Non-metric dental traits and dental disease from Late Bronze Age and Early Iron Age in Armenia

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Abstract
Antropological data from a (n=140) Late Bronze Age and Early Iron Age skeletal series provide insight into health, disease, and stress levels in Late Bronze Age and Early Iron Age in Armenia. The samples were recovered from the Lori region during excavations in 2009 and 2015. Macroscopic (observational) analysis of the teeth relied on inspection and exploration of the teeth in their totality. The southern gracile type is characteristic for individuals of the Late Bronze Age and Early Iron Age from Lori region. The Late Bronze Age and Early Iron Age was a time of greater nutritional stress. The most common findings were the dental caries with related complications and enamel hypoplasias.

Keywords: Armenia; Late Bronze Age and Early Iron Age; dental traits; dental diseases

Introduction

Teeth are vitally important to the study of the skeletal remains of past peoples (1). This is especially true of remains like those recovered at the sites from Lori region (Armenia). Due to their poor preservation, the analysis that can be performed on bony elements is limited. However, since teeth are more likely to survive, they can provide a wealth of information that might otherwise be missed. Dental morphology provides insights into phenotypic group differences and suggests differences in genotypic affiliation (2). Non-metric dental traits are partly controlled by genetics, and they are relatively free of gender and age bias (3). Commonly used to determine specific research questions such as the synchronic biological relatedness of segments of a particular society (4, 5) or diachronic changes in trait expressions in a particular region (6, 7, 8, 9, 10).

Overall there are a number of factors, which induce or predispose an individual to dental disease and defects, and it is important to remember these if we are to study, analyses and interpret dentitions of the past in order to get a better understanding of historic lives. Diet is an important aspect of past people's lives as it can have a wide ranging effect on the health and well-being of individuals and populations. Foods that tend to be high in sugars – whether natural or artificial, can have serious erosive affects on the dentition as well as promoting carious lesions throughout the mouth. Diets high in protein are also susceptible to higher amounts of calculus and can lead to more complicated conditions such as periodontal disease, which is much more prevalent today than in the past (11). Dental wear analysis presents information on differing food processing techniques which can give insight into the technology and culture of a population.

The aims of this article are to review the types of information which are potentially retrievable from a study of infectious disease in antiquity, and the range of published research already extant world on infectious disease, to document the range and quality of work already completed on Armenia material, and to recommend the way forward and best practice. In such a short article it will not be possible to include all aspects of infectious disease in past populations but the more common approaches will be considered. It is of necessity that a biocultural approach needs to be considered. The term refers to the biological evidence for disease within its cultural context, e.g. did the living environment of populations predispose them to infectious disease? While some Armenia researchers in paleobiological anthropology do follow this biocultural approach to studying paleopathology, others for Armenia material.

Dental diseases are classified either as infectious (when a pathogenic microorganism is responsible for the development of the condition), degenerative (due to the loss of a conspicuous amount of tooth or bone surface or substance), developmental (diseases occurring during the formation of dental tissues or during the developing interrelationship between teeth and jaws) or genetic (12, 1, 13, 14). Infectious disease has been an important element in the ecological model of collapse. Instead of epidemic disease, such as the yellow fever epidemics once proposed by Spinden (15), infectious disease is generally incorporated into collapse models as a factor operating in synergism with malnutrition, and contributing to an overall poor health status. The synergistic interaction of infectious disease with malnutrition is widely recognized as a critical element of weanling diarrhea and subadult morbidity and mortality in disadvantaged populations (16). Undoubtedly, this process operated among the population Late Bronze Age and Early Iron Age, as indicated by the prevalence of developmental enamel defects. Infectious disease can also be studied directly in skeletal remains through the investigation of subperiosteal bone inflammation – periostitis – a common response to infection. Disturbance of the periosteal membrane by infectious agents results in the deposition of a thin layer of fibrous new bone on the surface of the existing bone cortex. On recovery from the infection, this new bone is remodeled and gradually integrated into the underlying cortex. Thus, the state of periosteal reactions gives clues to the status of the infection that produced them, be it active or healed.

Materials and methodology

The human remains that were analyzed and that are discussed here were excavated by a team of archaeologists from Armenia under the direction of Suren Hobpsyan at the Bakheri chala, Bover and Barcryal sites located on the Lori region (Figure 1). Some graves are found only human teeth or human jaws with teeth.

