
Mesolithic Cultural Phase in Middle Ganga Plain and Adjoining Regions of North-Central India

Kulbhushan Mishra¹

¹. Department of Anthropology, University of Delhi, Delhi-110007, India (Email: mishra90@gmail.com)

Received: 13 October 2016; Accepted: 01 November 2016; Revised: 25 November 2016

Heritage: Journal of Multidisciplinary Studies in Archaeology 4 (2016): 459-471

Abstract: *Ongoing researches during the last five decades in middle Ganga plain have enriched our knowledge about the prehistoric cultures and their different techno-typological modes. While dealing with the Mesolithic people of the region, there are several theories explaining population pressure due to favourable environmental conditions coupled with technological changes, seasonal migrations from one place to another in search of food resources, symbiotic relationship, tendencies of sedentism and beginning of food production. In view of these issues, this review paper is an attempt to understand the cultural scenario of Mesolithic hunter-gatherer-fishers of the middle Ganga plain by synthesising the available material relics.*

Keywords: Mesolithic, Middle Ganga Plain, North-Central India, Ecology, Vindhyas, Chronology, Subsistence Strategies

Introduction

The term Mesolithic was first used by H.M. Westrop while describing the hunting stage in his evolutionist view of human social development (Rowley-Conwy 1996). This phase has been understood as a transitional period between preceding hunting-gathering economy of Upper Palaeolithic period and food producing economy of succeeding Neolithic period. The Mesolithic episode, in its techno-typological parameters, provides adequate indication of technological refinement in techniques of stone knapping from its preceding phase (Misra 1973, 1974). The diagnostic tools of this phase are microliths (miniature tools which are made on blades and bladelets), which were used as components of spearheads, arrowheads, knives, sickles, harpoons and daggers and they were fitted into grooves in bone, wood and reed shaft and joined together by natural adhesives (Misra 2001). The subsistence economy of Mesolithic phase continued to be based on hunting, gathering and fishing. In recent past, some scholars questioned the utility of broad, culture-phase nomenclature of the term 'Mesolithic' which typically refers to cultures characterised by several key technological and adaptive characteristics, i.e. (i) miniature stone tools (microliths), (ii) increased reliance on composite tools (sickle, bow and arrow), (iii) increased

subsistence diversity, including reliance on plants, fish, and birds, (iv) larger and more sedentary settlement, and (v) enhanced regional variation and cultural diversification (Lukacs and Pal 2003: 329). Misra (2002) also pointed out that the Mesolithic sites are larger, better preserved and more numerous than their Palaeolithic predecessors. Our understanding of the Mesolithic cultural adaptations in India is dramatically enhanced over preceding cultural phases by the presence of human skeletal remains in abundance for the first time in Indian Prehistory. In India, the Mesolithic occupations have an extensive distribution in varied ecological zones (east-west coasts; arid and semi-arid regions of western and north-western India comprising Gujarat and northwest Rajasthan; Vindhyan and Kaimur ranges; central Indian Highlands; southern part of middle Ganga plain; Chhotanagpur plateau; Santhal Parganas and Eastern Ghats) and exhibit successful adaptations to such ecologically distinctive habitats (Ajithprasad 2002, Chakrabarty 1993, Chakrabarty 2002, Misra 2002, Mohanty 1989, Mohapatra 1962). While dealing with hunting-gathering and Mesolithic social folks of India and abroad, several issues have been explained and theorized in view of techno-economic intensification, demographic pressure due to favourable environmental conditions coupled with technological changes, seasonal migrations from one place to another in search of food resources, symbiotic relationship, tendencies towards sedentism, storage and beginning of food production (Sharma 1975, Sharma *et al.* 1980, Chattopadhyaya 1988, 1996, Yesner 1980, Hyden 1981, Testart 1982, Rowley-Conwy 1983). In view of these issues, this paper is an attempt to understand the cultural scenario of Mesolithic hunter-gatherer-fishers of the middle Ganga plain by synthesising the available cultural relics.

Middle Ganga Plain: Ecological Setting

The middle Ganga plain is characterized by tropical dry deciduous (savanna) forest (Spate and Learmonth 1972). Geomorphologically, the middle Ganga plain, occupying central position in the vast Gangetic plain exhibits a wide range of alluvial geomorphic features lying between the Ganga-Yamuna confluence in the west, Rajmahal hills (Bihar-Bengal border) in the east, the Himalayan foothills in the north and Vindhyas in the south. It includes modern eastern Uttar Pradesh and plains of Bihar. The Ganga and its tributaries, the major drainage systems, provide a vast fertile alluvium tract and serve as a strong base for early human occupations in middle Ganga plain (Singh 1971: 183-193). A very distinctive morphological feature of this area is the presence of horse-shoe or oxbow lakes. These lakes still control the morphology of the plains, and were probably formed out of the meander of the river Ganges, representing the shifting of its course in various stages (Sharma 1975). This riparian habitat contains aquatic fauna including tortoise and fish, and mammals like swamp deer and buffalo (Chattopadhyaya 1996). On the basis of pollen studies from the archaeological site of Mahadaha in Vindhyan region and a deep profile from oxbow lake of Khuilan near Sarai Nahar Rai in middle Ganga plain, it has been suggested that this area was coupled with grassland vegetation, marshland and forest during most of the Holocene period (Gupta 1976: 109-19; Pant and Pant 1980: 229). Similarly, in last few years, a

