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Author(s): John R. Lukacs
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Human Dental Remains from Early Neolithic Levels at Mehrgarh, Baluchistan[1]

by JOHN R. LUKACS
Department of Anthropology, University of Oregon, Eugene, Ore. 97403, U.S.A. 26 x 82

Published descriptions of dental morphology and tooth size for the living and prehistoric inhabitants of Pakistan are few and often incomplete (Benyon 1971, Gupta, Dutta, and Basu 1962, Sakai, Hanamura, and Ohno 1971). While research on the dental morphology and pathology of two Iron Age skeletal series from northern Pakistan is currently in progress, virtually nothing is known about the dental characteristics of the pre-Harappan occupants of Pakistan.[2]

The prehistoric site of Mehrgarh, situated at the foot of the Bolan Pass in Baluchistan, is being excavated by the French Archaeological Mission to Pakistan (Jarrige and Meadow 1980). The antiquity of early Neolithic levels at Mehrgarh is well established by radiocarbon dates and cross-dating which place the beginning of Period 1 (MR3) prior to 6000 B.C. The transition from prepottery hunter-gatherers to pottery-using agriculturalists with domesticated cattle, sheep, and goats is well documented in Periods 1 and 2 at Mehrgarh (Jarrige 1981; Jarrige and Lechevallier 1979, 1980; Lechevallier and Quivron 1981; Meadow 1981). In addition, Period 1 has yielded human skeletal and dental remains of the Neolithic occupants, thereby providing a unique opportunity for the descriptive and comparative analysis of their dentitions.

The dental sample on which this study is based consists of 266 individual teeth derived from 16 individuals. Of these teeth, 10 are deciduous (3 upper, 7 lower) and 256 are permanent (124 upper, 132 lower). Although most of the teeth are isolated from their normal anatomical position in the jaw, many specimens are nearly complete, thus facilitating individual dental identifications.

All deciduous teeth in the Mehrgarh collection are free from caries. Six carious teeth are present in the permanent dentition. This results in a caries frequency of 2.3% over all tooth classes. All of the carious lesions found in the Mehrgarh dentition are on molar teeth, usually on the occlusal surface of the crown; 5.9% of the 101 molars are carious.

Reports on caries incidence in prehistoric South Asian populations are few. Basu and Pal (1980) report one cervical and one occlusal caries in the Burzahom series, yielding a frequency of 2.5% ($N = 78$) for molar teeth alone. Lukacs (1981) reports a 5.1% ($N = 79$) overall caries incidence for the Iron Age site of Pomparippu, Sri Lanka, in which the percentage of carious molar teeth was 8.3 ($N = 36$). The megalithic site of Mahurjhari, in central India, yielded a higher caries incidence: 7.7% of all teeth ($N = 196$) and 15.3% ($N = 98$) of molar teeth (Lukacs 1981).

The low caries incidence reported here for Neolithic levels at Mehrgarh is typically found in association with either hunting-and-gathering or mixed subsistence economies (Turner 1979). This stands in dramatic contrast to the high caries rates (up to 29.6%) found among full-time agriculturalists, whose diets are high in carbohydrates and refined sugars.

Morphological variations of the dental crown and roots of the Mehrgarh sample were studied in detail. Although the sample size is not adequate for meaningful statistical analysis, the occurrence of specific morphological traits in the Mehrgarh dentition is of anthropological significance.

All specimens with preserved incisor teeth with anatomical features present show some degree of the shovel-shape trait. In one case, a maxillary lateral incisor, the fully developed trait is present. Marginal ridging of the mesial and distal borders of the crown is present to some degree in all maxillary incisor teeth and in some lower incisor teeth. A few upper and lower canine teeth also exhibit traces of marginal ridges. The prevalence of this character in the Mehrgarh dentition may be indicative of a genetic relationship with people of central or eastern Asia, since a high frequency of the shovel-shape trait is one of the main phenotypic features of the "Mongoloid dental complex" (Harihara 1968). Marginal ridging has been interpreted as contributing to the strength of the crowns of anterior teeth and alternatively may indicate very heavy masticatory stresses.

The presence of much rarer dental traits in the Mehrgarh dentition adds further support to the suggestion of its biological affinities with central and eastern Asian populations. For example, Specimen MR 3, Locus 72, has three-rooted mandibular first molars. This trait, very rare among European and African populations, occurs with a minimal frequency of about 10% among Asian populations (Turner 1979). The presence of this trait in even a single specimen at Mehrgarh is therefore significant and justifies radiographic analysis to determine its occurrence in the remainder of the Mehrgarh specimens.

