

Table 8. Mesolithic Tooth Crown Areas (male; left side: DDM, MDH)

Tooth	Damdama			Lekhahia			Mahadaha		
	n	$\bar{x}$	sd	N	$\bar{x}$	sd	n	$\bar{x}$	sd
U11	11	72.4	7.6	1	72.3	--	2	67.1	7.0
U12	7	51.5	4.7	1	51.4	--	3	48.7	2.9
UC	13	75.0	7.9	2	69.7	12.2	4	74.4	7.6
UP3	13	77.0	7.8	2	75.7	6.6	5	70.8	5.9
UP4	14	70.4	7.5	3	68.2	5.5	4	64.6	6.2
UM1	11	140.2	13.5	2	127.2	1.9	5	123.5	12.7
UM2	14	128.3	9.1	3	127.9	1.4	6	118.6	13.3
UM3	16	111.6	20.3	3	120.4	8.1		102.7	15.4
MX/AREA		726.4			712.9			670.4	
L11	6	37.0	2.3	1	26.8	--	5	35.5	2.3
L12	6	43.3	3.3	1	42.2	--	4	39.2	2.6
LC	12	63.5	8.1	3	55.8	8.2	6	61.0	6.9
LP3	12	67.9	7.5	3	65.1	5.4	6	65.4	6.0
LP4	12	71.1	10.2	3	63.9	5.6	6	67.0	11.0
LM1	9	137.3	14.6	1	134.4	--	6	132.4	15.7
LM2	15	131.6	12.9	2	117.6	13.4	6	128.7	5.8
LM3	12	118.0	19.7	1	134.8	--	5	122.1	9.8
MD/AREA		669.7			640.6			651.3	
TOTAL		1396.1			1353.5			1321.7	

Tooth size for LKH was computed by averaging right and left sides, but when one antimer was missing the measurements taken on the side that was preserved.

Table 9. Stature Estimates for Lekhahia Specimens

Specimen No.	Sex	Bone	Side	Length <sup>1</sup>	Stature	Std Error	$\bar{x}^2$
3a	F	Humerus	R	30.6	160.8	±4.45	
		Tibia	R	37.7	170.9	±3.66	*
4a	F	Radius	R	23.8	167.7	±4.24	*
		Ulna	R	26.3	170.1	±4.30	
5	M	Ulna	L	28.2	178.4	±4.32	
		Fibula	L	39.4	177.4	±3.29	*
9a	F	Femur	L	(40.3)	(153.6)	±3.72	*
10	F	Talus	L	53 mm	160.4	±5.89	*
15a	F	Talus	R	49 mm	156.6	±5.89	*
15b		Talus	L	53 mm	160.4	±5.89	*
17	F	Femur	R	43.8	162.3	±3.72	*

1. Length is in cm. for long bones and mm. for tali; bracketed values are estimates.
2. Measurement used in calculating mean stature.

### Evidence of Skeletal Trauma

Traumatic injuries often leave clear and unambiguous marks on the human skeletal system. While skeletal lesions of traumatic origin reveal valuable insights into an individual's life history, the pattern of trauma by age, sex, and status groups has the potential to reveal typical behaviours of past populations (Ortner and Putschar 1981, Steinbock 1976). At Lekhahia four traumatic lesions were observed: three long bone fractures and one cranial impact injury. The long bone fractures occur in the left ulna of a female, and the left femur and the right humerus of two different males. The distal fracture of the left ulna is a classic 'parry fracture', an injury that commonly occurs when the left forearm is raised in a defensive posture to block an assailant's blow (Plate VIII) (Ortner and Putschar 1981, Pietruszewsky and Douglas 1994). Parry fractures have been observed by Lukacs in specimens from Damdama (DDM - 24) and Mahadaha (MDH - 11, 23), and a separate report on skeletal trauma in Mesolithic India is currently in preparation (Lukacs and Pal in prep). The co-occurrence of parry fractures of the left ulna at all four sites suggests that inter-personal violence was a behaviour not uncommon in Mesolithic north India. Assessing the ultimate source of this violent behaviour is more conjectural, but domestic violence (between husband and wife), and male - male combat, were probably involved. In prehistoric North America, parry fractures are more frequent in high status males who engage in warfare, and low status females who are subject to abuse (Jurmain 1991, Lahran and Berryman 1984, Powell 1988).

