eight cases of dental caries. To conclude, 7.5 % of children had caries and the incidence of carious teeth (%C) in the mixed dentition of the non-adult sample was 1 % (for details see *Table 5*). To compare, one child with caries was found both in samples from Vedrovice and Horné Krškany. In both cases, caries occurred on the first deciduous molar (Frayer 2004). In the group of 38 children with 671 teeth from the Moravian Neolithic (LBK period), only one child (2.6 %) with one case of tooth decay was found. The incidence of carious teeth (%C) in the mixed dentition of the non-adult LBK sample was 0.15 % (Jarošová, Dočkalová 2008). In the Final Neolithic sample from Hoštice I, we observed four cases of dental caries in 776 examined teeth, i.e. 0.5 % of all teeth were carious (%C). Two children out of 35 examined (5.7 %) in this period had caries (Jarošová 2012a).

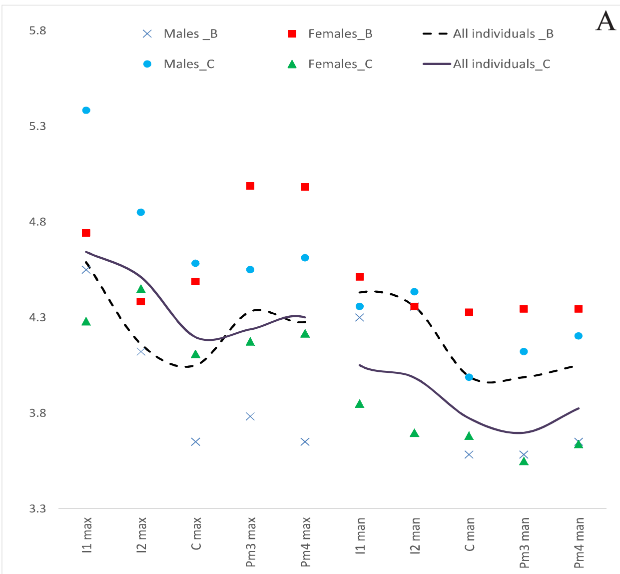
4.3 Occlusal wear

Dental wear was scored in order to find out the basic characteristics of the food that was consumed. The degree of dental wear could be evaluated in 81 adult individuals with 968 permanent teeth (*Table 6*) from Neolithic B and C. The main reason for such a low number of teeth included in the dental wear analysis was that the age category of 15–19 years was only partially scored. Two different methods were used while assessing dental wear: incisors, canines and premolars (n = 612) after Smith (1984), while molars (n = 356) were evaluated after Scott (1979). Both Neolithic B and C periods were evaluated separately. As follows

TABLE 5: Dental caries in non-adults (0–14 yrs) in Neolithic B and C with regard to age groups.

	Neolithic B (4900–4000 BC)			Neolithic C (3800–3400 BC)			
Dental caries in non-adults	0.5–6 yrs	7–14 yrs	All children	0.5–6 yrs	7–14 yrs	All children	All B+C
number of examined children (N)	11	11	22	16	15	31	53
children with caries (nC)	1	2	3	0	1	1	4
% children with caries (%nC)	9.1	18.2	13.6	0.0	6.7	3.2	7.5
number of examined deciduous teeth (n)	109	42	151	154	84	238	389
number of examined permanent teeth (n)	52	177	229	39	169	208	437
number of all examined teeth (n)	161	219	380	193	253	446	826
caries in deciduous teeth (C)	1	0	1	0	5	5	6
caries in permanent teeth (C)	0	2	2	0	0	0	2
number of all caries (C)	1	2	3	0	5	5	8
% caries in deciduous teeth (%C)	0.9	0.0	0.7	0.0	6.0	2.1	1.5
% caries in permanent teeth (%C)	0.0	1.1	0.9	0.0	0.0	0.0	0.5
% number of all teeth with caries (%C)	0.6	0.9	0.8	0.0	2.0	1.1	1.0

from the results cited in *Table 6,* the highest degree of dental wear could be detected on the first upper incisors (I1max = 5.3) in males from Neolithic C. Exactly the same average value of dental abrasion and type of tooth (I1max) was found in the sample from LBK settlements (Jarošová, Dočkalová 2008). Other scored values of I, C, and Pm were always lower in Neolithic B and C. This might indicate unspecified manipulative dental wear in males from Neolithic C (*Figure 6A*). Despite this observation, non-parametric tests (Kolmogorov-Smirnov) did not show any statistically significant differences in dental wear between the Neolithic B and C samples. Likewise, no statistically significant sex-related differences in dental wear were observed. The



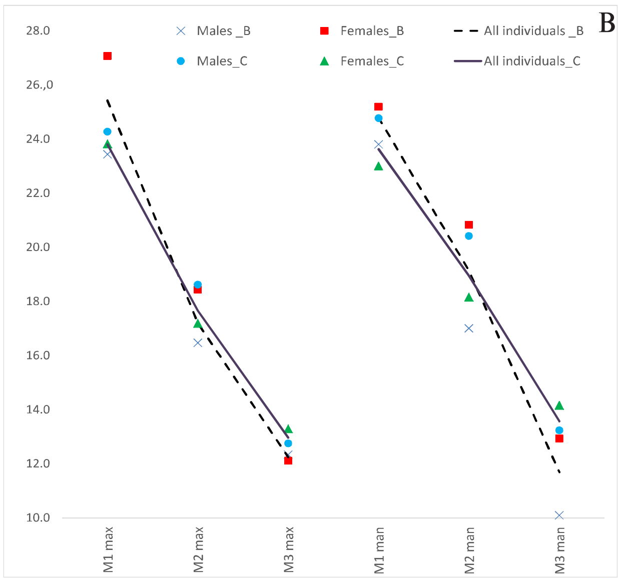


FIGURE 6: Mean values of the dental wear of incisors, canines, and premolars (A) and molars (B) in adults over 15 years in Neolithic B and C.

TABLE 6: Mean values of dental wear in adults (15+ yrs) in Neolithic B and C concerning sex, age categories and tooth type. Data of selected sites for comparison added. CB – Central Bohemia, CM – Central Moravia, SM – South Moravia, NB – Neolithic B, NC – Neolithic C.

Individuals (15+ yrs)	I1max	I2max	Cmax	Pm3 max	Pm4 max	M1max	M2max	M3max	I1man	I2man	Cman	Pm3 man	Pm4 man	M1man	M2man	M3man
Neolithic B (4900–4000 BC)																
Number of examined teeth (n)	26	27	32	32	31	31	31	21	21	26	34	32	35	34	32	25
Males	4.5	4.1	3.6	3.7	3.6	23.4	16.5	12.3	4.3	4.3	3.5	3.5	3.6	23.8	17.0	10.1
Females	4.7	4.3	4.4	4.9	4.9	27.1	18.4	12.1	4.5	4.3	4.3	4.3	4.3	25.2	20.8	12.9
All individuals	4.5	4.1	4.0	4.3	4.2	25.4	17.2	12.2	4.4	4.3	3.9	3.9	4.0	24.8	19.1	11.7
15–19 yrs	3.0	2.0	2.5	2.5	2.0	17.0	11.0	10.0	N/A	N/A	2.0	2.0	2.0	17.5	10.5	10.0
20–35 yrs	4.0	3.3	3.3	3.8	3.8	23.4	15.5	9.9	3.8	3.5	3.4	3.6	3.6	23.5	18.4	9.6
35–50 yrs	5.1	5.0	5.0	5.1	5.2	29.6	19.6	14.0	5.1	5.3	4.9	4.6	4.7	27.1	21.6	15.7
50+ yrs	7.0	7.0	7.0	6.0	5.5	30.0	26.0	30.0	6.0	7.0	6.5	6.0	6.0	32.0	22.0	18.0
M 20–35 yrs	4.0	3.6	3.1	3.5	3.4	22.7	14.7	9.1	3.8	3.6	3.1	3.3	3.4	22.4	16.6	8.4
M 35–50 yrs	5.3	5.3	5.0	5.3	5.3	30.0	21.0	14.7	5.5	5.3	4.7	4.3	4.3	27.3	22.3	17.0
M 50+ yrs	8.0	8.0	8.0	N/A	N/A	N/A	30.0	30.0	N/A	8.0	7.0	6.0	6.0	38.0	N/A	N/A
F 20–35 yrs	4.0	2.8	3.5	4.1	4.3	24.3	16.4	11.0	3.9	3.4	3.6	3.8	3.7	23.9	19.8	10.9
F 35–50 yrs	5.4	5.3	5.3	5.4	5.5	29.8	21.0	13.5	5.0	5.2	5.0	4.7	4.9	27.0	22.0	15.2
F 50+ yrs	6.0	6.0	6.0	6.0	5.5	30.0	22.0	N/A	6.0	6.0	6.0	6.0	6.0	26.0	22.0	18.0
Neolithic C (3800–3400 BC)																
Number of examined teeth (n)	27	26	34	32	36	34	31	23	29	31	36	34	31	29	38	27
Males	5.3	4.8	4.5	4.5	4.6	24.3	18.6	12.8	4.3	4.4	3.9	4.1	4.2	24.8	20.4	13.2
Females	4.2	4.4	4.1	4.1	4.2	23.8	17.2	13.3	3.8	3.6	3.6	3.5	3.6	23.0	18.2	14.2
All individuals	4.6	4.5	4.1	4.2	4.3	23.8	17.6	13.0	4.0	3.9	3.7	3.6	3.8	23.6	18.9	13.6
15–19 yrs	2.7	2.3	2.0	2.5	2.2	16.5	9.0	N/A	2.2	2.0	1.7	1.6	1.8	17.0	12.7	7.0
20–35 yrs	3.9	3.9	3.5	3.6	3.7	20.9	15.5	10.8	3.5	3.3	3.3	3.1	3.2	21.3	15.8	9.8
35–50 yrs	5.8	5.9	5.7	5.7	5.6	30.2	22.4	15.7	5.0	4.8	4.8	4.5	4.7	28.5	22.8	18.8
50+ yrs	7.5	7.0	7.0	6.0	6.3	34.0	32.0	12.0	7.0	7.0	6.0	6.3	6.3	38.0	34.0	27.0
M 20–35 yrs	4.7	4.4	3.9	4.0	3.8	21.2	15.5	11.0	3.7	3.7	3.3	3.4	3.4	22.3	16.4	9.9
M 35–50 yrs	5.3	5.0	5.3	6.0	6.0	33.7	24.7	17.5	4.7	4.8	4.8	4.5	4.8	32.3	26.3	20.8
M 50+ yrs	7.5	7.0	7.0	6.0	7.0	34.0	32.0	12.0	7.0	7.0	6.0	6.5	6.5	N/A	32.0	N/A
F 20–35 yrs	3.2	3.4	3.3	3.3	3.9	20.7	15.5	10.7	3.3	3.0	3.1	3.0	3.0	20.2	15.3	9.6
F 35–50 yrs	6.0	6.2	5.9	5.6	5.4	28.9	21.5	15.3	5.2	4.8	4.8	4.6	4.7	26.0	21.0	17.5
F 50+ yrs	N/A	N/A	N/A	N/A	5.0	N/A	N/A	N/A	N/A	7.0	6.0	6.0	6.0	38.0	38.0	27.0

