ANCIENT ASIA

Vol. 15, 2024, pp. 199-222

URL: https://ancient-asia-journal.com
https://doi.org/10.47509/AA.2024.v15i.12

Unveiling the Techniques and Patterns of the Microlithic Industry: A Quantitative Survey of Prehistoric Artefacts in Anuppur, Central India

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Abstract: *The investigation of prehistoric lithic industries holds significant importance in comprehending human evolution and technological development. This research paper aims to understand the microlithic industry of the Anuppur region by conducting a comprehensive survey of recently explored sites of the prehistoric period. Our primary objectives revolve around providing a meticulous description of the tools collected during our exploration, Performing statistical analysis of the tool data employing SPSS software, elucidating the regional landscape, and discussing our findings in the context of prior research. Our ultimate goal behind doing this research is to contribute to a deeper knowledge of the microlithic industry of the Anupur region of Central India and its larger relevance within the context of human technological behaviour. Through the systematic analysis of recently explored sites, we could shed light on the intricate details of the microlithic industry, unravelling its complexities and offering valuable insights into the evolution of human societies in this region. By utilising robust statistical methods and exploring the regional landscape, we endeavour to create a comprehensive framework for understanding the multifaceted dimensions of the microlithic industry in Central India.*

Keywords: *Microliths Industry, Central India, Artefacts, Landscape, Quantitative Analysis, Chaîne opératoire*

Published : 12 November 2024

TO CITE THIS ARTICLE:

Roopnarayan Bhaina, Pratik Pandey, Neelam Singh, Binayak Kr. Dubey & Sachin Kr. Tiwary (2024). Unveiling the Techniques and Patterns of the Microlithic Industry: A Quantitative Survey of Prehistoric Artefacts in Anuppur, Central India. *Ancient Asia,* 15: 1, pp. 199-222. *https://doi.org/10.47509/AA.2024.v15i01.12*

Introduction

Microlithic industries have been a subject of great interest among prehistoric archaeologists and anthropologists. These industries are known for producing small retouched stone tools usually associated with hafting as a composite tool (see definition Clark, G. D. 1985, Lewis and Petraglia 2017, Pargiter 2016**,** Clarkson et al. 2009,) mostly made of siliceous materials, which were widely used by prehistoric communities over time for various purposes (Jayaswal and Pant 1997*).* The transition from Palaeolithic to microlithic tools represents a significant event in the technological history of humankind. This transition might be influenced by the climatic shifts, the emergence of Homo sapiens, advancements in toolmaking and cognitive abilities. Microlithic tools, which were smaller and more specialised than their Paleolithic predecessors, were better suited for diverse environments, enabling more efficient hunting and gathering practices and solving other local problems (Barton et al. 2006, Elston, R. G., & Brantingham, P. J. 2001). Further, Sinha 1989 and Groman-Yaroslavski et al., 2020 provide details about the utilisation of these microliths in activities like cutting, whittling, slicing, scraping, piercing, boring and chopping. This technological innovation coincided with modern humans' cognitive and cultural advancements, facilitating their ability to adapt and thrive.

The Anuppur region of Madhya Pradesh in Central India is the hotspot of several microlithic sites (Fig. 1) and serves as a source of fascination for prehistoric researchers. In this research paper, we aim to conduct a quantitative analysis of the microlithic industry in the Anuppur region, focusing on understanding the tool typology, raw material procurement, and overall technological advancements in the region.