The femoral fracture (LKH - 8) and the humeral fracture (LKH - 11), represent trauma whose origin is of a significantly different nature (Plate IX). These injuries are much more serious, and they occur exclusively in the small sample of skeletons from Lekhahia. Fractures of the upper arm and thigh were not observed in Mesolithic series of the Ganga Plains, despite more complete preservation and greater abundance of long bones. Is this difference due to chance? or is there a more plausible behavioural explanation? In general, fractures of the humerus and femur are much rarer than fractures of the forearm or leg (Jurmain 1991, Powell 1988), and the frequency of such traumatic lesions does not change significantly with time or culture. This is because fractures of the femur and humerus are largely accidental. That they were observed in such a small skeletal series suggests that these injuries were common enough and possibly related to difficulties of negotiating the rocky outcrops and terrain of the Kaimur Range. Since well aligned fractures are common in prehistory and many living foragers know how to reduce fractures, the fact that neither of the Lekhahia fractures healed in a well aligned orientation (see Plate IX) suggests that these accidents

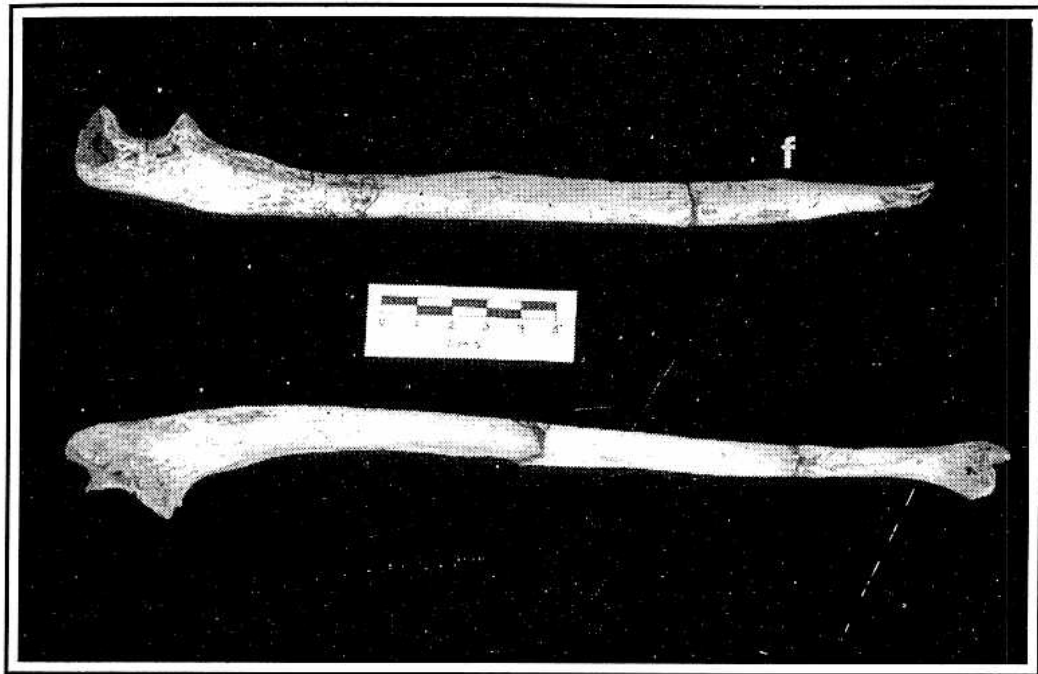


Plate VIII. Fracture of the Left Ulna (top) in LKH-4a

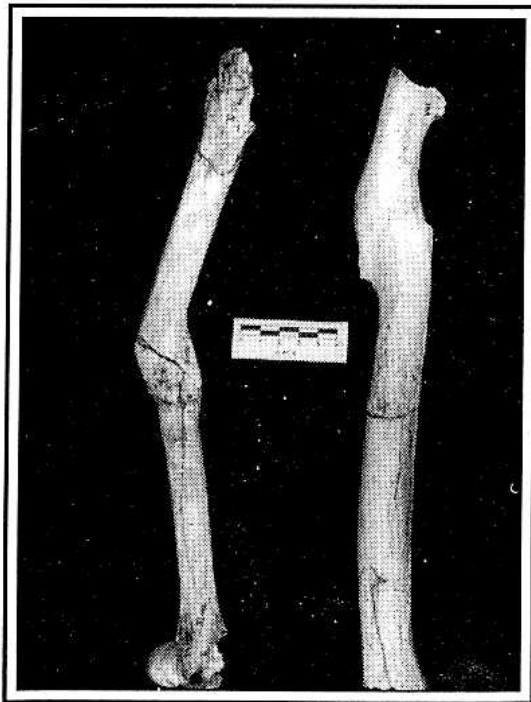


Plate IX. Fracture in Proximal Limb Bones at LKH  
(right humerus of LKH-11, on left; left femur of LKH-8 on right)

may have occurred while the men were away from camp on solitary journeys or hunting expeditions. Overall, the fracture patterns at Lekhahia show parallels to Ganga Plains sites in the presence of parry fractures, but accidental trauma of the upper arm and thigh is restricted to the Lekhahia series and is absent from the Ganga Plains sites.