TABLE 6: Continued.

Selected microregions																
Kolín (CB) NB	5.0	4.8	4.2	4.3	4.5	28.3	20.7	14.7	4.4	4.2	3.9	3.8	4.0	26.6	23.1	12.3
Pečky (CB) NB	4.0	4.5	4.0	4.0	4.3	24.2	16.8	12.5	4.0	3.5	3.8	3.4	3.4	23.6	18.6	14.2
Přerov (CM) NB	4.0	3.0	3.8	5.0	5.0	29.0	18.3	9.0	3.7	3.8	3.8	4.5	4.8	25.3	20.0	9.0
Těšetice - Kyjovice (SM) NB	4.8	4.5	3.7	4.0	4.0	24.8	15.8	8.7	4.8	4.6	4.0	4.0	4.2	25.0	18.0	11.5
Kolín (CB) NC	4.0	4.7	4.7	6.0	3.5	34.5	24.5	17.0	3.7	3.5	3.0	3.8	3.5	29.0	22.3	22.0
Ivanovice (CM) NC	3.8	3.3	4.0	4.3	4.5	22.8	19.0	14.0	4.0	4.4	4.6	4.0	4.2	24.8	20.6	18.5
Prostějov (CM) NC	2.0	2.0	2.5	3.7	3.7	23.3	16.3	17.0	2.5	2.5	2.3	2.0	2.0	20.0	16.0	12.7
Dambořice (SM) NC	3.5	3.0	2.5	2.8	3.0	21.0	16.5	12.5	3.0	3.0	2.7	2.5	2.5	22.0	16.0	12.5
Modřice (SM) NC	5.7	5.4	4.9	4.5	4.8	25.9	18.0	12.5	4.7	4.4	4.3	4.4	4.4	23.8	20.1	12.0
Podivín (SM) NC	4.0	4.0	3.3	3.8	4.0	20.5	13.5	10.0	4.0	4.0	3.8	3.0	3.3	20.3	17.5	5.0
Brno - N. Lískovec (SM) NC	5.3	5.0	4.8	4.0	4.5	24.8	18.7	15.0	4.7	4.0	3.8	4.0	4.5	26.7	21.3	18.0

results of molar abrasion are very similar in both periods of interest (*Table 6*, *Figure 6B*). It is not possible to say with certainty in which period a recorded score of dental wear was higher, as values often overlap, although in Neolithic B (compared to Neolithic C), higher degrees of dental wear can be observed on lower incisors, canines and premolars and both upper and lower first molars. For this reason, we tried to compare individuals from Neolithic B and C separately in the age categories of 20–35 years and 35–50 years and add data from Neolithic A and Final Neolithic periods for comparison (*Figure 7*). In molars, we can observe that the highest scores of dental wear were found in individuals from Neolithic C, while the lowest scores of dental wear were observed in individuals from the Final Neolithic.

From the comparison of dental wear of selected sites, no statistically significant differences were observed by

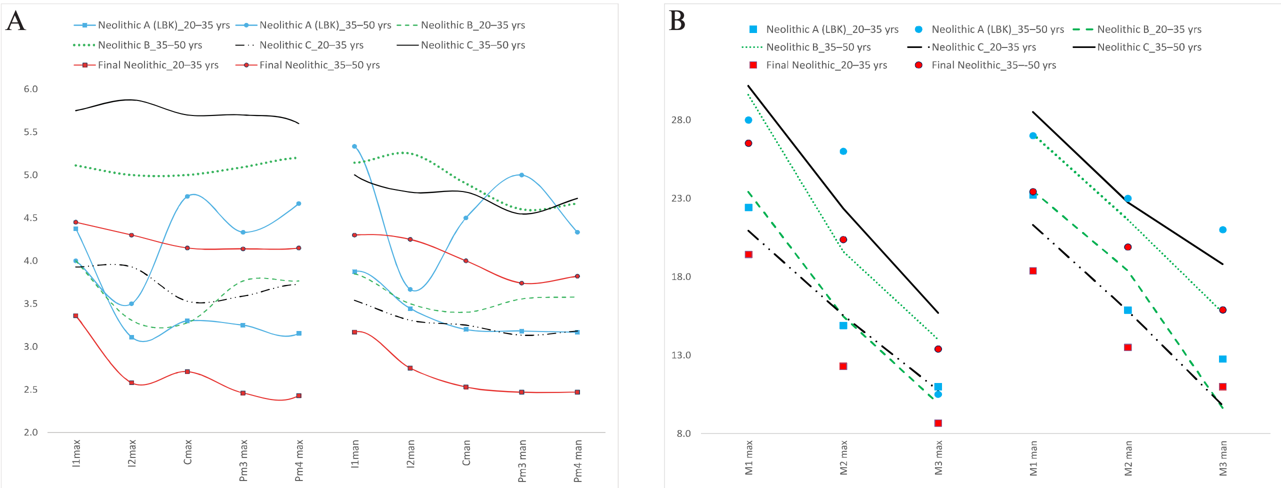


FIGURE 7: Mean values of the dental wear of incisors, canines, and premolars (A) and molars (B) in Neolithic A (LBK), Neolithic B, Neolithic C, and Final Neolithic (Hoštice sample). Data are presented separately in two age groups and divided into the upper and lower jaw. The figure presents data from individuals 20–50 years of age.

TABLE 7: Presence of periodontal disease in adults (15+ yrs) in Neolithic B and C concerning sex, age categories and tooth type. Data of selected sites for comparison added. CB – Central Bohemia, CM – Central Moravia, SM – South Moravia.