Excavations at Lori region began in 2009 by S. Hobosyan and are still in progress.

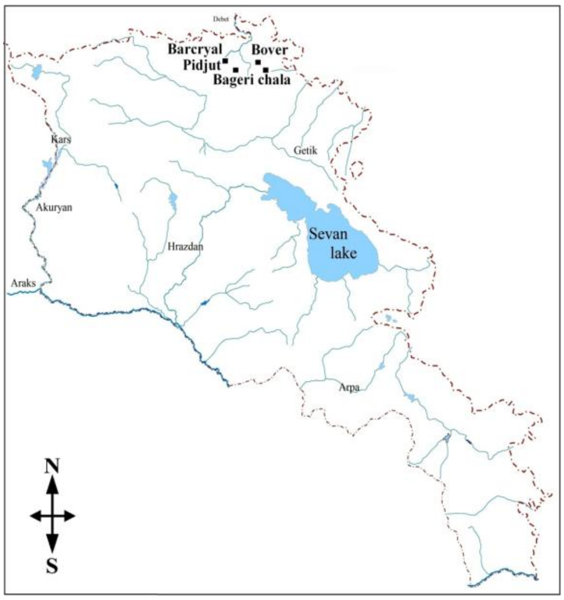

Figure 1. Map of Armenia showing the location of the sites discussed in the paper

Archaeological excavations were done near the villages of Shnogh and Teghut, Lori District of the Republic of Armenia. Due to good climatic and geographic conditions, the basin of the Shnogh river, where the Dukanadzor mining district is situated, had been inhabited since the Stone Age. On the area of nearly 1500ha there are tens of settlements and cemeteries dealing especially with the period from the Bronze Age to medieval times (Hobossyan 2011). All of the burials appear to have been primary interments, typical of the Late Bronze Age and Early Iron Age (c. 13st – 11rd BCE), and oriented in an east-west direction. One major difficulty in the study of human remains is preservation. Whether naturally caused through time or through intervention from humans or animals, the damage to the skeleton can cause much heartache and frustration. In an ideal situation the entire skeleton would be available, but more often then not, bones are broken or missed in excavations, or were just not suitable for analysis. Some graves are found only human teeth or human jaws with teeth. The material makeup of teeth presents the prospect for better preservation and as a result, provides the opportunity for analysis when it may not have been available otherwise. Enamel is the hardest tissue in the human body and can provide evidence of the stresses an individual was experiencing early in life during its formation. Dentition can also display the results that often occur when teeth are used for purposes other than eating, or when substances possibly not suitable for consumption are eaten. Through dental studies paleopathologist are able to extract an extensive record of the life of an individual, presenting insights into the stresses, diets and occupations which an individual and or population may have dealt with during their lives. Dental and skeletal remains of 140 individuals were available for the analysis (Table 1). A burial was excavated there containing the remains of individual, together with rich grave goods. Intentionally interred remains of small animals were also common.

The age-at-death and sex of adults were assessed through the use of multiple indicators: morphological features of the pelvis and cranium were used for the determination of sex (17, 18); a combination of pubic symphysis (19, 20, 21), auricular surface changes (22), degree of epiphyseal union (18), and cranial suture closure (21) were used for adult age estimation. For subadults, dental development and eruption, long bone length, and the appearance of ossification centres and epiphyseal fusion were used (23, 24, 25, 18).

The following 10 non-metric dental traits were recorded using the binary system of “presence” or “absence”: (1) diastema of the upper central incisors I1–I1 and double shovelling; (2) crowding of the upper lateral incisor I2; (3) reduced hypocone of the upper second molar, forms 3+ and 3, and reduced maxillary second permanent molar. Here, Dahlberg’s degree of cusp reduction was employed; (4) Carabelli cusp on the upper first molar M1; (5) four-cusped forms on the lower first molar M1; (6) form +5 on the lower first molar M1; (7) four-cusped crown form of the lower second molar M2; (8) deflected metaconid wrinkle on the lower first molar M1 (9) the variant 2med II position of the second furrow of the M1 metaconid, and (10) the distal crest on the lower first molar M1 trigonid (26, 27). Non-metric dental traits definitions and code matching for the ranked traits used in the study (Zubov scheme) and in the Arizona State University Dental System (ASU scheme) cited according to Haeussler and Turner (28) and Khudaverdyan (10).