Dental characters that occur very rarely or never in more recent Pakistani populations (Sarai Khola) are found in the Mehrgarh specimens. An extra cuspule (metaconule) on the distal margin of the crown of upper molar teeth occurs in three specimens from Mehrgarh (MR 3, Burial 5; MR 3-C54, Tomb 119; MR 3, Locus 72). The protostylid, a small accessory cusp on the buccal surface of lower molar teeth, is observed bilaterally in the third molars of MR 3, Burial 5. Finally, the accessory lingual cusp of lower molar teeth, the metaconulid (Cusp 7), is found in two teeth of Burial 5. These features distinguish the Mehrgarh sample from more recent Pakistani skeletal samples from Harappa and Sarai Khola. These data do not suggest the existence of a genetic or biological continuum between the people of Mehrgarh and more recent inhabitants of the Indus Valley.

A highly polymorphic dental trait known as Carabelli's trait, an accessory cusp of maxillary molar teeth, is conspicuous by its absence in the Mehrgarh sample. Not only are full cusp expressions of the trait absent, but grooves, pits, and the Y-form of the polymorphism are absent from the permanent teeth as well. The small-pit variant of the trait is discerned in the deciduous left maxillary second molar of MR 3, Locus 65. This absence of a dental trait of high frequency in European populations and peoples of European extraction (recent South Asians) is evidence in favor of the Asian affinities of the Neolithic inhabitants of Mehrgarh.

Mesiodistal and buccolingual measurements of the teeth from Neolithic Mehrgarh were made according to the method followed by Moorrees (1957). Mean tooth-crown diameters are presented in table 1; crown indices, following Wolpoff (1971), are given in table 2. These tooth-size data compare favorably with figures for Neolithic populations of southwestern Asia reported by Arensburg, Smith, and Yakar (1978) and Dahlberg (1960). If the crown areas of upper and lower molar teeth are summed and this figure is employed as a basis for comparison, the results are revealing. The summed molar crown area

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[2] An investigation of the dental morphology and pathology of two Iron Age skeletal series from northern Pakistan (Sarai Khola and Timargarha) is currently being conducted by the author in collaboration with Wolfram Bernhard (Mainz) and Michael Schultz (Gottingen).

TABLE 1

MEAN CROWN DIMENSIONS OF PERMANENT TEETH (MM)

	MAXILLA				MANDIBLE			
	Mesiodistal		Buccolingual		Mesiodistal		Buccolingual	
TOOTH	Mean (*N*)	SD	Mean (*N*)	SD	Mean (*N*)	SD	Mean (*N*)	SD
I1 R....	8.93(6)	0.46	7.45(6)	0.46	5.58(4)	0.34	5.92(5)	0.26
L.....	8.82(6)	0.55	7.32(6)	0.48	5.32(6)	0.45	6.03(7)	0.24
I2 R....	7.38(4)	0.24	6.40(4)	0.16	5.99(8)	0.27	6.29(9)	0.33
L.....	7.26(5)	0.24	6.74(5)	0.29	5.97(6)	0.39	6.35(6)	0.46
C R....	7.64(5)	0.19	8.42(5)	0.72	6.77(9)	0.43	7.36(9)	0.53
L.....	7.60(7)	0.20	8.23(7)	0.58	6.80(6)	0.52	7.38(6)	0.54
PM1 R....	7.08(6)	0.50	9.70(6)	0.41	7.08(9)	0.56	7.97(9)	0.77
L.....	6.91(7)	0.65	9.71(7)	0.60	7.05(8)	0.50	7.85(8)	0.62
PM2 R....	7.16(7)	0.36	9.83(7)	0.42	7.11(9)	0.49	8.30(9)	0.60
L.....	7.13(6)	0.20	9.82(6)	0.50	7.10(7)	0.30	8.23(7)	0.54
M1 R....	10.45(8)	0.45	11.75(8)	0.31	11.34(8)	0.52	10.91(8)	0.39
L.....	10.35(6)	0.34	11.68(6)	0.39	11.21(8)	0.51	10.98(8)	0.48
M2 R....	9.78(8)	0.29	11.64(8)	0.59	10.76(8)	0.81	10.28(8)	0.39
L.....	9.94(7)	0.19	11.67(7)	0.53	10.84(5)	0.40	10.38(5)	0.34
M3 R....	8.93(3)	0.46	11.23(3)	0.25	10.60(6)	0.30	9.92(6)	0.46
L.....	9.06(5)	1.04	10.88(5)	0.74	10.82(5)	0.36	10.04(5)	0.52