		I1		I2		C		Pm3		Pm4		M1		M2		M3		I1	I2	C	Pm3	Pm4	M1	M2	M3
Periodontal disease	Individuals (15+ yrs)	absence	presence	absence	presence	absence	presence	absence	presence	absence	presence	absence	presence	absence	presence	absence	presence	% presence	% presence	% presence	% presence	% presence	% presence	% presence	% presence
Neolithic B (4900–4000 BC)	Males	4	9	9	12	15	12	13	13	13	14	8	17	10	15	9	7	69.2	57.1	44.4	50.0	51.9	68.0	60.0	43.8
	Females	11	10	13	9	17	13	13	18	11	18	6	23	10	19	10	10	47.6	40.9	43.3	58.1	62.1	79.3	65.5	50.0
	15–19 yrs	2	0	4	0	5	0	5	0	5	0	4	1	6	0	4	0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0
	20–35 yrs	9	10	12	11	22	12	16	17	16	18	11	22	14	19	13	11	52.6	47.8	35.3	51.5	52.9	66.7	57.6	45.8
	35–50 yrs	5	7	7	7	7	11	6	12	4	14	1	16	2	15	3	6	58.3	50.0	61.1	66.7	77.8	94.1	88.2	66.7
	50+ yrs	0	3	0	4	0	4	0	4	1	3	0	4	1	2	1	1	100.0	100.0	100.0	100.0	75.0	100.0	66.7	50.0
	Number of examined teeth (n)	16	20	23	22	34	27	27	33	26	35	16	43	23	36	21	18	55.6	48.9	44.3	55.0	57.4	72.9	61.0	46.2
Neolithic C (3800–3400 BC)	Males	8	13	9	12	13	15	10	17	8	19	4	24	5	22	10	11	61.9	57.1	53.6	63.0	70.4	85.7	81.5	52.4
	Females	3	13	5	14	7	16	6	18	8	16	3	23	4	21	2	17	81.3	73.7	69.6	75.0	66.7	88.5	84.0	89.5
	15–19 yrs	3	1	4	1	7	0	6	1	7	1	3	5	6	1	4	0	25.0	20.0	0.0	14.3	12.5	62.5	14.3	0.0
	20–35 yrs	9	8	11	8	15	9	11	14	10	13	4	23	5	20	9	9	47.1	42.1	37.5	56.0	56.5	85.2	80.0	50.0
	35–50 yrs	1	13	1	13	0	16	0	17	0	17	0	17	0	18	0	17	92.9	92.9	100.0	100.0	100.0	100.0	100.0	100.0
	50+ yrs	0	4	0	4	0	6	0	4	0	5	0	4	0	4	0	2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Number of examined teeth (n)	13	26	16	26	22	31	17	36	17	36	7	49	11	43	13	28	66.7	61.9	58.5	67.9	67.9	87.5	79.6	68.3
Selected microregions	Kolín (CB) NB	6	0	7	0	10	0	7	2	6	5	2	9	5	6	3	1	0.0	0.0	0.0	22.2	45.5	81.8	54.5	25.0
	Pečky (CB) NB	0	0	1	0	4	1	3	2	3	2	3	2	3	2	3	2	N/A	0.0	20.0	40.0	40.0	40.0	40.0	40.0
	Přerov (CM) NB	0	5	0	7	0	8	1	7	1	7	1	6	1	7	2	3	100.0	100.0	100.0	87.5	87.5	85.7	87.5	60.0
	Těšetice-Kyjovice (SM) NB	2	6	2	7	4	8	1	11	1	11	0	11	1	10	1	5	75.0	77.8	66.7	91.7	91.7	100.0	90.9	83.3
	Kolín (CB) NC	0	1	0	2	0	2	0	2	0	2	0	1	0	2	0	1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Ivanovice (CM) NC	0	2	1	2	2	3	1	5	2	3	1	4	1	4	0	3	100.0	66.7	60.0	83.3	60.0	80.0	80.0	100.0
	Prostějov (CM) NC	3	0	3	0	5	0	2	3	2	3	1	6	3	4	2	3	0.0	0.0	0.0	60.0	60.0	85.7	57.1	60.0
	Dambořice (SM) NC	2	0	3	0	3	0	4	0	3	0	3	1	2	1	3	0	0.0	0.0	0.0	0.0	0.0	25.0	33.3	0.0
	Modřice (SM) NC	3	16	4	14	5	16	3	17	3	18	0	20	2	18	1	15	84.2	77.8	76.2	85.0	85.7	100.0	90.0	93.8
	Podivín (SM) NC	3	0	3	0	5	1	5	0	5	2	2	6	3	4	5	0	0.0	0.0	16.7	0.0	28.6	75.0	57.1	0.0

using Kruskal-Wallis ANOVA. It is still evident that the lowest dental wear scores were found in samples from Prostějov and Dambořice, while the highest scores come from Kolín and Modřice (all Neolithic C). In Neolithic B, average values of dental wear show less variability. While the lowest dental wear score of molars was calculated for Podivín, Podivín's values for other teeth types are only average (*Figure 8D*).

The relationship between dental caries (%C), percentage of intravital loss (%E) and dental wear was investigated using the Principal component analysis in adult individuals. Dental periodontitis was not included in this analysis as there was only small number of indviduals who had all dental characteristics available for this analysis. When looking at sex and chronogical group, no statistical affiliation is not obvious between Neolithic B and C. Central Bohemia and Central Moravia seems to follow the same trends in dental characteristics during Neolithic B and C period, while data from Southern Moravia differ slightly, but not significantly. In summary, we do not observe a significant trend in dental characteristics (dental caries & dental

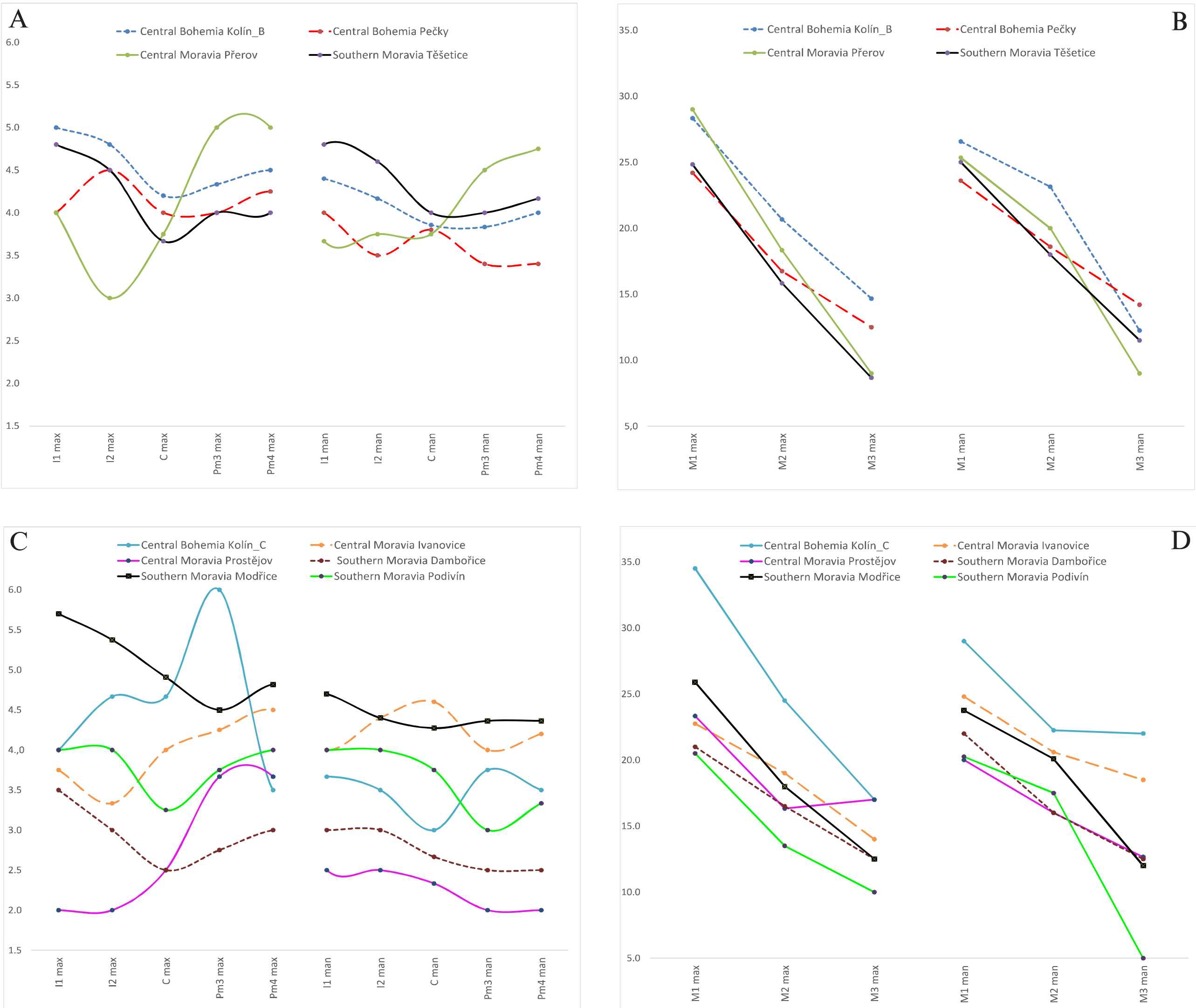


FIGURE 8: Mean values of the dental wear of incisors, canines, and premolars (A) and molars (B) in Neolithic B in comparison to incisors, canines and premolars (C) and molars (D) in Neolithic C. Data are presented separately in selected microregions and divided for the upper and lower jaw. The figure presents data of all individuals over 15 years.

wear) in terms of sex and region in the Neolithic B and C. For a detailed analysis of changes in the Neolithic period, we would need to analyze data from LBK and Final Neolithic, which we do not have yet.