There are several conditions that fall under Enamel Defects category including linear enamel hypoplasia, gross enamel defects and deciduous enamel defects. These defects can occur on all the teeth (generally implying genetic factors) or on a majority of teeth, suggesting a possible metabolic origin. These

Site	Sex	Age categories							
		0-10	11-19	20-29	30-39	40-49	50-59	60+	Total
Bakheri chala	male			1	5	1	4	3	14
	female				4	3	1	1	9
	undet.		5	2	1	2			9
Bover	male		1	7	7	7	2	1	25
	female			1	2	1	1		5
	undet.	2	1	8	3	1	1		16
Barcryal	male		1	4	4	9	2	1	19
	female			2	3	1			6
	undet.	3		5	5	1			13
Pidjut	male		2	3	2	5	1		13
	female			2	1	1	1		5
	undet.	4		1		1			6

Table 1. Number of individuals from Armenian sites studied in this paper.

lines arise during chronic periods of nutritional stress or other kinds of physical stress in which the body must selectively utilize available resources. This pathological condition most often indicates chronic periods of childhood nutritional stress (18, 14).

Calculus is the mineralization of bacterial plaque resulting from, among other things, a high protein diet (12). This mineralization can result in a variety of manifestations including pits, fissures, grey or brown thick plaque on the supragingival surface or thinner green or black plaque on the subgingival surface (29). The presence of calculus can result in protection against caries as the tooth surface is covered with hard concretions making it less susceptible to infection (30). The teeth most often affected include the upper molars on the buccal surface and lower incisors on the lingual surface.

Dental caries are defined as “an infectious and transmissible disease in which progressive destruction of tooth structure, crown or root, is initiated by microbial activity on the tooth surface” (31). The main cause of carious lesions is the bacterial fermentation of refined sugars and carbohydrates. Other exogenous factors that affect the rate of carious lesions include diet, functional use of teeth, degree and rate of wear, and oral hygiene. Caries appear on the dental crown when acid producing bacteria in the plaque initiate demineralization of the enamel. If the pulp chamber becomes exposed, serious infection can overtake the tooth and result in abscesses (14).

Dental wear can be divided into three general categories including attrition, abrasion and erosion. Attrition is due to tooth on tooth contact and can result in the wearing down of tooth enamel, possibly exposing the dentine and pulp chamber (31). Abrasion can produce the same effects with the general loss of surface detail due to abrasive particles such as unprocessed or poorly processed foods which damage the surfaces with mastication (32). Erosion of tooth enamel occurs most often when acidic substances are ingested or built up within the mouth.

Periodontal disease is an inflammatory response of the alveolar bone to irritants. The inflammation results in the resorption of the alveolar bone creating a large space between the alveolar bone and the cemento-enamel junction. The later stages of this condition can result in tooth loss and alveolar resorption. Calculus is a common cause of this irritation. Other irritants, such as metabolic diseases, may result in inflammatory conditions that affect the periodontal tissues. For instance, scurvy can weaken the connective tissues of

the teeth resulting in the weakening of the alveolar joint (14).
Due to small sample size, no statistical testing of inter-sex or inter-site differences was applied.

Results

The dental traits, their frequencies, and the number of individuals observed for each trait for the Lori region samples are provided in Table 2. A “diastema” is a dental term referring to a space or gap between two teeth, and its size depends on that of the alveolar process. It is most commonly applied to the space found between the two maxillary central incisor teeth (upper front teeth: I1–I1).

Trait	%
Midline Diastema UI1	37.5 (3/8)
Shovelling UI1	41.67 (20/48)
Shovelling UI2	52.84 (28/53)
Dental crowding UI2	31.25 (5/16)
Reduced peg-formed tooth UI2	64.44 (29/45)
Hypocone UM2	66.18 (45/68)
Carabelli's cusp UM1	15.25 (13/80)
Four-cusped LM1	32.88 (24//73)
Form +5 on M_1	60.76 (48/79)
Six-cusped LM1	2.82 (2/71)
Four-cusped LM2	87.5 (56/64)
Deflecting wrinkle LM1	43.06 (31/72)
Distal Trigonid Crest LM1	29.58 (21/71)
2 med II LM1	42.26 (30/71)

Table 2. Frequency of non-metric traits in comparative populations

The frequency of diastema in the Late Bronze Age and Early Iron Age populations equal to the 37.5%. Dental crowding UI2 occurs when there is disharmony in the tooth-to-jaw size relationship or when the teeth are larger than the available space. The frequency of lateral maxillary incisors crowding in populations is equal to the 31.25%. Reduced-peg UI2. Lateral incisors are frequently smaller than medial ones. Maximal reduction of the lateral maxillary incisors, ultimately resulting in peg-shaped incisors, was rare in the Armenia populations. Grade 1 reduction UI2, however, was frequent in the Late Bronze Age and Early Iron Age in populations of the Lori region (64.44%).