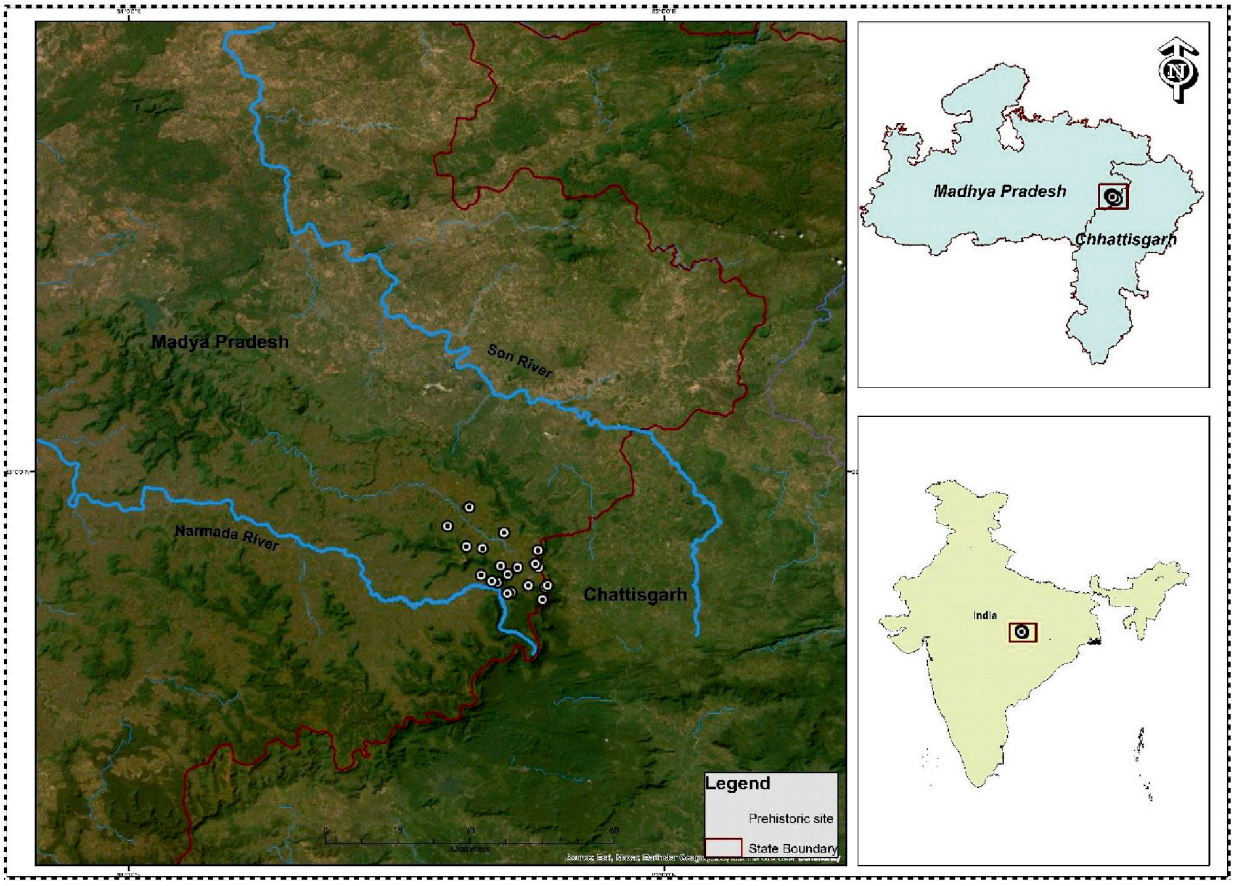


Figure 1: General Topography of Anuppur region (Data Source: ArcGIS Basemap, Map generated in ArcGIS 10.8.2)

The microlithic industry of the Anuppur region has been studied in the past, and several scholars have provided insights into its various aspects. The majority of these studies, however, were merely reports that paid little attention to the utilisation of landscapes or technological or quantitative analyses of the sector. In this paper, we attempt to fill this gap by providing a detailed statistical analysis of the microlithic tools found in the region. The study of the microlithic industry in the Anuppur region is of particular significance, as it sheds light on the technological advancements and cultural practices of the ancient communities that lived in the region. The microlithic industry is a significant archaeological phenomenon that reflects the ingenuity and adaptability of ancient human societies. Microblade technology is a significant aspect of the prehistoric culture in the Indian subcontinent, linked to early modern humans due to its long-lasting presence from its emergence until the Iron Age. (Jayaswal, 2002), (Mishra, *et al.*, 2013), (Raphael, *et al.*, 2020). The Sites like Dhaba, Mehtakheri, Kan and Mahadebra throw back the date of this technology to the late Pleistocene of almost 48ka (Haslam, *et al.*, 2012) (Mishra, *et al.*, 2013) (Bishnupriya and Srivastava, 2017). Clarkson and colleagues emphasize the adaptive advantages of microlithic tools in the aspects of transportability, raw-material exploitation, manufacturing procedures, standardisation, habitability, maintainability, and reliability (Clarkson, *et al*, 2018).