4.4 Periodontitis

Analysis of the measurements showed that in general the distances between the cementoenamel junction (CEJ) and the alveolar bone crest (ABC) increased with age, which was also proven in a previous study (Tal 1985). Measurements on the right and left sides of the mandible and maxilla were not compared with each other due to the small sample size. Periodontal disease was found to be more common in the Neolithic C sample compared to Neolithic B. Periodontitis was more frequent by posterior teeth in females than in males in both periods (*Figure 9*). When examined by tooth type, periodontal disease values remained higher for all cases in Neolithic C when compared to Neolithic B, except for the first incisors, whose values were higher in males from Neolithic B. Non-parametric testing indicates that the differences between the Neolithic B and C samples were not statistically significant. Similarly, no statistically significant sex-related differences were observed. Detailed results are presented in *Table 7*.

In Neolithic B, the highest incidence of periodontal disease was found in the samples from Přerov and Těšetice-Kyjovice. Similar results of the high incidence of periodontitis are seen in the samples of Modřice and Ivanovice, both linked to Neolithic C. The populations of these four Moravian regions were probably the most exposed to the periodontopathic bacteria for a long time, which resulted in a very similar pattern of bone resorption. The samples from Kolín and Pečky in central Bohemia had a lower incidence of periodontitis than the Moravian samples from Neolithic B. The lowest occurrence of periodontitis was detected in the sample of Dambořice from Neolithic C (these were the healthiest dentitions of all the samples in our study) (*Figure 10A, B*). However, these conclusions are not supported by statistical analysis, which did not provide substantiated conclusions due to the small sample sizes. Data from comparative samples (Neolithic A and Final Neolithic) are not available.

At this point, it is important to mention that the overassessment of the incidence of periodontal disease in osteological material is often observed in many anthropological and clinical studies (Clarke *et al.* 1986). These observations may in part have been influenced by the mid-life loss of teeth caused by severe periodontitis, and their absence in the sample may have masked the true extent of periodontal bone loss. The difference in age of eruption and, therefore, the difference in the period of exposure to the oral environment may account for the more severe bone loss in the anterior teeth, especially in specimens from younger individuals (21–30 years) (Tal 1985). It was not possible to study this variability in greater detail, as we don't have any or only a few individuals in each of the age categories in the studied sites. We can only conclude that as in other dental characteristics, the presence of periodontal disease linked to dental health probably varies in different periods and regions.

4.5 Buccal dental microwear

A statistically significant difference in buccal microwear variables (NH, NV, and NH/NT) was found between central and south Moravia in the Neolithic C period. In the group of non-adults, no regional differences were proven in any of the studied periods. The abrasive consistency of the diet (NT) did not statistically differ between Neolithic B and C samples. Sex-related differences in diet were not observed by using non-parametrics tests. A comparison of buccal microwear data with stable isotope data will be discussed in detail in a paper prepared by Drtikolová Kaupová *et al.* (*in prep.*).

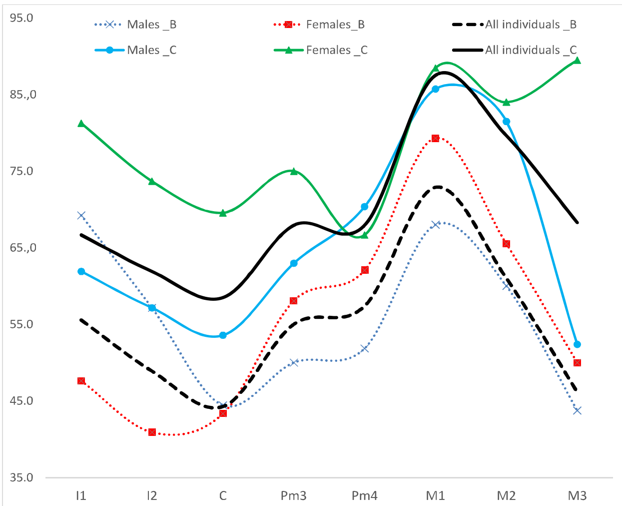


FIGURE 9: Frequencies in percentages (%) of present periodontal disease in Neolithic B and C according to the tooth type. The figure presents data of all individuals over 15 years.

In previously analysed populations, a different buccal microwear pattern was often observed between groups of adults and non-adults (2–14 years) (e.g. Pérez-Pérez *et al.* 1994, Jarošová 2007, Jarošová, Tvrdý 2017). We also looked at diet differences between children and adults in each period and site. Results for the proportion of the meat component depending on NH/NT and NV/NT indices were not entirely uniform in the post-LBK period. We found a different diet among adults and children in Tešetice-Kyjovice (Neolithic B) and Modřice (Neolithic C) by using non-parametrics tests, while at most other sites children and adults did not differ in the proportion of the meat component at the sites of Kolín and Friebritz (both Neolithic B) and Dambořice (Neolithic C). Among these, the sample from Kolín is interesting, as the proportion of the meat component remained unchanged not only between children and adults but also during the transition from Neolithic B to Neolithic C (for details, see the paper by Drtikolová Kaupová *et al., in prep.*). The pairwise comparison using the Kolmogorov-Smirnov test among non-adults from Friebritz (Neolithic B) and Modřice (Neolithic C) did not show any statistical differences as concerns the composition of food (only XMD was $p < 0.025$, i.e. average length of mediodistal striations). From this random sample of south Moravian sites, we can assume uniform food composition among children.

When focusing on buccal microwear at the level of sites, we can see variability in dietary habits across Bohemian and Moravian sites and periods (*Table 8*). The softest diet linked to striation density (NT) was found in adults from Těšetice-Kyjovice (Neolithic B) and in comparative samples from the Early Neolithic (represented by Vedrovice and (Nitra-) Krškany sites) and Final Neolithic (*Figure 11A*). Conversely, a diet with a high proportion of abrasive particles (high NT), which tends to be primarily of plant origin (Lalueza *et al.* 1996), was found in adults from the Brno – Nový Lískovec site (Neolithic C), and in the central Bohemian region, as represented by the sites of Kolín (Neolithic B and C) and Pečky (Neolithic B). A diet with long striations (XT) of buccal dental microwear tending to be associated with the majority of meat components (Lalueza *et al.* 1996) was found at the sites of Brno – Nový Lískovec and Podivín (Neolithic C).

The highest proportion of meat in the diet based on NV/NT and NH/NT indices (Lalueza *et al.* 1996) was found in adult samples from the Neolithic C period at the Podivín site (*Figure 11B*). Among the other sites studied, adults with a higher proportion of NV/NT index also occurred at Brno – Nový Lískovec and Kolín, suggesting that their diet contained a higher proportion of meat. All other studied Neolithic samples might be characterised by a mixed diet. The lowest ratio of meat intake was observed in all studied groups of non-adults

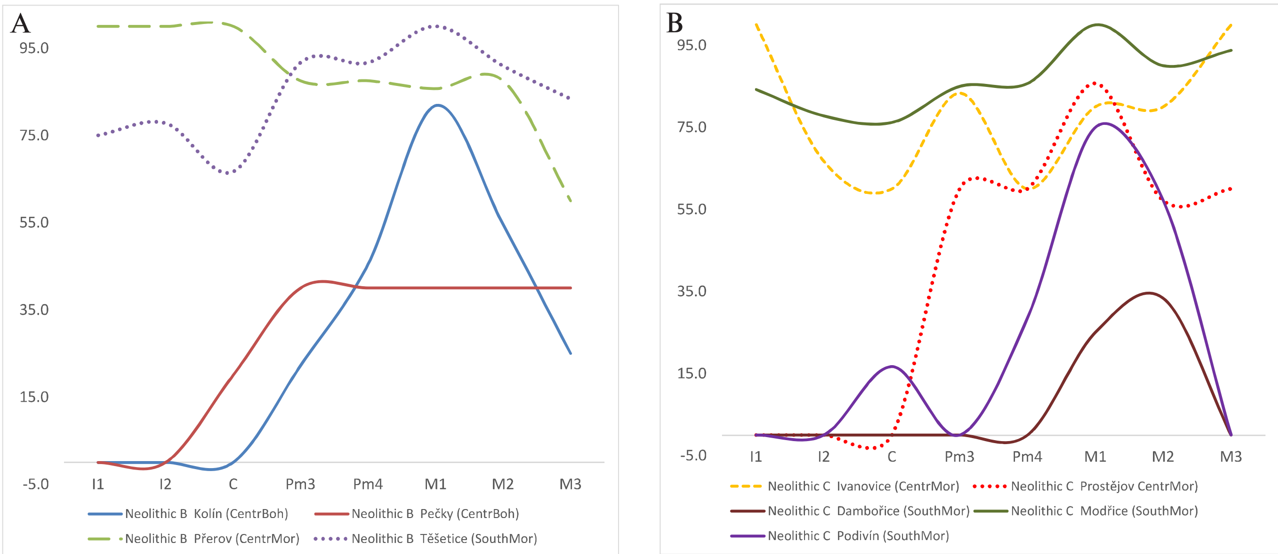


FIGURE 10: Incidence of periodontal disease in samples from Neolithic B (A) and Neolithic C (B) according to selected microregions and tooth types. (Friebritz dated to Neolithic B and Kolín with Brno – Nový Lískovec dated to Neolithic C were excluded due to the small sample size). The figure presents data of all individuals over 15 years.