Shovel trait is a combination of a concave lingual surface and elevated marginal ridges enclosing the central fossa in the upper central incisor teeth (average point 0–3). The mesial and distal lingual ridges of the incisors may be elevated producing a ‘shovel-shaped’ incisor. This trait is quite variable on the world scale and displays clear-cut geographical regularities. It is well known that the summarized percentage value of the shovel shaped forms (2+3) of the upper medial incisors varies between 0 and 15 in the Europoid populations (26), whereas the highest frequency of shovel-shaped incisors (75–100%) has been found in Mongoloid ones. In the Late Bronze Age and Early Iron Age the mean total shovelling frequency (forms 2+3) is 41.67% (I1) and 52.84% (I2).
Hypocone (distolingual cusp) reduction of maxillary second permanent molar. In the Lori region, the distinctive feature of the Bronze Age populations is a relatively high frequency of hypocone UM2 (66.18%). Carabelli’s trait is a morphological feature that can occur on the protocone of human maxillary molars. The expression of the trait varies from a slight or distinct single furrow, pit, double furrow, y-shaped furrow, or slight protuberance lacking a free apex, to a small, moderate or large cusp, which occasionally equals in size the main occlusal cusp. In people of Lori region the frequency of Carabelli’s trait is equal to the 15.25%.
Cusp number mandibular molars. The occurrence of reduced four-cusped LM1 in the populations is equal to the 32.88%. The frequency of the six-cusped LM1 is low in populations (2.82%). People of Lori region display a high degree of the lower second molar reduction (87.5%). Discrete dental traits are under genetic control (3) and can be used to estimate genetic relationships among populations (9,). The frequency of distal trigonid crest LM1 in populations is equal to the 29.58%. The deflecting wrinkle is one of the particular formations of the median ridge of the metaconid. The ridge, when the deflecting wrinkle appears, shows a stronger development in either its length or breadth and curves distalward at the central part of the occlusal surface. In the Late Bronze Age and Early Iron Age of the Armenians, the frequency of the deflecting wrinkle LM1 is higher (43.06%). 2 med II LM1 is notation for an odontoglyphic trait. 2 (II) indicates that furrow 2 (a second order furrow that occurs closer to the fovea centrale than furrow 1) goes into furrow II (a first order furrow that separates the

protoconid from the metaconid) (33). The frequency of 2 med II LM1 in populations is equal to the 42.26%.

Teeth of the population of the Lori region are characterised by low frequency of Carabelli's cusp UM1, low frequency of six-cusped LM1. The occurrence of high reduced-peg UI2 was not recorded (variants 2 and 3). The frequency of dental crowding UI2, midline diastema UI1, reduced-peg UI2 (grade 1), hypocone UM2, four-cusped LM2, 2 med II LM1, distal trigonid crest LM1 and deflecting wrinkle LM1 was very high.

The frequencies of various types of dental disease in individuals are presented in Table 3. The average dental wear in groups was moderate to severe. The most heavily worn teeth were the first molars and the incisors. This trend was observed on both the maxilla and the mandible. Average dental wear was comparable between men (Figure 2) and women. A relatively high frequency of dental wear was observed in populations from Bakheri chala (32%) and Pidjut (31.58%). The tooth wear is primarily caused by the addition of grit to the diet. Interestingly, 6 individuals (Pidjut: burials 2, 7, 15A and 13-2, Bakheri chala: burial 4, Bover: burial 7) displayed an generally flat of wear on their first and second incisors. Several individuals in groups (Bakheri chala: burials 5, 25, 31, Barcryal: burials 79, 84; Bover: burials 41, 44), displayed an oblique, uneven pattern of wear on their first (Figure 2) or first and second molars.

Periodontal disease, in terms of alveolar bone loss, was the most common dental pathology among the group Bover burials (Figure 3). Two out of fourteen observable dentition (14.29%) exhibited some form of alveolar bone loss. As a whole, the most severely affected teeth were the premolars and molars. Out of 21 observable dentitions in the Pidjut sample, 1 (4.77 %) displays alveolar bone loss.