number of studies have been conducted based on proxy data of lacustrine sediments in middle Ganga plain dealing with the phytolith, pollens, stable isotopes, geochemistry and micro fauna to reconstruct the palaeo-climatic pattern (changes in rainfall and temperature), palaeo-vegetation and human habitation during Holocene period (Chauhan *et al.* 2004, 2009, Chauhan and Chatterjee 2007; Sharma *et al.* 2004, 2006; Saxena *et al.* 2013). These conditions must have provided the decisive impulse for migration of human population from Vindhyas to the more favorable riparian habitat in Ganga plain.

Archaeological Record from Middle Ganga Plain

The intensive and extensive archaeological investigations in the last few decades have substantially revealed more than two hundred sites having remains of Mesolithic folks (Sharma *et al.* 1980). Among these, the important excavated and larger sites are Sarai Nahar Rai, Mahadaha and Damdama. All three sites, located in Pratapgarh district, preserve evidence of human occupation adjacent to horseshoe lakes or streams originating from these lakes, and have produced the largest collection of Mesolithic human skeletons in Asia. Besides biological remains, these sites are also marked by thick occupational deposits, indicating thereby semi-sedentary way of life. These sites fall into two categories: non-geometric microliths (172 sites) and geometric microliths (22 sites) based on techno-typological considerations (Pal 1994, Varma 1989).

The site of Sarai Nahar Rai is situated on the bank of a filled-up oxbow lake, 15 km south-west of Pratapgarh district. The site was excavated in 1973 and 1975 by the University of Allahabad under the direction of G.R. Sharma (1973, 1975). It covers an area of about 1800 sq m and has revealed evidence of two periods of occupation with an average total depth of 6 cm. Two seasons' excavation brought to light 11 burials containing fourteen individuals, one grave was a quadruple burial, eight pit hearths and a hut floor. Subsequently, Mahadaha excavated in the late 1970s, is also located on the western bank of an oxbow lake, extended over an area of approximately 8000 sq. m and revealed a 60 cm thick occupation deposit divided into four layers (Sharma *et al.* 1980, Pal 1985). The site of Mahadaha is divisible into two broad areas: the lake area towards the east and combined cemetery-cum habitation area and butchering/dumping area. The cemetery-cum-habitational area contained four occupational layers and produced 28 *in situ* graves with thirty individuals, two being double burials (Pal 1992). The third site of Damdama excavated in mid-1980s (Varma *et al.* 1985), is situated at the confluence of the two branches of Tambura *nala*, a tributary of Pili River, and covers an area of approximately 8,750 sq m. The excavations revealed an undisturbed habitational deposit of 1.5 m divisible into ten occupational strata. Total 41 human graves located from different layers were exposed at the sites (Pal 1985, 1992). All three sites provide similar mortuary evidence such as individuals were buried in shallow rectangular graves, generally in extended position. The excavations at all these sites have yielded burnt plaster floors, hearths, charred seeds, animal bones, and stone artefacts such as microlith, querns, mullers, ring stones, sling

stones, hammer stone and anvils as well as simple jewellery of bone and antler. Microliths include retouched blades, pints, awls, lunates, triangles and trapezes.

Archaeological Record from Vindhya

While discussing the Mesolithic folks of middle Ganga plain, the evidence from the Vindhyan region must be taken in cognizance as it is geographically contiguous with middle Ganga plain and more importantly cultural similarities are also observed in both the regions. It may be proper to say that both the regions witnessed an identical cultural pattern in terms of chronology, settlement and subsistence pattern. Ongoing research during last five decades in this region has been enriching our knowledge about the prehistoric cultural manifestations and its different techno-typological modes (Sharma 1980, Sharma and Clark 1983). In the Vindhya, the two river valleys of Belan and Son have been extensively explored. The most revered example of the geological section of the Belan was examined from Baraundha in Mirzapur in the east and Belan-Tons confluence in the west, referred as 'Text Book Section' in literatures of prehistoric studies and brings out the uninterrupted evolutionary episodes of prehistoric cultures from Lower Palaeolithic to Mesolithic periods (Misra 2010). Similarly, the geological formations of middle Son valley bounded by Kaimur in the north and Son in the south have been also intensively investigated and divided into four geological formations: 1- Sihawal, 2- Patpara, 3- Baghor and 4- Khetauhi formations which have exhibited the holistic cultural sequence of Palaeolithic cultures from Lower Palaeolithic to Neolithic periods (Pal 2013).