TABLE 8: Mean values of selected buccal dental microwear variables at studied sites (N>4). The non-adult sample includes children from 2 to 14 years of age, the sample of adults includes individuals over 15 years of age. CB – Central Bohemia, CM – Central Moravia, SM – South Moravia, LA – Lower Austria, NA – Neolithic A, NB – Neolithic B, NC – Neolithic C.

	Buccal dental microwear	Age	Number of examined individuals (N)	NH	XH	NV	XV	NT	XT	NH/NT	NV/NT
Neolithic B (4900–4000 BC)	All adults	Ad	38	24.3	149.2	49.7	161.1	122.2	149.8	0.2032	0.4004
	All children	subAd	17	20.2	119.6	37.5	130.7	99.8	120.4	0.2223	0.3504
Neolithic C (3800–3400 BC)	All adults	Ad	36	21.2	127.1	64.4	195.3	131.0	166.2	0.1632	0.4892
	All children	subAd	22	28.9	118.5	42.3	161.2	113.2	138.6	0.2646	0.3655
Selected microregions	Kolín (CB), NB	Ad	6	20.5	169.9	65.2	160.6	133.2	153.6	0.1647	0.4689
	Pečky (CB), NB	Ad	4	21.3	131.3	65.3	134.2	132.5	136.0	0.1899	0.4528
	Těšetice-Kyjovice (SM), NB	Ad	5	13.8	133.2	32.4	165.3	82.0	155.8	0.1559	0.4314
	Brno-N. Lískovec (SM), NC	Ad	4	27.5	131.3	61.8	238.3	138.0	194.8	0.1718	0.4784
	Kolín (CB), NC	Ad	6	25.3	129.6	67.0	190.3	138.7	151.8	0.1853	0.4715
	Modřice (SM), NC	Ad	11	22.0	130.4	55.1	172.2	123.4	157.1	0.1736	0.4476
	Podivín (SM), NC	Ad	4	18.0	113.5	61.0	216.1	114.0	187.0	0.1581	0.5332
	Friebritz (LA), NB	subAd	4	27.5	112.8	47.5	136.3	115.8	117.9	0.2436	0.3721
	Modřice (SM), NC	subAd	6	35.7	128.0	42.2	163.2	127.8	143.4	0.2830	0.3247
Comparative samples	Vedrovice (SM), NA	Ad	34	18.7	142.3	26.7	163.1	80.7	145.5	0.2369	0.3223
	Nitra (Slovakia), NA	Ad	34	17.2	152.6	39.4	181.2	89.5	167.7	0.1976	0.4337
	Hoštice I (Bell Beakers), Final Neolithic	Ad	40	12.3	127.1	38.3	180.9	85.1	162.2	0.1445	0.4501

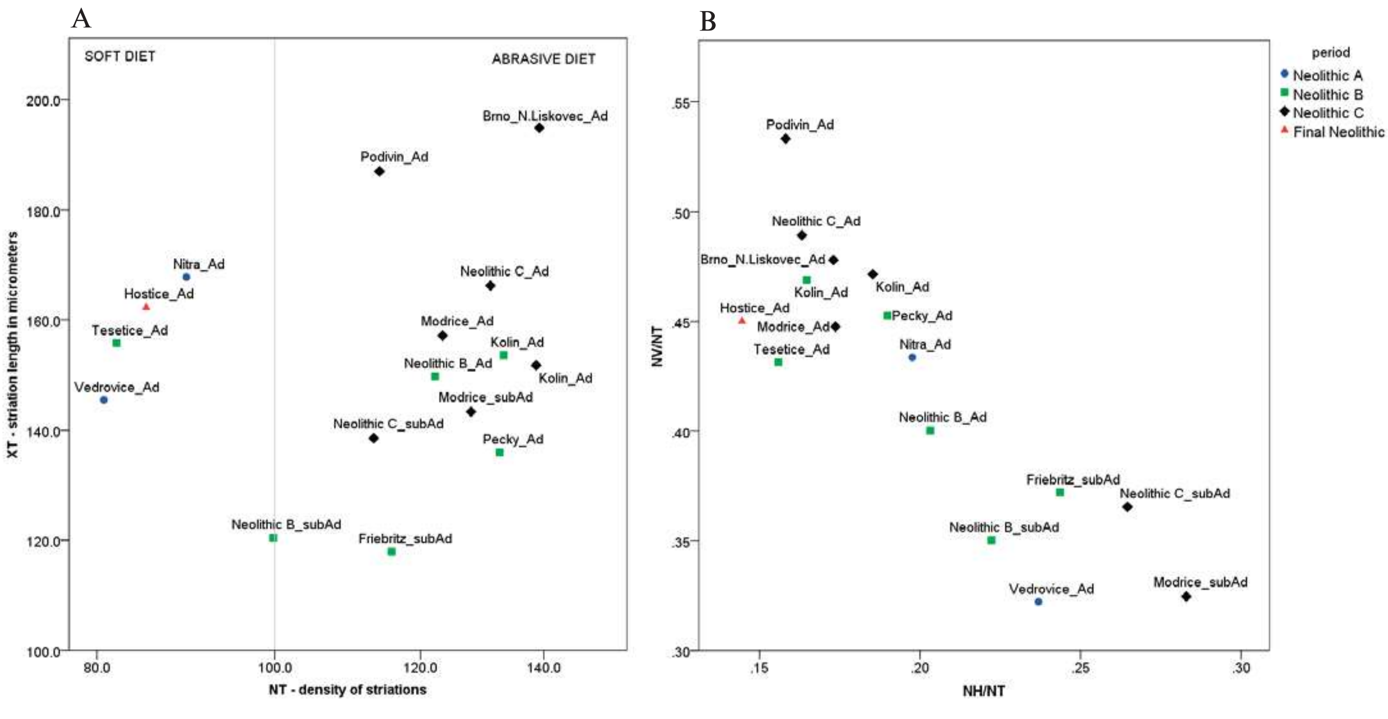


FIGURE 11: Scatterplot A presents dietary abrasiveness by comparing analysed buccal microwear density (NT) and length (XT, in μm) between subadult (2–14 years) and adult samples (over 15 years of age). Scatterplot B presents the ratio of meat intake comparing NH/NT index to NV/NT index between adults and subadults. All samples are presented only as mean values. Presented chronology: Neolithic A (LBK), Neolithic B (SBK/LGK), Neolithic C (TBK), Final Neolithic (Bell Beaker culture).

and also in the Vedrovice sample linked to the Early Neolithic.

The Těšetice-Kyjovice site (south Moravia, settled from Neolithic A to B) differed significantly from the other post-LBK adults in NV, XV and NT values. According to buccal microwear data, food composition at this site was softer (NT = 82) with low meat intakes. A sample of adult individuals buried in Podivín (south Moravia, Neolithic C) showed the highest NV/NT values (0.5332) among all compared sites, which can be linked to the highest proportion of the meat component in food.

According to the results of the reconstruction of the diet using buccal microwear, the long-term settled sites of Modřice (south Moravia, Neolithic C), Kolín and Pečky (central Bohemia, Neolithic B and C) appear to be uniform in terms of the higher abrasiveness of the diet (based on NT) and mixed composition of the diet (by using NV/NT ratio) compared to other studied microregions.

5. DISCUSSION

Vedrovice (Early Neolithic LBK cemetery) represents a human skeletal population at the introduction to agriculture. As observed at Vedrovice, the presence of advanced carious lesions in many of the studied individuals suggests the consumption of carbohydrates in the diet, as occurs with the consumption of cereal-based subsistence strategies (Lillie 2008). Larsen (2002: 123) notes that caries incidence increases with the adoption of agriculture and the concomitant consumption of carbohydrates, although regional variability is in evidence (e.g. Frayer 1987, 2004). Larsen (1995: 189) also links the differences in caries expression between males and females to gender-based differences in the preparation and consumption of food, a factor which could be implicated in the caries incidence and oral pathology at the Vedrovice cemetery (Lillie 2008). Caries incidence in individuals buried in LBK settlements was quite different from individuals buried in LBK burial grounds, even if both reflected gender differences in caries expression: LBK females from settlements tend to have a low number of carious teeth similar to Neolithic C females, whereas the caries incidence of LBK males buried at settlements tends to be higher than the caries incidence linked to values of individuals buried at LBK cemeteries. When comparing the absolute values of the caries incidence in Neolithic A, LBK cemeteries always have higher values than LBK settlements.