Previous Works and Research Gaps

The earlier works were done by R. Sengupta in the proposed area during 1961-62, who collected some middle and upper Palaeolithic artefacts from *Rajendra Gram* and *Amarkantak* (IAR, 1961-62:100). Numerous lower and middle Palaeolithic sites were found in 1962 by Nishar Ahamad (IAR, 1962-63:11) in Lalpur, Markandeya, and Amarkantak. He emphasised the significance of these locations for comprehending prehistoric human conduct and the cultural arcs of the Indian Stone Age. The same year, Middle Palaeolithic assemblages in this region were discovered by S.B. Trivedi from ASI (IAR 69). The Archaeological Survey of India conducted a village-to-village survey in 2009, and later, under the direction of J. N. Malpani (Malpani) of the Bhopal Regional Centre, successful exploration was carried out with a number of discoveries that indicate the cultural progression from the Stone Age to the early Medieval period. Following that B. K. Mohanta covered the Upper Johila Valley and reported a group of prehistoric sites ranging from Mesolithic to Neolithic in 2017 (Mohanta, 2017). The same year has also been fruitful for Alok Shrotriya and Mohan Lal Chadhar (Shrotriya, 2017: 185-191), (Chadhar) from IGNTU discovered several prehistoric stone tools, including microliths from this area. Vinay Kumar and Vishi Upadhyay (Kumar and Upadhyay 2015) studied some microlithic tools in the region about 60 km away from the present study area. All these previous works and their important findings suggest that this area was once a region of attraction for prehistoric hominines and contains a long history of prehistoric occupational evidence.

There is still much to learn about the manufacture, use, and dispersion of microliths even though previous investigations by academicians have confirmed their presence in the area. For a better knowledge of the microlithic sector, we evaluated freshly explored sites in the Anuppur region for this study. Our survey focused on four main objectives: (1) to describe each site in detail, (2) to provide a detailed description of the tools we recovered during our exploration, (3) to perform a statistical analysis of the tool data using SPSS (Statistical Package for the Social Sciences is a comprehensive software package designed for statistical data analysis) software, and (4) to describe the landscape of the region. Through these objectives, we aim to contribute to the existing knowledge of the microlithic industry in the Anuppur region and try to shed light on the technological, economic, and social aspects of prehistoric human societies. By doing so, we hope to provide a better understanding of the microlithic industry's importance in the broader context of human evolution.

General geology of the Study area

Central India, including the Anuppur district, has a rich geological history marked by the Vindhyan, Gondwana, and Deccan Trap supergroups. The ancient rocks from these formations were crucial for prehistoric communities, who utilized them to manufacture microlithic tools. All the microlithic sites in this region lies in the proximity of the Amarkantak formation group of Vindhyas, which is a good source of siliceous raw material including porcellanite chert and chalcedony which are abundantly found in the foothill regions (see Figure 2). These silica rich crypto-crystalline raw materials were well utilised by the microlithic community of this region for manufacturing tiny tools.