In the Vindhyan region, Mesolithic sites are divided into two groups: rock-shelter (both plain as well as painted) and open air sites. The important excavated Mesolithic sites are Morhana Pahad, Baghaikhor (Varma 1986), Lekhahia (Misra 1977) and Chopani-Mando (Sharma *et al.* 1980). The first three sites are rock-shelters located in Mirzapur district along the Kaimur hill ranges near Bhainsore village. Chopani-Mando (an open air site), on the other hand, is located on the left bank of Belan in Allahabad district. Baghaikhor rock-shelter revealed an extended human burial with east-west orientation whereas Lekhahia rock-shelter revealed seventeen human skeletal remains in fragmentary condition which have been examined by John R. Lukacs (Lukacs and Misra 1997: 873-89). Excavations at these rock-shelter sites have brought to light profuse amount of microliths made on chalcedony, chert, agate and carnelian; pieces of handmade pottery and tool processing equipment. It can be noted that artefacts have been obtained in different stages of manufacturing, indicating that these artefacts were locally shaped. At Chopani-Mando, 37 circular huts of different phases have been identified and on the floor of the huts were discovered microliths, broken stone pieces and burnt grains. In contrast to the sites of middle Ganga plain, the availability of ill-fired handmade cord-impressed pottery from these sites of Vindhyan area is very much significant.

Situating the Mesolithic Phase in Chronological Perspective

As far as chronology is concerned, several radiometric dates have been obtained from

the Mesolithic sites of middle Ganga plain and Vindhyan area. There are two AMS C¹⁴ dates from Lekhahia rock shelter I in Vindhyas, viz., 6420 ± 75 and 6050 ± 75 BCE (Lukacs *et al.* 1996: 301-311). Similar dates have also been obtained from sites situated in middle Gangetic region. An early radiometric date of 8395±110 BCE has been derived from Sarai Nahar Rai (Possehl and Rissman 1992: 461, table 2) but this early Holocene date is highly questionable in view of suitability of the samples, contamination and methodology (Lukacs and Pal 2003: 331). Subsequently, a charred animal bone fragment from Mahadaha was accelerator dated, and obtained an age of 6,320 ± 80 BP; OxA-1647 (Chattopadhyaya 1996: 466). A thermo-luminescence date obtained from Damdama, suggested the range from 7000 BCE to 5000 BCE and two AMS dates derived from the human bone samples from stratum 1 (earliest) and stratum 6 (middle) at Damdama have yielded dates of 8865 and 8640 ± 65 BP respectively (Lukacs *et al.* 1996: 301-311). Thus, the combined testimonies of above dates suggest a mid-Holocene antiquity for Mahadaha and middle to early Holocene age for Damdama. However, in recent past, a time bracket of 10th millennium BCE to 8th millennium BCE has also been suggested for the Mesolithic cultures of Belan and Son valleys based on Infra-Red Stimulated Luminescence Ages (Pal *et al.* 2004: 62: Table 4).

Subsistence Strategies

Available archaeological records including faunal and floral evidence from the excavated sites provide a glimpse on Mesolithic subsistence economy. The faunal remains recovered from the excavated sites, large number of hearths filled partially with charred and burnt animal bones and plant remains in context with lithic artefact provide significant insight on the dietary habits of Mesolithic inhabitants. The faunal remains from Sarai Nahar Rai show the presence of large wild animals such as cattle, buffalo, gaur, elephant and rhinoceros. These remains were examined and identified by Alur (1980), but his identification suffers from disagreements and hence disputed. In addition to these, Damdama remains show that black-buck, gazelle, wild pig, *neelgai*, etc. were exploited for food intake (Thomas *et al.* 1995). In subsequent phases, Chattopadhyaya (1996) also examined all the animal taxa from Sarai Nahar Rai, Mahadaha and Damdama, and suggested a generalised economy with specialized hunting of swamp deer and hog deer, and intensive exploitation of aquatic resources. He has further elucidated that the nature of butchery marks particularly in the upper phalanges of swamp and hog deer infer skinning activity; hence, he has suggested that these two species of deer not only served as a dietary source but seems to have also been used as cloth, container, antler tools and ornaments (Chattopadhyaya 1988: 140). The Mesolithic mortuary practices in the middle Ganga plain provide sufficient insights into issues regarding settlement pattern, social organisation, and territoriality (Chattopadhyaya and Chattopadhyaya 1990). Bioarchaeological analysis of human remains is also very important to understand the subsistence strategy of the Mesolithic people. Study of human bone remains from Sarai Nahar Rai and Lekhahia were initiated by Lukacs (1977) and it was followed by subsequent comprehensive studies at Mahadaha and Sarai Nahar Rai (Kennedy *et al.* 1986, 1992). A noteworthy analysis of

skeletal pathology, conducted a decade ago by Lukacs and Pal (2003) at Damdama within the framework of subsistence transition theory, indicates hunting and foraging subsistence system. The result of this analysis also confirms prior understanding regarding subsistence and dietary pattern derived from the dental pathology profile and tooth size reported at Damdama, and thus further affirms the similarity of the Damdama's inhabitants to their neighbours at Mahadaha and Sarai Nahar Rai.