Females in the Neolithic B and C periods also exhibit higher incidences of caries when compared to males, which can reflect different access to dietary carbohydrates in these populations: females in Neolithic B tend to consume a similarly high ratio of carbohydrates in food as LBK individuals buried at cemeteries, while females in Neolithic C already decreased their ratio of carbohydrates in consumed food. Nevertheless, it is difficult to estimate if this behaviour was a result of some socio-economic changes or food preferences. What is noticeable, however, are differences in tooth decay in a chrono-geographical context, when in post-LBK periods we have observed several sites without any dental caries. However, the absence of tooth decay might only be the result of a random lower carbohydrate intake in individuals from post-LBK periods with distinct stages of agricultural techniques and only a few buried individuals, which do not represent the entire population as in the LBK comparative samples. There are only a few sites (e.g. Modřice, Kolín) which can be classified as "long-term settlements", so these can probably provide the clearest picture of post-LBK agriculture patterns traceable on dental remains.

Moreover, as observed in our samples, a low carbohydrate diet does not imply a diet with high meat intake (as observed e.g. at the Podivín site, which, with all its dental characteristics, represents a very unique example). When considering sex-related differences, there was no higher meat intake observed in females compared to males in all LBK and post-LBK populations. A tendency to higher meat intake was observed in Neolithic C, while the LBK population at Vedrovice was characterised by low meat intake.

As we can see from all dental characteristics observed, the introduction of the agricultural way of life was neither continuous nor uniform. In the LBK population, we observed a local decrease in the prevalence of dental caries, higher tooth wear as a consequence of an abrasive diet, probably related to food preparation techniques, and we hypothesise different levels of exposure to periodontal bacteria. Differences among Neolithic populations might also suggest new behavioural patterns, including different eating habits. As suggested by Šmíd *et al.* (2018), the burial grounds of the Funnel Beaker culture (TBK; in our Neolithic C context), with burials in an outstretched position without grave goods, were a new phenomenon in the studied area and in neighbouring Poland.

According to Šmíd their occurrence across Moravia from Olomouc through Prostějov (Čechůvky) to Modřice near Brno and further to Podivín near Mikulov to Maissau in Lower Austria determines the direction of their intense penetration from north to south to the territory of present-day Lower Austria. These new populations might have passed through the studied area or partially settled. However, it is possible that they did not follow previous eating habits and therefore the data from the Final Neolithic period seems to be different. Many questions still remain unanswered. We will keep these discussions open to other researchers, who can build on our findings and continue to investigate the Neolithic populations to refine our knowledge about them.

6. CONCLUSION

In this study, the dental health characteristics of 141 individuals (88 adults over 15 years of age and 53 non-adults) were analysed. Concerning dental caries, the intersex differences in its prevalence within the different Neolithic phases were not found to be statistically significant. When comparing the data on dental caries from Neolithic A (Early Neolithic, LBK) with our results, it appeared that changes in the prevalence of dental caries did not occur continuously during the Neolithic, as might be expected, but probably depended on differences in dietary composition in a geographical and chronological context. In adults (over 20 years of age), the highest values of caries intensity were recorded in Neolithic A (Early Neolithic, LBK), then decreased slightly in Neolithic B (Middle Neolithic, SBK/LgK), and the lowest values of caries intensity were observed in Neolithic C (Late Neolithic, TBK) and the Final Neolithic (Bell Beaker culture). Thus, it can be said that the incidence of dental caries had a decreasing tendency during the Neolithic in the studied region, with oscillations at the local level.

Periodontal disease was found to be more common in the Neolithic C samples when compared to Neolithic B, but without statistically significant differences.

Scores of dental wear recorded for the Neolithic B and C period often overlap and no significant differences were observed. This finding is consistent with the observation of food composition analysed by buccal microwear analysis, according to which both Neolithic B and C individuals have a similarly high number of total striations (NT). Thus the Neolithic B and C samples can be linked to a diet containing a high proportion of abrasive particles, while the samples from Neolithic A and the Final Neolithic can be linked to a soft diet.

Using buccal dental microwear analysis (n = 113), variability in the adult diet was found among microregions and periods: while those dated to Neolithic B might be associated with a mixed diet, a tendency towards higher meat consumption was observed at most of the sites dated to Neolithic C (Late Neolithic, TBK). Buccal microwear data for Neolithic A (Early Neolithic, LBK) sites suggest high variability in the ratio of meat consumed – in Vedrovice we observed the lowest meat intake, while in Horné Krškany the ratio of meat consumed was comparable to Neolithic B samples. In Neolithic B and C, sites were identified at which the diets of both children (n = 39) and adults (n = 74) appear to have been uniform in terms of buccal dental microwear data, but there are also exceptions where the diets of children and adults were significantly different. From this point of view, the post-LBK period does not seem as uniform as we might have first thought. In the studied region, in a changing geographic and chronological context, societies probably existed at different socioeconomic levels, which was subsequently reflected in the approach to the food consumed.

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APPENDIX 1: List of examined adult individuals (15+ years) from Neolithic B and C included in this study. CB – Central Bohemia, CM – Central Moravia, EB – Eastern Bohemia, SM – South Moravia.A complete database of all dental characteristics can be requested from the main author.

id_projekt 19-16304S	Site	Grave no.	Studied microregion	Traditional period	Neolithic period in our study	Subregion	Sex	Age	No. of examined permanent teeth	No. of examined caries (C)	No. of examined intravital looses (E)	No. of examined alveoli (A)	%C	%E	I-CE	nC	nE	nCE	CDI	CAI	Bucal microwear (for source data, see Drtikolová Kaupová *et al.* in prep.)
GLN-098	Brno - Novy Liskovec, Kaminky	indiv. I	Brno-Novy Liskovec_C	TBK	C	SM	M	20-35 y	30	2	2	32	6.7	6.3	12.9			1	100.0	100.0	yes
GLN-177	Brno - Novy Liskovec, Kaminky	indiv. II	Brno-Novy Liskovec_C	TBK	C	SM	M	35-50 y	31	0	0	31	0.0	0.0	0.0				96.9	96.9	yes
GLN-178	Brno - Novy Liskovec, Kaminky	indiv. III	Brno-Novy Liskovec_C	TBK	C	SM	F	35-50 y	31	1	0	32	3.2	0.0	3.2	1			96.9	100.0	yes
GLN-179	Brno - Novy Liskovec, Kaminky	indiv. IV	Brno-Novy Liskovec_C	TBK	C	SM	M	20-35 y	7	0	0	9	0.0	0.0	0.0				21.9	28.1	yes
GLN-105	Brno-Ivanovice	H 803/obj. 784/ 2010		LgK	B	SM	F	20-35 y	21	2	1	32	9.5	3.1	12.6			1	68.8	100.0	yes
GLN-162	Brno-Komin	Pa44/1938		LgK	B	SM	M	20-35 y	27	2	0	32	7.4	0.0	7.4	1			84.4	100.0	yes
GLN-119	Dambořice	806	Damborice_C	TBK	C	SM	F	20-35 y	22	0	0	29	0.0	0.0	0.0				68.8	90.6	no
GLN-120	Dambořice	807	Damborice_C	TBK	C	SM	?	20-35 y	15	0	0	15	0.0	0.0	0.0				46.9	46.9	yes
GLN-121	Dambořice	808	Damborice_C	TBK	C	SM	F	20-35 y	29	0	0	31	0.0	0.0	0.0				90.6	96.9	yes
GLN-123	Dambořice	810	Damborice_C	TBK	C	SM	M	20-35 y	28	0	0	32	0.0	0.0	0.0				87.5	100.0	yes
GLN-106	Friebritz-Süd	13/1	Friebritz_B	LgK	B	SM	M	20-35 y	23	0	0	30	0.0	0.0	0.0				71.9	93.8	yes
GLN-107	Friebritz-Süd	13/2	Friebritz_B	LgK	B	SM	F	20-35 y	12	0	0	16	0.0	0.0	0.0				37.5	50.0	yes
GLN-112	Friebritz-Süd	134	Friebritz_B	LgK	B	SM	M	50+ y	1	0	0	1	0.0	0.0	0.0				3.1	3.1	no
GLN-114	Friebritz-Süd	136	Friebritz_B	LgK	B	SM	M	20-35 y	31	0	0	32	0.0	0.0	0.0				96.9	100.0	yes
GLN-087	Hluboké Mašůvky	H1/1897		LgK	B	SM	?	35-50 y	11	0	0	14	0.0	0.0	0.0				34.4	43.8	yes
GLN-160	Holubice	inv.č.10		LgK	B	CM	?	15-19 y	15	0	0	16	0.0	0.0	0.0				46.9	50.0	yes
GLN-170	Ivanovice na Hané 3/2_Padělky	H807	Ivanovice_C	TBK	C	CM	F	35-50 y	30	0	0	30	0.0	0.0	0.0				93.8	93.8	no
GLN-171	Ivanovice na Hané 3/2_Padělky	H808	Ivanovice_C	TBK	C	CM	F	20-35 y	21	0	0	23	0.0	0.0	0.0				65.6	71.9	no
GLN-173	Ivanovice na Hané 4, Za střediskem	H805	Ivanovice_C	TBK	C	CM	F	20-35 y	30	0	0	30	0.0	0.0	0.0				93.8	93.8	yes
GLN-068	Ivanovice na Hané 4, Za střediskem	obj. 518 - H 808	Ivanovice_C	TBK	C	CM	F	50+ y	10	0	1	20	0.0	5.0	5.0		1		34.4	62.5	no
GLN-174	Ivanovice na Hané 4, Za střediskem	H812	Ivanovice_C	TBK	C	CM	M	35-50 y	24	0	0	25	0.0	0.0	0.0				75.0	78.1	yes
GLN-030	Kolín (u kostela Všech svatých) = Starý Kolín	H1, obj. 3/2012	Kolin_B	LgK	B	CB	F	35-50 y	27	1	0	28	3.7	0.0	3.7	1			84.4	87.5	yes
GLN-012	Kolín obchvat	165	Kolin_B	SBK	B	CB	F	20-35 y	28	0	0	32	0.0	0.0	0.0				87.5	100.0	yes
GLN-013	Kolín obchvat	265	Kolin_B	SBK	B	CB	F	20-35 y	27	5	0	32	18.5	0.0	18.5	1			84.4	100.0	yes