### Conclusions

The cultural evidence of burial patterns and grave goods at Lekhahia has been presented along with biological data regarding dental disease, tooth size, stature, and traumatic fractures. This bio-cultural approach to the Mesolithic of north India has documented a greater number of similarities between Lekhahia and the sites of the Ganga Plains, than difference.

### References

- Agrawal, D.P. and S. Kusumgar 1969. Tata Institute of Fundamental Research List VI, *Radiocarbon* 11(1): 188-193.
- Agrawal, D.P. and S. Kusumgar 1974. *Prehistoric Chronology and Radiocarbon Dating in India*. New Delhi: Munshiram Manoharlal.
- Buikstra, J.E. 1991. Out of the Appendix and into the Dirt: Comments on Thirteen Years of Bioarchaeological Research, in *What Mean These Bones?: Studies in Southeastern Bioarchaeology* (M.L. Powell, P.S. Bridges and A.M.W. Mires Eds.), pp. 172-188. Tuscaloosa: University of Alabama Press.
- Dales, G.F. and J.M. Kenoyer 1993. The Harappa Project 1986-89: New Investigations at an Ancient Indus City, in *Harappan Civilization: A Recent Perspective* (2<sup>nd</sup> ed.) (G.L. Possehl Ed.), pp. 469-520. New Delhi: Oxford-IBH and AIIS.
- Dhavalikar, M.K. 1988. *The First Farmers of the Deccan*. Pune: Ravish Publishers.
- Gupta R.N. (ms) Osteological Study of in situ Skeletal Remains of Lekhahia Rock Shelter, Kaimur, Vindhyas, Mirzapur, Uttar Pradesh.
- Holland, T.D. 1995. Estimation of Adult Stature from the Calcaneus and Talus, *American Journal of Physical Anthropology* 96 (3): 315-320.
- Huss-Ashmore, R., A.H. Goodman and G.J. Armelagos 1982. Nutritional Inference from Paleopathology, in *Adv. Archaeol. Method Theory* (M.B. Schiffer Ed.) 5: 436-474.
- Jurmain, R.D. 1991. Paleoepidemiology of Trauma in a Prehistoric Central California Population, in *Human Palaeopathology: Current Syntheses and Future Options* (D.J. Ortner and A.C. Aufderheide Eds.), pp. 241-248. Washington: Smithsonian Institution

Press.