Besides hunting-gathering, plant based dietary pattern seems to have constituted an important role in the Mesolithic subsistence strategies; as vegetal food resources were abundant and easily accessible. The riparian environment of middle Ganga plain was favourable for the growth of such vegetal resources. Hunting is open with high-risk, low-return subsistence activity, whereas gathering is low-risk, high-return subsistence activity. Hence, considering this phenomenon and favourable environment, it was quite natural for the Mesolithic inhabitants to focus on easily available food resources. In this regard, botanical records from Damdama indicate broad-spectrum exploitation of edible wild plants including wild grasses, and goosefoot (*Chenopodium album*) (Kajale 1990). The remains of both wild (*Oryza rufipogon*) and cultivated rice (*Oryza sativa*) have been reported from the painted rock shelter site of Lekhahia (Kajale 1996). The occurrence of wild rice grain in the form of husk stuck with pottery and imbedded in lumps of burnt clay from Chopani Mando, suggest that collection of wild grains was prevalent as food practices of Mesolithic inhabitants. The large number of heavily utilised querns, mullers and anvils from excavated sites attested the processing activities of wild edible fruits, grains and tubers for the Mesolithic diet. The subsistence economy of Mesolithic folk has also been well demonstrated from several rock paintings bearing variety of hunting and food gathering depictions in Vindhya and Kaimur hills (Varma 1996). Recent phytolith analysis of Chopani Mando, carried out by Tulika and Sinha (2014), attested the presence of bamboo, palm and other plants like Cucurbita, *kush*, *munj*, and suggested that the people were not only consuming these plants for their dietary and culinary purposes but also to manufacture objects like water container, bows and arrows, hafts of composite lithic tools, cooking vessels, and baskets.

Overview and Discussion

The arrays of material record, radiometric dates and its chronological brackets of Mesolithic cultures in India in general and north-central part of India in particular, clearly indicate the survival of Mesolithic way of life even after the 2nd millennium BCE. In this regard, one can obviously perceive that the early farmers (both Neolithic and Chalcolithic) also emerged and survived well in suitable geographical locations in the same chronological bracket discussed above. Consequently, it would have been possible that the Mesolithic hunter-gatherers, in many instances entered in cultural exchange and symbiotic relationship with their agriculturist neighbourhood.

To look into the context, the archaeological and ethnographic testaments have been portrayed. In Vindhyan area, the Corded and the Rusticated wares were reported for

the first time at Koldihwa and after that from Mahagara, Pachoh and Indari (Pal 1986: 92-116) and recently at Tokwa (Misra *et al.* 2000-2001). Besides these, an interesting feature has come from several Mesolithic rock shelter sites in adjoining Vindhyan area where Cord-impressed ware has also been reported from Baghaikhor and Lekhahia in late Mesolithic context with the geometric microliths (Pal 1986:76-79). As far as the chronology is concerned, there are two AMS C¹⁴ dates from Lekhahia rock shelter I, viz., 6420 ± 75 and 6050 ± 75 BCE (Lukacs *et al.* 1996: 301-311) which is certainly contemporary to Neolithic phase of this region. But this scenario has not been observed at those sites situated in middle Ganga plain such as Sarai Nahar Rai, Mahadaha and Damdama (Misra 2010). Therefore, question arises at this juncture whether the late Mesolithic inhabitants had any cultural relation with the Neolithic people of Vindhya and middle Ganga plain or did any evolutionary trend exist in pottery making? In this regard, Misra (2010) has pointed out that the recovery of these pots from rock shelter sites in late Mesolithic context might have been due to the symbiotic relation between late Mesolithic and Neolithic cultures. He further suggested that there were certain people still living a Mesolithic way of life even at a time when Neolithic was established in this area. By drawing the ethnographic inferences from the Birhors of south Bihar, Bhattacharya (2004) has pointed out the tendencies of cultural exchange and opined that the newly settled communities along the river valleys might have entered into a regular symbiotic relationship with the forest dwellers.