GLN-015	Kolín obchvat	5096	Kolin_B	SBK	B	CB	M	35-50 y	29	0	0	29	0.0	0.0	0.0				90.6	90.6	yes
GLN-016	Kolín obchvat	5160	Kolin_B	SBK	B	CB	F	20-35 y	23	0	1	26	0.0	3.8	3.8		1		75.0	81.3	yes
GLN-018	Kolín obchvat - sev. brána rondelu	452	Kolin_B	SBK/LGK	B	CB	?	20-35 y	7	0	0	7	0.0	0.0	0.0				21.9	21.9	yes
GLN-022	Kolín obchvat - sev. brána rondelu	469	Kolin_B	SBK/LGK	B	CB	M	20-35 y	25	0	0	29	0.0	0.0	0.0				78.1	90.6	yes
GLN-032	Kolín-Šťáralka	H 1/obj 56	Kolin_C	TBK	C	CB	F	15-19 y	12	0	0	12	0.0	0.0	0.0				37.5	37.5	yes
GLN-033	Kolín-Šťáralka	H 2/obj 57	Kolin_C	TBK	C	CB	F	35-50 y	11	0	0	24	0.0	0.0	0.0				34.4	75.0	yes
GLN-036	Kolín-Šťáralka	H 6/obj 68	Kolin_C	TBK	C	CB	F	15-19 y	9	0	0	15	0.0	0.0	0.0				28.1	46.9	yes
GLN-040	Kolín-Šťáralka	H 10/obj 72	Kolin_C	TBK	C	CB	M	15-19 y	13	0	0	13	0.0	0.0	0.0				40.6	40.6	yes
GLN-043	Kolín-Šťáralka	H 13/obj 75	Kolin_C	TBK	C	CB	M	35-50 y	11	0	0	13	0.0	0.0	0.0				34.4	40.6	yes
GLN-044	Kolín-Šťáralka	H 14/obj 77	Kolin_C	TBK	C	CB	M	35-50 y	23	0	0	23	0.0	0.0	0.0				71.9	71.9	yes
GLN-082	Krumlovský les	H 1		LgK	B	SM	F	20-35 y	29	0	0	32	0.0	0.0	0.0				90.6	100.0	yes
GLN-083	Krumlovský les	H 2a		LgK	B	SM	F	35-50 y	24	0	1	32	0.0	3.1	3.1		1		78.1	100.0	yes
GLN-088	Mašovice-Pšeničné	1066/H1/2003		LgK	B	SM	M	20-35 y	31	2	0	32	6.5	0.0	6.5	1			96.9	100.0	yes
GLN-163	Medlov	H800		TBK	C	CM	M	20-35 y	6	0	0	6	0.0	0.0	0.0				18.8	18.8	no
GLN-004a	Miskovice	104		SBK	B	CB	?	20-35 y	4	0	0	4	0.0	0.0	0.0				12.5	12.5	yes
GLN-005	Miskovice	108		SBK	B	CB	?	35-50 y	2	0	0	2	0.0	0.0	0.0				6.3	6.3	yes
GLN-130	Modřice-Rybníky	H 3851/2015	Modrice_C	TBK	C	SM	F	20-35 y	28	4	0	31	14.3	0.0	14.3	1			87.5	96.9	yes
GLN-131	Modřice-Rybníky	H 3853/2015	Modrice_C	TBK	C	SM	M	50+ y	26	6	0	29	23.1	0.0	23.1	1			81.3	90.6	yes
GLN-134	Modřice-Rybníky	H 3858/2015	Modrice_C	TBK	C	SM	F	15-19 y	19	0	0	19	0.0	0.0	0.0				59.4	59.4	yes
GLN-136	Modřice-Rybníky	H 3860/2015	Modrice_C	TBK	C	SM	F	15-19 y	25	0	0	32	0.0	0.0	0.0				78.1	100.0	yes
GLN-137	Modřice-Rybníky	H 3862/2015	Modrice_C	TBK	C	SM	F	35-50 y	32	1	0	32	3.1	0.0	3.1	1			100.0	100.0	yes
GLN-140	Modřice-Rybníky	H 3866/2015	Modrice_C	TBK	C	SM	M	50+ y	16	0	7	29	0.0	24.1	24.1		1		71.9	90.6	no
GLN-143	Modřice-Rybníky	H 3872/2015	Modrice_C	TBK	C	SM	M	20-35 y	29	0	0	32	0.0	0.0	0.0				90.6	100.0	yes
GLN-146	Modřice-Rybníky	H 3889/2015	Modrice_C	TBK	C	SM	F	20-35 y	32	1	0	32	3.1	0.0	3.1	1			100.0	100.0	yes
GLN-148	Modřice-Rybníky	H 4805/2015	Modrice_C	TBK	C	SM	F	35-50 y	27	2	1	32	7.4	3.1	10.5			1	87.5	100.0	yes
GLN-149	Modřice-Rybníky	H 4809/2015	Modrice_C	TBK	C	SM	F	50+ y	5	0	14	27	0.0	51.9	51.9		1		59.4	84.4	yes
GLN-150	Modřice-Rybníky	H 4811/2015	Modrice_C	TBK	C	SM	M	20-35 y	29	0	0	32	0.0	0.0	0.0				90.6	100.0	yes
GLN-158	Modřice-Rybníky	H 3855/2015		SBK	B	SM	M	15-19 y	27	0	2	32	0.0	6.3	6.3		1		90.6	100.0	yes
GLN-099	Modřice-Rybníky (ROVA)	H 3820/2008		LgK	B	SM	M	50+ y	17	0	6	28	0.0	21.4	21.4		1		71.9	87.5	yes
GLN-101	Modřice-Rybníky (ROVA)	H 3831/2008	Modrice_C	TBK	C	SM	F	35-50 y	27	0	0	31	0.0	0.0	0.0				84.4	96.9	yes
GLN-089	Moravský Krumlov	1.1980		LgK	B	SM	F	20-35 y	2	0	0	2	0.0	0.0	0.0				6.3	6.3	yes
GLN-164	Náměšť na Hané - Za hřbitovem	H800		TBK	C	CM	F	35-50 y	21	0	0	28	0.0	0.0	0.0				65.6	87.5	yes
GLN-051	Pavlov	obj. 7 - H1		LgK	B	SM	M	35-50 y	28	0	0	32	0.0	0.0	0.0				87.5	100.0	yes