A high frequency of dental caries was observed both in Pidjut site (31.58%). Caries in Bakheri chala group affected 24% (Figure 4) of individuals (N=25). In terms of the numbers of caries, the molars were most commonly affected.

In Barcryal group, 29.04% of individuals were affected by caries (N=31). For Bove group 14.64% (Figure 4) of individuals (N=19) bore carious lesions. The most commonly affected teeth were the molars. At the same time, individuals with carious lesions exhibited a higher frequency of dental abscesses. An increase in the availability of sugary foods and refined carbohydrates resulted in an increase in carious lesions in Armenian populations during the Late Bronze Age and Early Iron Age.

Figure 2. Dental abcesses and dental wear found in Bover individual (burial 44) of Lori región

Figure 3. Peridontal disease and ante-mortem tooth loss wear found in Bover individual (burial 24) of Lori region

Enamel hypoplasia was a frequent pathology in the dentitions of Bover group (see Table 3, Figure 5). Enamel hypoplasias in Bakheri chala site affected 56.67% of individuals (N=30). For Pidjut group 68.43% of individuals (N=19) hypoplasias were noted. Incidences of enamel hypoplasias in group Barcryal were infrequent. Only 16 individuals (48.49 % of individuals), all adults, were observed to have a hypoplasia. Hypoplasias were noted on the incisors and canine.

Figure 4. Caries wear found in Bover (burial 28) and Bakheri chala (burial 12) individuals of Lori region

Figure 6. Dental abcesses and non-specific infection (periostitis) found in Bakheri chala (burial 25) individual of Lori region

Dental calculus affected 44.0% of individuals in Bakheri chala group. The molars were the most commonly affected teeth. In Bover group 60.98% of individuals had calculus deposits (Figure 5). Calculus in Barcryal group was relatively rare. Only 3.23% of the individuals in the group had observable calculus deposits. Dental calculus affected 36.85 % of individuals in Pidjut group.

Figure 5. Enamel hypoplasias and dental calculus found in Bover (burial 28) and Pidjut (burial 4) individuals of Lori regiόn

Dental abscesses were found on 9 individuals in Bakheri chala group, which is 60% of those observable. The teeth most commonly affected by abscesses were the molars, followed by the premolars, canines (see Table 3). Bover group (Figure 2, burial 44), dental abscesses were found in 42.86% of observable dentitions. Pidjut group revealed 3 dental abscesses, which is 14.29% of observable dentitions. Dental abscess was found on 1 individual in Barcryal group, which is 12.5% of those observable.

The single incidence of non-specific infection (periostitis) is observed in Bakheri chala (burial 25) on the lower jaw (Figure 6). Presence on the jaw is probably due to the fact that this region is not well protected by soft tissue and is prone to dental abcesses.

Paleoanthropologists are frequently faced with tooth eruption anomalies during the gradual emergence of complete adult dentition, and notably disorders related to tooth impaction (34). The crown of the tooth is in position vestibular or buccal compared to others teeth is observed in Pidjut site (burial) on the maxilla (Figure 7).