TABLE 2

DENTAL INDICES OF PERMANENT TEETH

	MAXILLA			MANDIBLE		
TOOTH	Crown Area	Crown Module	Crown Index	Crown Area	Crown Module	Crown Index
I1 R.....	66.53	8.19	119.87	33.03	5.75	94.26
L.....	64.56	8.07	120.49	32.08	5.68	88.23
I2 R.....	47.23	6.89	115.31	37.68	6.14	95.23
L.....	48.93	7.00	107.72	37.91	6.16	94.02
C R.....	64.33	8.03	90.74	49.83	7.07	91.98
L.....	62.55	7.92	92.35	50.18	7.09	92.14
PM1 R.....	68.68	8.39	72.99	56.43	7.53	88.83
L.....	67.10	8.31	71.16	55.34	7.45	89.81
PM2 R.....	70.38	8.50	72.84	59.01	7.71	85.66
L.....	70.02	8.48	72.61	58.43	7.67	86.27
M1 R.....	122.79	11.10	88.94	123.72	11.13	103.94
L.....	120.89	11.02	88.61	123.09	11.10	102.09
M2 R.....	113.84	10.71	84.02	110.61	10.52	104.67
L.....	116.00	10.81	85.18	112.52	10.61	104.43
M3 R.....	100.28	10.08	79.52	105.15	10.26	106.85
L.....	98.57	9.97	83.27	108.63	10.43	107.77

(SMCA) for Mehrgarh is 680 mm², a figure very similar to those reported for other early Neolithic populations; the SMCA for Jarmo is 680 mm² and for Abou Gosh 685 mm². These sites are similar to Mehrgarh both chronologically and in their cultural inventories.

Summed molar crown areas for several prehistoric southern Asian skeletal series are graphically presented in figure 1. Mehrgarh clusters with other large-toothed Neolithic and Mesolithic skeletal series from India, Sri Lanka, and southwestern Asia. The SMCA for the Mehrgarh sample is considerably larger than figures reported for more recent skeletal series from Pakistan, including Harappa, Sarai Khola, and Timargarha (Dutta 1980, Lukacs n.d.).

The recently published description of human skeletal remains from the late Neolithic site of Burzahom in Kashmir, however, provides a SMCA of 560.19 mm² (Basu and Pal 1980). This figure is substantially smaller than those quoted for early Neolithic sites of Mehrgarh and southwestern Asia. The difference may partially be explained by the more advanced technology at Burzahom, including pottery, stone axes, and a copper arrowhead, and by the much younger age of that site (2300–1500 B.C.). Although the cultural affinities of Burzahom are with China and central Asia, Basu and Pal (1980) find that the dentition and osteology of the Burzahom skeletons reveal an affinity with the occupants of Cemetery R37 at Harappa. Consequently, differences in tooth size between Burzahom and Mehrgarh may also be due to fundamental genetic differences between these biological populations.

It is concluded from this preliminary analysis of genetic variations of the dentition from Mehrgarh that biological affinities exist between the Mehrgarh people and populations of central Asia. The large molar teeth and low caries incidence at Mehrgarh are in agreement with the predominantly hunting-and-gathering economy of these early Neolithic people. Further conclusions from the morphological data reported here are limited by the facts that several independent variants occur in the same individual (MR 3, Burial 5) and that only a small sample of molar teeth preserves morphological details for analysis. Exhaustive analysis of the dentition of later, Chalcolithic-age, skeletal remains from Mehrgarh will provide anthropologists with valuable comparative data on tooth size, dental morphology, pathology, and attrition, data that will help answer important questions regarding the biological consequences of dietary and subsistence changes for the human dentition.

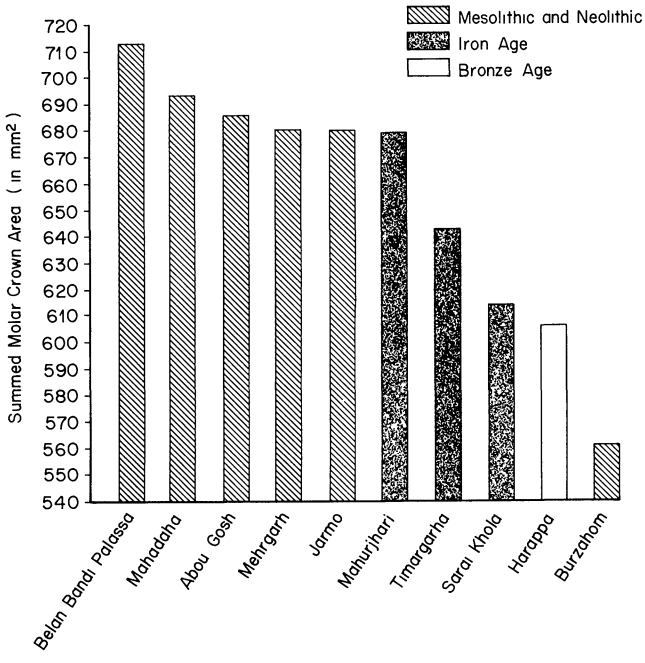

FIG. 1. Summed molar crown areas for selected South and Southwest Asian skeletal series (in mm²), from Lukacs (1982).

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