On seeing the material records from the other regions located in different ecological settings, similar evidence of Neolithic-Chalcolithic nature (potsherds, copper spiral ear ring, bangles, steatite beads, arrowheads and needles made on limestone) has been recorded from the Late Mesolithic occupation in Muchchatla Chintamanu Gavi II cave, Kurnool cave area, Andhra Pradesh. Thermo-luminescence dating of a potsherd from this level has given a date of 1800 BCE. Hence, this evidence suggests that the Mesolithic traditions not only existed in time-and-space subsequent to the Neolithic culture but there was cultural exchange (Murty 1985, 2015). This phenomenon is further demonstrated at Bagor and Langhnaj where the evidence of cultural and biological exchange between Mesolithic hunter-gatherers and their agricultural neighbors, have been testified (Lukacs 1990).

After the excavation at Sarai Nahar Rai, G.R. Sharma hypothesized seasonal migration of Vindhyan populations into the Ganga plain area in search of food and water during terminal Pleistocene/early Holocene, caused by the acute scarcity of food and seasonal drought in the Vindhya (Sharma 1973, 1975; Sharma *et al.* 1980). He has further pointed out that these sites should be treated as camp sites where these groups of people settled for one season, but not year-round. This hypothesis was based on thin occupational deposits at Sarai Nahar Rai and paucity of lithic raw materials in entire middle Ganga plain. Subsequent excavations at Mahadaha and Damdama provide sufficient ground to raise questions about this hypothesis (Varma *et al.* 1985; Varma 1989). It has been further argued that Sharma's hypothesis of seasonal migrations is no longer acceptable in view of greater thickness of the cultural deposits at Mahadaha (60

cm) and Damdama (1.5 m) consisting of 4 and 9 layers respectively, and without any interlude, decisively suggest that this phase of Mesolithic does not represent periodic migrations (Varma *et al.* 1985; Pal 1994).

Faunal remains recovered from the sites of middle Ganga plain also provide important insight towards understanding whether Mesolithic people of this region were sedentary at some sites, or residentially mobile (Chattopadhyaya 1996). The analysis of animal bone remains, particularly swamp deer and hog deer indicates a wide range of killing seasons. To substantiate this further, Chattopadhyaya (1996: 468) interestingly emphasized the significant presence of bandicoot rat at Mahadaha and Damdama; while highlighting the significance of this commensal species, he quoted Hesse's (1979) argument that commensal animal cannot colonize a habitation site unless food is available throughout the year. Therefore, the increasing proportion of bandicoot rat remains in the later phases both at Mahadaha and Damdama, may suggest increasingly year-round occupation rather than seasonal occupation at these sites (Chattopadhyaya 1996).

While discussing subsistence variability and complex social formations in prehistoric Ganga plain, Chattopadhyaya (1988) provided an ethno-ecological model for the Mesolithic phase by quoting Mishra's (1982) work in the Royal Chitwan National park in Nepalese Terai. Mishra argued that Chitwan ecological and environmental pattern is broadly similar to that expected for the early/mid Holocene Ganga plain. Mishra (1982: 30) points out that canes of tall elephant grass have been traditionally used for making walls and partitions. If similar was in practice during Mesolithic time it is doubtful whether such structures would leave any tangible evidence in the archaeological record. But recent phytoliths analysis at Chopani Mando (Tulika and Sinha 2014) suggests the presence of bamboo (both hollow and slid varieties), *munj* and *kush* at the site thereby indicating structural activity and storage practice. It is also substantiated with the evidence of post holes in both the phases (early and advanced Mesolithic/proto Neolithic) (Sharma *et al.* 1980: 37-40). It has been argued again that rich growth of organic raw materials in early/mid Holocene Ganga plain presumably solved the storage problem in Mesolithic time (through the manufacturing of baskets, etc.) where societies in other regions had to depend upon the introduction of pottery (Chattopadhyaya 1988). The significance of food storage among hunter-gatherers has been discussed (Testart 1982) in view of abundance of plant and animal resources. Generally it is accepted that storage is as a characteristic of surplus economy that is Neolithic culture. The storage in Mesolithic, therefore, can be viewed as aiming towards social investment in the manner of organic solidarity within and between bands.

To understand the beginning of food production and domestication of plants and animals, it would be pertinent to look into the relevant records. Alur's (1980) identification of domestic animals which included cattle, sheep, and goat from Sarai Nahar Rai and Mahadaha, is not convincing. Subsequent faunal studies of Damdama remains also suggest that there is no evidence of domestic animals and possible

domesticates are absent as well (Thomas and Joglekar 1994; Thomas *et al.* 1995). As far as plant domestication is concerned, grains of wild variety of rice have been recorded, embedded in burnt clay lumps from later phase of Chopani Mando in Vindhya. Some other noteworthy testaments from this phase include crude handmade pieces of Cord-impressed ware, lithic objects like querns, mullers, ring stones and rubbers. These objects are important, if put together with plant remains to understand the harvesting and processing strategies of wild grains by the Mesolithic inhabitants.