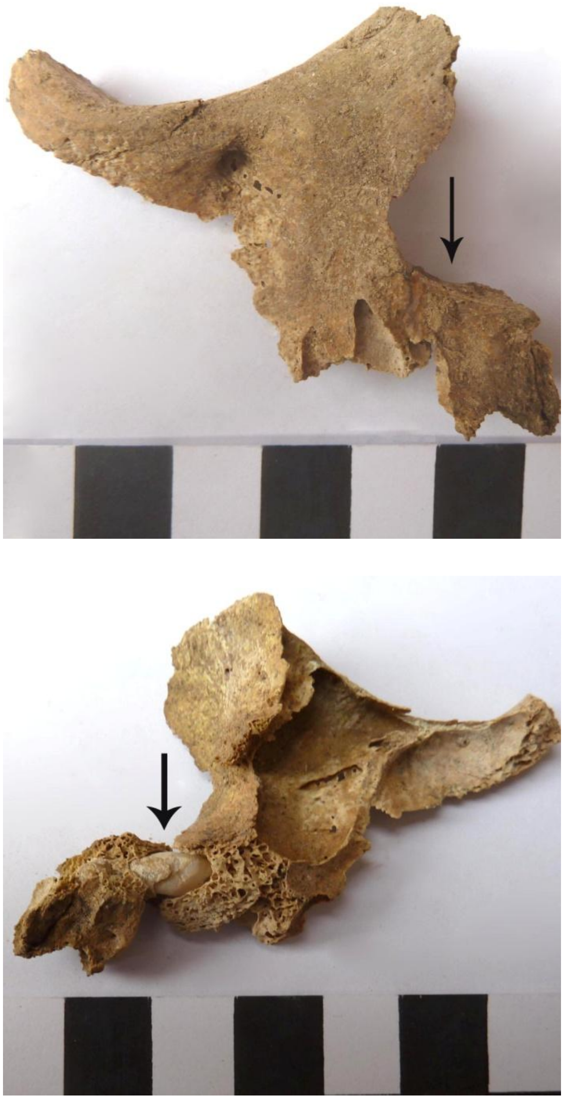

Figure 7. Impacted teeth (I^2 /right/) found in Pidjut (burial 9) individual of Lori región

Discussion

The southern gracile type is characteristic for individuals of the Late Bronze Age and Early Iron Age from Lori region. The southern gracile type has low percentages of Carabelli's cusp UM1, somewhat increased distal trigonid crest LM1, four-cusped LM1, Four-cusped LM2 and low variant 2 med II LM1 (35). Information about the southern gracile dental types can be found in Zubov (33), Khaldeeva (35) and Khudaverdya (5, 10) et. The frequency of shovel-shaped incisors is very high in the dental system of people of Lori region belonging to the Europoid area. This trait is quite variable on the world scale and displays clear-cut geographical regularities. It is well known that the summarized percentage value of the shovel shaped forms (2+3) of the upper medial incisors varies between 0 and 15 in the Europoid populations (26), whereas the highest frequency of shovel-shaped incisors (75–100%) has been found in Mongoloid ones. The odontoscopical values characterizing the mixed groups from the zone of the Ural Mountains and Central Asia, i.e. East-Finns, Ugors, Kazakhs and Uzbeks have an intermediary position between the above mentioned extremes. Nevertheless, the frequency of shovel-shaped incisors is very high in the dental system of many people of India (Oraons, Munda, Santals) belonging to the Europoid area. A dental crown size reduction (66.18 %) has been observed among the populations from Lori region (Armenia). Various researchers report that this trend varies by tooth type and tooth dimension (36). It has long been suggested that these changes might be caused by the transition to soft food (37) and the ensuing reduction of functional load. Comparative studies of twins (38), of parent and offspring (39) and full versus half siblings (40) substantiate the claim that more than half of the variability in tooth crown size could be attributed to genetic factors (3). Other experts point to the importance of environmental or biochemical processes, etc. (41). Dahlberg (41) observed considerable population-specific variability in tooth size and form, so he hypothesised that changes in human dentition are the result of a relaxation of certain environmental pressures. He, therefore, proposed that European populations have a smaller tooth mass than do populations in “less favoured environments”. Small teeth may be the outcome of “selection by crowding”, whereby reduced load on the masticatory apparatus causes the reduction of alveolar processes, resulting in too little space for teeth (42). Another possible factor in dental gracilization may be the high occurrence of caries, which mostly affects large teeth with complex occlusal surfaces. These processes demonstrate the importance of cultural factors in dental evolution. Transition to agriculture may lead to a reduction of dental size, as demonstrated by Sciulli (43), who compared the dentition of hunters and gatherers with that of agriculturalists. It has been demonstrated that the Neolithic Revolution may have caused an abrupt decrease in tooth size.

Many dental diseases are the result of the diet of the individual. Other defects can be the result of childhood stress or infections (44). The dentition itself has a distinct anatomy and physiology from the rest of the skeleton, and is more likely to survive in the archeological record. Therefore, teeth are vitally important to the study of the skeletal remains of past peoples (1). This is especially true of remains like those recovered at the sites from Lori region. Due to their poor preservation, the analysis that can be performed on bony elements is limited. However, since teeth are more likely to survive, they can provide a wealth of information that might otherwise be missed.