- Kennedy, K.A.R., N.C. Lovell and C.B. Burrow 1986. *Mesolithic Human Remains from the Gangetic Plain: Sarai Nahar Rai*. Occasional Papers and Theses; South Asia Program. 10. Ithaca: Cornell University.
- Kennedy, K.A.R., J.R. Lukacs, N.C. Lovell, J.N. Pal and C.B. Burrow 1992. *Mesolithic Human Remains from the Gangetic Plain: Mahadaha*. Occasional Papers and Theses; South Asia Program. Ithaca: Cornell University.
- Larsen, C.S. 1987. Bioarchaeological Interpretations of Subsistence Economy and Behavior from Human Skeletal Remains. *Adv. Archaeol. Method Theory* 10: 339-445. Orlando: Academic Press, Inc.
- Lahren, C.H. and H.E. Berryman 1984. Fracture Patterns and Status at Chucalissa (40SY1): A Biocultural Approach, *Tennessee Anthropologist* 9 (1): 15-21.
- Lukacs, J.R. 1992. Dental Paleopathology and Agricultural Intensification in South Asia: New Evidence from Bronze Age Harappa, *American Journal of Physical Anthropology* 87 (1): 133-150.
- Lukacs, J.R. 1994. Report of Field Research to National Geographic Society: Palaeopathology, Health and Subsistence in Mesolithic North India. (unpublished).
- Lukacs, J.R. and J.N. Pal 1993. Mesolithic Subsistence in North India: Inferences from Dental Pathology and Odontometry, *Current Anthropology* 34 (5): 745-765
- Lukacs, J.R. and J.N. Pal (in prep) Skeletal Trauma in Mesolithic India: Evidence of Accidental or Violent Behavior, *International Journal of Osteoarchaeology*.
- Lukacs, J.R. and S.R. Walimbe 1986. *Excavations at Inamgaon. Vol II - The Physical Anthropology of Human Skeletal Remains. Part i - an Osteobiographic Analysis*. Pune: Deccan College.
- Mandal, D. 1972. *Radiocarbon Dating and Indian Archaeology*. Allahabad: Vaishali Publishing House.
- Misra, V.D. 1977. *Some Aspects of India Archaeology*. Allahabad: Prabhat Prakashan.
- Ortner, D.J. and W.G.J. Putschar 1981. Identification of Pathological Conditions in Human Skeletal Remains. Smithsonian Contrib. *Anthropol.* 28. Washington: Smithsonian Institution Press.
- Pal, J.N. 1985. Some New Light on the Mesolithic Burial Practices of the Ganga Valley: Evidence from Mahadaha, Pratapgarh, Uttar Pradesh, *Man and Environment*.

IX: 28-37.

Pal, J.N. 1988. Mesolithic Double Burials from Recent Excavations at Damdama, *Man and Environment* XII: 115-122.

Pal, J.N. 1992. Mesolithic Human Burials in the Gangetic Plain, North India, *Man and Environment* XVII (2): 35-44.

Pietrusewsky, M. and M.T. Douglas 1994. An Osteological Assessment of Health and Disease in Precontact and Historic Hawai'i, in *In The Wake of Contact: Biological Responses to Conquest* (C.S. Larsen and G.R. Milner Eds.), pp. 179-196. New York: Wiley-Liss.

Possehl, G.L. and P.C. Rissman 1992. The Chronology of Prehistoric India: From Earliest Times to the Iron Age, in *Chronologies in Old World Archaeology* (R.W. Ehrich Ed.), Vol. I, pp 465-490; Vol. II, pp 447-474. Chicago: University of Chicago Press.

Powell, M.L. 1988. *Status and Health in Prehistory: a Case Study of the Moundville Chiefdom*. Washington: Smithsonian Institution Press.

Powell, M.L., P.S. Bridges and A.M.W. Mires 1991. *What Mean These Bones?: Studies in Southeastern Bioarchaeology*. Tuscaloosa: University of Alabama Press.

Scott, E.C. 1979. Dental Wear Scoring Technique, *American Journal of Physical Anthropology* 51: 513-218.

Seth, P.K. (ms) Human Skeletal Remains from Lekhahia. (Department of Anthropology, Delhi University).

Sharma, G.R. 1965. Comments on V.N. Misra's 'Mesolithic Phase in Prehistory of India', in *Indian Prehistory - 1964* (V.N. Misra ad M.S. Mate Eds.), pp. 76-79. Pune: Deccan College.

Steinbock, R.T. 1976. *Palaeopathological Diagnosis and Interpretation: Bone Diseases in Ancient Human Populations*. Springfield: Charles C. Thomas.

Storey, R 1993. *Life and Death in the Ancient City of Teotihuacan: A Modern Palaeodemographic Synthesis*. Tuscaloosa: University of Alabama Press.

Trotter, M. 1970. Estimation of Stature from Intact Long Limb Bones, in *Personal Identification in Mass Disasters* (T.D. Stewart Ed.), pp. 71-83. Washington: National Museum of Natural History.