Concluding Remarks

The above discussion amply demonstrates that both sedentism and surplus management are visible well within the Mesolithic culture in the middle Ganga plain. It is also noteworthy that wild rice is abundant in this region and still harvested by local population. Thus, it will appear that all the pre-requisites of a Neolithic culture can already be seen in the Mesolithic of middle Ganga plain. In fact, when Neolithic develops in this region in the subsequent phase, one can hardly see any marked change in the entire tools or habitat. It thus appears that perhaps for as much as 2000 to 3000 years these Neolithic people remained as part-time farmers.

Acknowledgements

This paper is a review of the research carried out by earlier scholars and I take the opportunity to thank all of them whose pioneering contributions have been utilized fruitfully in writing this paper. I am thankful to Dr. Manoj Kumar Singh (my Ph.D. supervisor), Dr. B.R. Mani, Shri K.N. Dikshit and Prof. D.K. Bhattacharya for their unconditional guidance and constant support in my research career. I am grateful to Dr. Manjil Hazarika and Dr. Neetu Agarwal for critical comments and fruitful discussion.

References

- Ajithprasad, P. 2002. The Mesolithic culture in the Orsang Valley, Gujarat. In *Mesolithic India*, eds. V.D. Misra and J.N. Pal, 154-189. University of Allahabad: Department of Ancient History, Culture and Archaeology.
- Alur, K.R. 1980. Faunal Remains from the Vindhya and the Ganga Valley. In *Beginnings of Agriculture*, eds. Sharma, G.R., V.D. Mishra, D. Mandal, B.B. Mishra and J.N. Pal, 207-210. Allahabad: Abinash Prakashan.
- Bhattacharya, D.K. 2004. The Anthropological Probing of Mesolithic India. *Studies in Indian Anthropology: Festschrift to Professor Gopal Sarana*, ed. P.K. Misra, 371-387. Jaipur, New Delhi: Rawat Publication.
- Chakrabarty, Dilip, K. 1993. *Archaeology of Eastern India: Chhotanagpur Plateau and West Bengal*. New Delhi: Munshiram Manoharlal Publishers Pvt. Ltd.
- Chakrabarty, Subrata. 2002. Mesolithic Cultures in West Bengal. In *Mesolithic India*, eds. V.D. Misra and J.N. Pal, 332-346. University of Allahabad: Department of Ancient History, Culture and Archaeology.

- Chattopadhyaya, I., and U.C. Chattopadhyaya. 1990. The Spatial Organisation of Mortuary Practices in the Mesolithic Ganga Valley: Implications for territoriality. In *Adaptation and Other Essays*, ed. N.C. Ghosh and S. Chakrabarty, 103-109. Shantiniketan: Visva Bharati.
- Chattopadhyaya, U.C. 1988. Subsistence Variability and Complex Social Formation in Prehistoric Ganga Valley: Problems and Prospects. *Man and Environment* XII: 135-152.
- Chattopadhyaya, U.C. 1996. Settlement Pattern and the Spatial Organisation of Subsistence and Mortuary Practices in the Mesolithic Ganges, North-Central India. *World Archaeology* 27 (3): 461-476.
- Chauhan, M. S. and S. Chatterjee. 2007. Holocene vegetation, climate and human habitation in the central Ganga Plain based on pollen records from the lake deposits. *Palaeobotanist* 57: 265–275.
- Chauhan, M. S., A. K. Pokharia and I.B. Singh. 2009. Pollen Record of Holocene vegetation, climate change and human habitation from Lahuradewa Lake, Sant Kabir Nagar District, Uttar Pradesh, India. *Man & Environment* 34: 88–100.
- Chauhan, M. S., C. Sharma, I. B. Singh and S. Sharma. 2004. Proxy records of Late Holocene vegetation and climate changes from Basaha Jheel, Central Ganga Plain. *J. Palaeontol. Soc. India* 49: 27–34.
- Gupta, H. P. 1976. Holocene palynology from Meander Lake in the Ganga valley, district Pratapgarh, U.P. *The Palaeobotanist* 25: 109-19.
- Hayden, B. 1981. Research and Development in the Stone Age: Technological Transitions among Hunter-Gatherers. *Current Anthropology* 22: 519-548.
- Hesse, B. 1979. Rodent Remains and Sedentism in the Neolithic: Evidence from Tepe Ganj Dareh, Western Iran. *Journal of Mammalogy* 60 (4): 856-57.
- Kajale, M. D. 1990. Some Initial Observations on Palaeobotanical Evidence for Mesolithic Plant Economy from Excavations at Damdama, Pratapgarh, Uttar Pradesh. In *Adaptation and Other Essays*, eds. N. C. Ghosh and S. Chakrabarti, 98-102. Santiniketan: Visva-Bharati.
- Kajale, M. D. 1996. Plant Resources and Diet Among the Mesolithic Hunters and Foragers. In *The Prehistory of Asia and Oceania*, ed. G. Afanas'ev, S. Cleuziou, J. R. Lukacs, and M. Tosi, vol. 16, 251-253, Forli: ABACO Edizioni.
- Kennedy, K. A. R., J. R., Lukacs, R. F. Pastor, T. L. Johnston, N. C. Lovell, J. N. Pal, B. E. Hemp-hill and C. B. Burrow. 1992. Human Skeletal Remains from Mahadaha: A Gangetic Mesolithic Site. Occasional Papers and Theses of the South Asian Program, No. 11. Ithaca: Cornell University.
- Kennedy, K. A. R., N. C. Lovell and C. B. Burrow. 1986 *Mesolithic Human Remains from the Gangetic Plains: Sarai Nahar Rai*. Occasional Papers and Theses of the South Asia Program, No. 10. Ithaca: Cornell University.
- Lukacs, J.R, J.N. Pal and V.D. Mishra. 1996. Chronology and Diet in Mesolithic North India: A Preliminary Report of New AMS C14 Dates, δ -C Isotope Values and their Significance, In *Bioarchaeology of Mesolithic India: An Integrated*