Sample	Caries	Dental abcesses	Dental calculus	Dental wear	Enamel hypoplasias	Peridontal disease
Bakheri chala	24 (2/25)	60 (9/15)	44% (11/25)	32 (8/25)	56.67 (17/30)	0 (15)
Bover	14.64 (6/41)	42.86 (6/14)	60.98 (25/41)	18.43 (7/38)	83.73 (36/43)	14.29 (2/14)
Barcryal	29.04 (9/31)	12.5 (1/8)	3.23 (1/31)	9.68 (3/31)	48.49 (16/33)	0 (8)
Pidjut	31.58 (6/19)	14.29 (3/21)	36.85 (7/19)	31.58 (6/19)	68.43 (13/19)	4.77 (1/21)

Table 3. The distribution of dental pathology in the different sites

Enamel hypoplasias occurred in a much higher frequency in dental samples (see Table 3). This suggests that the Late Bronze Age and Early Iron Age was a time of greater nutritional stress. The archeological record indicates that population increased from the Late Bronze Age and Early Iron Age, which would have meant greater competition for resources. The number and frequency of enamel hypoplasias is direct evidence that the competition for subsistence resources had a negative impact on the health of peoples. Rates of dental wear are very comparable between Bakheri chala groups and Pidjut. Is a sllght deviation in the rate of wear in Barcryal groups and Bover. It is of interest to note the unusual flat of wear of the first incisors of 6 individuals in Pidjut groups and Bover, which is an unusual occurrence found in few prehistoric populations. Often it was so extensive it occurred at a faster rate than the odontoblasts were able to lay down secondary dentine, resulting in pulpal exposure, necrosis of the pulp and subsequent apical infection. Uniform dental wear of the anterior teeth and bone development of the relief in chewing muscles attachments in this individuals suggest that dental wear was a consequence of functional load. This feature of the teeth may be associated either with malocclusion, or with the use of teeth for a non-masticatory activity (45). Another unusual aspect of dental wear in groups concerns the uneven, oblique molar wear observed on 7 individuals. This pattern, according to Smith (46), is more characteristic of early agricultural groups than hunter-gatherers. Caries in groups show that their frequency was not significantiy different. Evidentiy, the food resources that were being exploited had a cariogenic component. High rates of dental caries were observed in groups Pidjut and Barcryal. The reason for the differences is related to the etiology of caries (47, 48). Even though there are many factors related to caries, it is generally accepted that the amount of carbohydrates in food is one of the most important factors for developing caries (47). Dental calculus was less of a problem for Barcryal group (3.23%) than for groups Bover (60.98%), Bakheri chala (44%) and Pidjut (36.85%). This would suggest some shift in diet. Compared to the Barcryal and Pidjut samples, groups Bakheri chala and Bover had a significantly higher rate of dental abscesses. Dental abscesses have an important role in infectious processes, as they are propitious for the development of the bacteria that cause infection, not only in the alveolar bone but also in the rest of the body.

Periodontal disease of the molars were more prevalent at Bover. In individuals from Bakheri chala and Barcryal there was no instance of the specified disease. The single incidence of periostitis is observed in Bakheri chala (burial 25) on the lower jaw. Periostitis occurs when the periosteum which surrounds the living bone becomes irritated by infection or trauma to the area and produces new bone. This originates as disorganised and porous (woven) bone in the active stage and later becomes smooth and organised (lamellar) bone as healing takes place. Presence on the jaw is probably due to the fact that this region is not well protected by soft tissue and is prone to dental abcesses.

Impacted teeth are classically defined as retained in the jaw beyond their normal date of eruption, surrounded by their coronary bag and without communication with the oral cavity (49). The classic distribution in order of frequency of impaction of permanent teeth can be summarized as follows : lower third molars, upper third molars, upper canines, upper and lower premolars, upper incisors, lower canines, lower incisors, upper and lower first molars and upper and lower second molars (50). Primary reasons: genetics (51), endocrinologic deficiency, irradiation, palatal clefts, developmental abnormities of germs, supernumerary tooth or tooth fragments , dento-maxillary disharmony (mostly for bucal impactions), late or missing root development, growth disharmony between pre-maxilla and maxilla (concerns maxillary canines only), maxillary brachygnatia, transversal growth deficiency of the anterior maxilla (52). Secondary reasons: loss of guidance of the lateral incisor (microdontia or tooth absence) (53), trauma etc.

Trends presented in the article only outline the serious problems associated with the influence of environmental and social factors on the development of human populations. In general, inter-group differences in stress parameters underlie genetic mechanisms that reflect the biological history in the formation of specific populations. Each factor – ethnic and environmental – contributes to the character of the adaptive response.

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