GLN-024	Pečky	KH1, 516	Pecky_B	SBK	B	CB	F	35-50 y	23	2	0	23	8.7	0.0	8.7	1			71.9	71.9	yes
GLN-025	Pečky	KH2, 517A	Pecky_B	SBK	B	CB	F	35-50 y	23	1	0	30	4.3	0.0	4.3	1			71.9	93.8	yes
GLN-026	Pečky	KH3, 521	Pecky_B	SBK	B	CB	F	20-35 y	13	1	0	18	7.7	0.0	7.7	1			40.6	56.3	no
GLN-027	Pečky	KH4, 546	Pecky_B	SBK	B	CB	M	15-19 y	24	0	0	31	0.0	0.0	0.0				75.0	96.9	yes
GLN-029	Pečky	KH6, 553	Pecky_B	SBK	B	CB	M	20-35 y	23	0	0	26	0.0	0.0	0.0				71.9	81.3	yes
GLN-008	Plotiště nad Labem	LVI		SBK	B	EB	F	35-50 y	23	2	0	25	8.7	0.0	8.7	1			71.9	78.1	yes
GLN-151	Podivín	H800	Podivin_C	TBK	C	SM	F	20-35 y	19	2	0	21	10.5	0.0	10.5	1			59.4	65.6	yes
GLN-152	Podivín	H801	Podivin_C	TBK	C	SM	M	20-35 y	26	0	0	28	0.0	0.0	0.0				81.3	87.5	yes
GLN-154	Podivín	H803	Podivin_C	TBK	C	SM	M	15-19 y	14	0	0	18	0.0	0.0	0.0				43.8	56.3	yes
GLN-156	Podivín	H805	Podivin_C	TBK	C	SM	F	50+ y	2	0	18	19	0.0	94.7	94.7		1		62.5	59.4	no
GLN-157	Podivín	H806	Podivin_C	TBK	C	SM	M	20-35 y	32	0	0	32	0.0	0.0	0.0				100.0	100.0	yes
GLN-086	Předmostí Dluhonice (Přerov)	126/1/2006	Prerov_B	LgK	B	CM	F	35-50 y	27	1	2	32	3.7	6.3	10.0			1	90.6	100.0	no
GLN-168	Přerov-Předmostí 8	H811	Prerov_B	LgK	B	CM	F	20-35 y	32	0	0	32	0.0	0.0	0.0				100.0	100.0	yes
GLN-169	Přerov-Předmostí 8	H812	Prerov_B	LgK	B	CM	M	20-35 y	29	8	0	32	27.6	0.0	27.6	1			90.6	100.0	yes
GLN-166	Přerov-Předmostí 8	H809/obj. 107	Prerov_B	LgK	B	CM	F	35-50 y	20	1	1	26	5.0	3.8	8.8			1	65.6	81.3	yes
GLN-085	Prostějov-Čechůvky	K1535		LgK	B	CM	F	15-19 y	31	0	0	32	0.0	0.0	0.0				96.9	100.0	yes
GLN-056	Prostějov-Čechůvky	H1/K519/2001	Prostejov_C	TBK	C	CM	?	15-19 y	29	0	0	31	0.0	0.0	0.0				90.6	96.9	no
GLN-060	Prostějov-Čechůvky	H 7	Prostejov_C	TBK	C	CM	F	35-50 y	13	0	0	32	0.0	0.0	0.0				40.6	100.0	yes
GLN-064	Prostějov-Čechůvky	H 10	Prostejov_C	TBK	C	CM	M	20-35 y	15	0	0	25	0.0	0.0	0.0				46.9	78.1	yes
GLN-067	Prostějov-Držovice-U hřbitova	obj. 575 - H 6	Prostejov_C	TBK	C	CM	M	15-19 y	15	0	0	16	0.0	0.0	0.0				46.9	50.0	yes
GLN-093	Střelice	H 9		LgK	B	SM	?	35-50 y	2	0	0	9	0.0	0.0	0.0				6.3	28.1	no
GLN-091	Střelice I. Starý zámek	without no.		LgK	B	SM	F	50+ y	3	1	19	24	33.3	79.2	112.5			1	68.8	75.0	yes
GLN-090	Střelice u Brna-Prostřední trať	obj. 523/K800/2005		LgK	B	SM	?	15-19 y	18	0	0	18	0.0	0.0	0.0				56.3	56.3	yes
GLN-077	Těšetice-Kyjovice	3.1972	Tesetice_B	LgK	B	SM	M	20-35 y	29	0	0	30	0.0	0.0	0.0				90.6	93.8	yes
GLN-078	Těšetice-Kyjovice	4.1974	Tesetice_B	LgK	B	SM	M	20-35 y	12	0	0	15	0.0	0.0	0.0				37.5	46.9	yes
GLN-080	Těšetice-Kyjovice	8.1976	Tesetice_B	LgK	B	SM	F	20-35 y	31	0	0	32	0.0	0.0	0.0				96.9	100.0	yes
GLN-069	Těšetice-Kyjovice	2_1/1968	Tesetice_B	SBK	B	SM	M	35-50 y	27	0	0	30	0.0	0.0	0.0				84.4	93.8	no
GLN-070	Těšetice-Kyjovice	2_2/1968	Tesetice_B	SBK	B	SM	?	35-50 y	13	0	0	16	0.0	0.0	0.0				40.6	50.0	no
GLN-073	Tešetice-Kyjovice	2.10.1981	Tesetice_B	SBK	B	SM	F	50+ y	29	0	0	32	0.0	0.0	0.0				90.6	100.0	yes
GLN-072	Těšetice-Kyjovice	1.10.1981	Tesetice_B	SBK	B	SM	M	20-35 y	27	0	0	32	0.0	0.0	0.0				84.4	100.0	yes
GLN-097	Žádovice	obj. 128/1986		TBK	C	SM	M	20-35 y	26	0	0	32	0.0	0.0	0.0				81.3	100.0	yes

APPENDIX 2: List of examined non-adult individuals (0–14 years) from Neolithic B and C included in this study. For data source of buccal microwear analysis, see Drtikolová Kaupová *et al.,* in prep.).

Dambořice (804, TBK, C, 0.5–6 y; 805, TBK, C, 7–14 y; 813, TBK, C, 0.5–6 y); Friebritz-Süd (131, LgK, B, 0.5–6 y; 132, LgK, B, 0.5–6 y; 133, LgK, B, 0.5–6 y; 135, LgK, B, 7–14 y; 137, LgK, B, 0.5–6 y); Ivanovice na Hané 4, Za střediskem (H804, TBK, C, 7–14 y); Kolín obchvat (418, SBK, B, 7–14 y); Kolín obchvat – sev. brána rondelu (452, SBK/LGK, B, 7–14 y; 452, SBK/LGK, B, 0.5–6 y; 469, SBK/LGK, B, 0.5–6 y); Kolín-Šťáralka (H 4/obj 64, TBK, C, 7–14 y; H 5/obj 66, TBK, C, 7–14 y; H 8/obj 70, TBK, C, 0.5–6 y; H 9/obj 71, TBK, C, 0.5–6 y; H 11/obj 73, TBK, C, 7–14 y); Miskovice (94, SBK, B, 7–14 y; 102, SBK, B, 0.5–6 y; 104, SBK, B, 0.5–6 y); Modřice-Rybníky (H 3850/2015, TBK, C, 0.5–6 y; H 3854/2015, TBK, C, 7–14 y; H 3859/2015, TBK, C, 0.5–6 y; H 3869/2015, TBK, C, 7–14 y; H 3871/2015, TBK, C, 7–14 y; H 3878/2015, TBK, C, 0.5–6 y; H 3881/2015, TBK, C, 0.5–6 y; H 3896/2015, TBK, C, 0.5–6 y; H 3828/2008, LgK, B, 7–14 y; H 3841/2008, TBK, C, 7–14 y); Plotiště nad Labem (LII, SBK, B, 7–14 y; LIII, SBK, B, 7–14 y; LVIII, SBK, B, 7–14 y); Přerov-Předmostí 5 (H822, LgK, B, 7–14 y); Prostějov-Čechůvky (H 2, TBK, C, 0.5–6 y; H 4, TBK, C, 0.5–6 y; H 6, TBK, C, 0.5–6 y; H 8A, TBK, C, 7–14 y; H 8B, TBK, C, 0.5–6 y; H 9, TBK, C, 0.5–6 y); Prostějov-Držovice – U hřbitova (obj. 591 – H 3, TBK, C, 0.5–6 y; obj. 557 – H 5, TBK, C, 7–14 y); Slatinky-Kosíř, Mohyla I (H1, TBK, C, 0.5–6 y; H2, TBK, C, 7–14 y); Sudoměřice (H800, TBK, C, 7–14 y; H801, TBK, C, 7–14 y); Těšetice-Kyjovice (KH1/1967, LgK, B, 0.5–6 y; 6/1967, LgK, B, 0.5–6 y; 3/10/1981, SBK, B, 7–14 y); Vedrovice – Široká u lesa sídliště (109/1984, LgK, B, 0.5–6 y); Velešovice-Padělky (obj. 1, LgK, B, 7–14 y); Žádovice (obj. 237, TBK, C, 7–14 y).