- Approach, Colloquium XXXIII of International Union of Prehistoric and Protohistoric Science*, eds. G.E. Afanas'ev, S. Cleuziou, J.R. Lukacs and M. Tosi: 301-311. Forli: ABACU Edizioni.
- Lukacs, J.R. 1990. On Hunter-Gatherers and their Neighbours in Prehistoric India: Contact and Pathology. *Current Anthropology* 31 (2): 183-186.
- Lukacs, J.R. and J.N. Pal. 2003. Skeletal Variation among Mesolithic People of the Ganga Plains: New Evidence of Habitual Activity and Adaptation to Climate. *Asian Perspective* 42 (2): 329-351.
- Lukacs, J.R. and V.D. Misra. 1997. The People of Lekhahia: A Bio-archaeological Analysis of Late Mesolithic Hunters-Foragers of North India. In *South Asian Archaeology 1995*, eds. R. Allchin and B. Allchin. New Delhi: Oxford and IBH.
- Mishra, H.M. 1982. The Ecology and Behaviour of Chital (*Axis axis*) in the Royal Chitwan National Park, Nepal (with comparative studies of hog deer (*axis porcinus*), sambar (*Cervus unicolor*) and barking deer (*Muntiacus muntjak*). Unpublished Ph.D. Dissertation, University of Edinburgh.
- Misra, V.D. 1977. *Some Aspects of Indian Archaeology*. Allahabad: Prabhat Prakshan.
- Misra, V.D. 2010. Late Upper Palaeolithic and Mesolithic Cultures of North-Central India. *Puratattva* 40: 8-16.
- Misra, V.D., J.N. Pal and M.C. Gupta. 2000-2001. Excavation at Tokwa: A Neolithic-Chalcolithic Settlement. *Pragdhara* 11: 59-72.
- Misra, V.N. 1973. Bagor: A Late Mesolithic Settlement in Northwest India. *World Archaeology* 5 (1): 92-110.
- Misra, V.N. 1974. Archaeological and Ethnographic Evidence for the Hafting and Use of Miceoliths and Related tools. *Puratattva* 7: 3-12.
- Misra, V.N. 2001. Prehistoric Human Colonisation of India. *Journal of Bioscience* 26 (4): 491-531.
- Misra, V.N. 2002. The Mesolithic Age in India. In *Prehistory Archaeology of South Asia: Indian Archaeology in Retrospect*, Volume I, eds. S. Settar and Ravi Korisetar, 111-125. New Delhi: Indian Council of Historical Research and Manohar.
- Mohanty, P. 1989. Mesolithic Settlement System of Keonjhar District, Orissa. Unpublished Ph.D. Dissertation: University of Puna.
- Mohapatra, G.C. 1962. *The Stone Age Cultures of Orissa*. Puna: Deccan College
- Murty, M.L.K. 1985. Ethnoarchaeology of the Kurnool Cave Areas. *World Archaeology* 17 (2): 192-205.
- Murty, M.L.K. 2015. Archaeology and Human Ecology of Late Pleistocene and Early Holocene Cultures in India: Implications for Transition to Agriculture. *Puratattva* 45: 6-36.
- Pal, J.N. 1985. Some New Light on the Mesolithic Burial Practices of the Ganga Valley: Evidence from Mahadaha. *Man Environment* IX: 28-37.
- Pal, J.N. 1986. *Archaeology of Southern Uttar Pradesh, Ceramic Industry of Northern Vindhya*. Allahabad: Swabha Prakashan.

- Pal, J.N. 1992. Mesolithic Human Burial in the Ganga Plain, north India. *Man and Environment* XVII (2): 35-44.
- Pal, J.N. 1994. Mesolithic Settlements in the Ganga Plain. *Man and Environment* XIX (1-2): 91-101.
- Pal, J.N. 2013. New Researches in the Prehistoric Archaeology of the Vindhyas. *Puratattva* 43: 1-10.
- Pal, J.N., M.A.J. Williams, M. Jaiswal and A.K. Singhavi. 2004. Infra-Red Stimulated Luminescence Ages for Prehistoric Cultures in the Son and Belan Valleys, North Central India. *Journal of Interdisciplinary Studies in History and Archaeology* 1 (2): 51-62.
- Pant, D.D. and R. Pant. 1980. Preliminary Observations on pollen flora of Chopani-Mando (Vindhyas) and Mahadaha (Ganga valley). *History and Archaeology* 1: 229-30.
- Possehl, G.L. and Paul Rissman. 1992. *Chronology in the Old World Archaeology*. (India) Vol. I, IIIrd Edition, R.W. Ehrich (ed.), University of Chicago press: Chicago and London.
- Rowley-Conwy P. 1983. Sedentary Hunters: the Ertebolle Example. In *Hunter-Gatherer economy in Prehistory*, ed. G Bailey, 111-126: Cambridge University Press.
- Rowley-Conwy P. 1996. Why didn't Westropp's 'Mesolithic' catch on in 1872? *Antiquity* 70 (270): 940-944.
- Saxena, A., V. Prasad and I.B. Singh. 2013. Holocene Palaeoclimate reconstruction from the phytoliths of the lake-fill sequence of Ganga Plain. *Current Science* 104 (8): 1054-1062.
- Sharma, G.R. 1975. Seasonal Migrations and Mesolithic Lake Cultures of Ganga Valley. In *G.R. Sharma (ed.), K.C. Chattopadhyaya Memorial Volume*, 1-20. University of Allahabad.
- Sharma, G.R. 1980. *History to Prehistory: Archaeology of Ganga Valley and Vindhyas*. Allahabad: University of Allahabad.
- Sharma, G.R. and J.D. Clark (eds.). 1983. *Palaeoenvironments and Prehistory in the Middle Son Valley*. Allahabad: Abinash Prakashan.
- Sharma, G.R., V.D. Mishra, D. Mandal, B.B. Mishra and J.N. Pal. 1980. *Beginnings of Agriculture*, Allahabad: Abinash Prakashan.
- Sharma, S., Joachimski, M., Tobschall, H. J., Singh, I. B., Sharma, C., Chauhan, M. S. and Morgenroth, G. 2004. Late glacial and Holocene environmental changes in Ganga Plain, northern India. *Quaternary Science Review* 23: 145-159.
- Sharma, S., M. M. Joachimski, H. J. Tobschall, I. B. Singh, C. Sharma and M. S. Chauhan. 2006. Correlative evidences of monsoon variability, vegetation change and human inhabitation in Sanai Lake deposit: Ganga Plain, India. *Current Science* 90: 973- 978.
- Singh, R.L. (ed) 1971. *India: A Regional Geography*, National Geographic Society of India, Varanasi.

- Spate, O.H.K and A.T.A. Learmonth. 1972. *India and Pakistan: A General and Regional Geography*. London: Methuen.
- Testart, A. 1982. The Significance of Food Storage among Hunter-Gatherers: Residence Patterns, Population Densities, and Social Inequalities. *Current Anthropology* 23: 523-537.
- Thomas, P.K., P.P. Joglekar, V.D. Misra, J.N. Pandey and J.N. Pal. 1995. A Preliminary Report of Faunal Remains from Damdama. *Man and Environment XX (I)*: 29-36.
- Thomas, P.K., P.P. Joglekar. 1994. Holocene Faunal Studies in India. *Man and Environment XIX*: 179-203.
- Tulika and P. Sinha. 2014. Phytoliths in Archaeological Soils from Chopani-Mando, Belan Valley: A Preliminary Study. *Puratattva* 44: 101-111.
- Varma, R.K. 1986. *The Mesolithic Age in Mirzapur*. Allahabad: Paramjyoti Prakashan.
- Varma, R.K. 1989. Pre-Agricultural Mesolithic Society of Ganga Valley. In *Old Problems and New Perspectives in the Archaeology of South Asia*, ed. J.M. Kenoyer, volume 2: 55-58. Wisconsin Archaeological Reports.
- Varma, R.K. 1996. Subsistence economy of the Mesolithic folk as reflected in the rock-paintings of the Vindhya region. In *The Prehistory of Asia and Oceania*, ed. G. Afanas'ev, S. Cleuziou, J. R. Lukacs, and M. Tosi, vol. 16, 329-339, Forli: ABACO Edizioni.
- Varma, R.K., V.D. Misra, J.N. Pandey, J.N. Pal. 1985. A Preliminary Report on the Excavations at Damdama (1982-84). *Man and Environment IX*: 45-65.
- Yesner, D.R. 1980. Maritime Hunter-Gatherers: Ecology and Prehistory. *Current Anthropology* 21: 727-750.