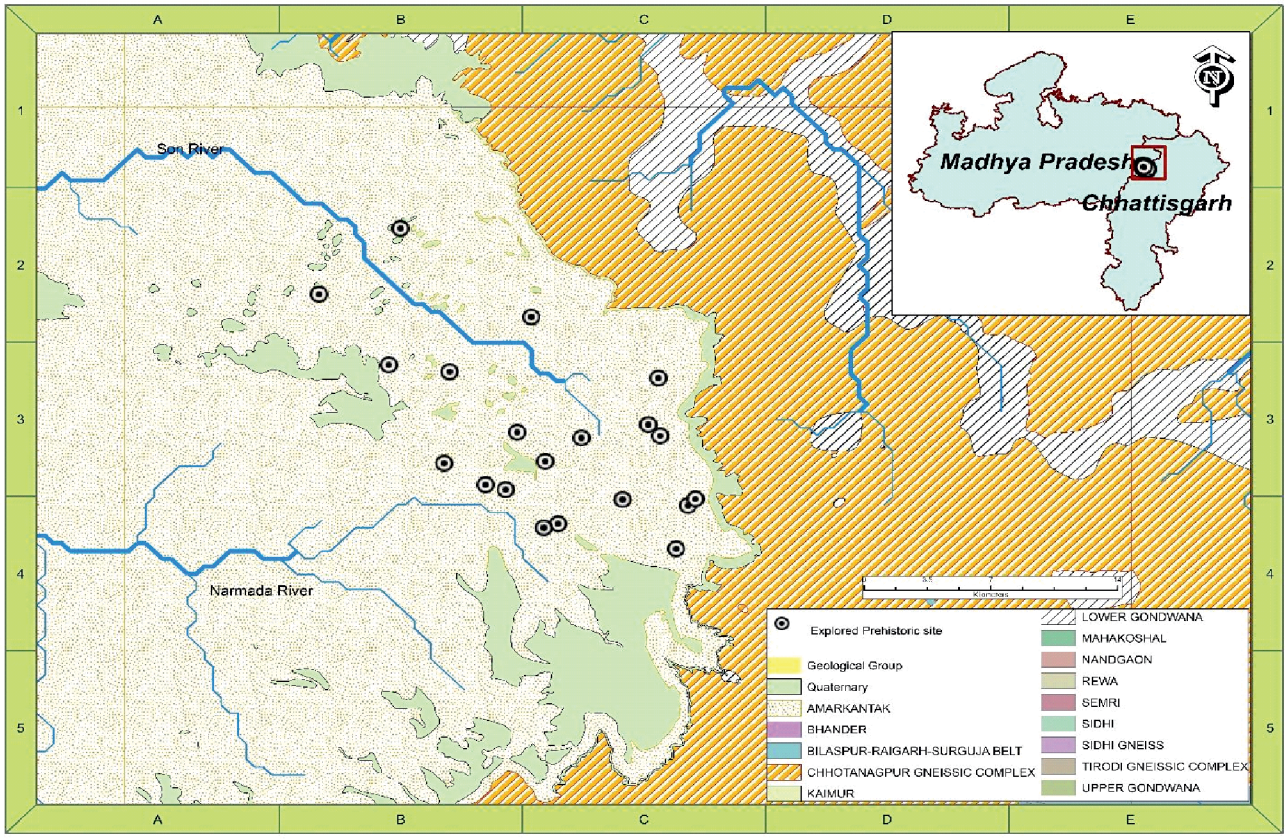


Figure 2: Geological map of the study area (Data Source:BHUKOSH,GSI, May 2024, Map generated in ArcGIS 10.8.2)

The Digital Elevation Model of the explored area provides some crucial information about the Human-landscape interaction of prehistoric hunter-gatherers. The existence of the site is primarily reported based on exploration, and it indicates the different terrain adaptations by prehistoric groups in this area and their preference towards the specific landscape occupation.

All the explored prehistoric sites ranging within the proximity of water channels (Fig. 2) would infer the needs of the prehistoric population, for fresh water and lithic raw materials. The concentration of the sites mainly lies among **1.** 922 to 1010 m, **2.** 848 to 921 m, and **3.** 782 to 848 m and share statics of 50%, 35%, and 15% respectively (Fig. 3). The area consists of general gradients to the west and all the small and seasonal streams finally discharge themselves into two prominent rivers such as the Narmada and Son. This uneven terrain provided the main means of transportation and accessibility for raw materials with its steep gradients and high water flow. The abundance of these resources would be

the main attraction for the prehistoric community to occupy this region. The presence of microlithic tools on the margins of the hills and their context indicates that these assemblages could be transported materials and collected from the secondary context.

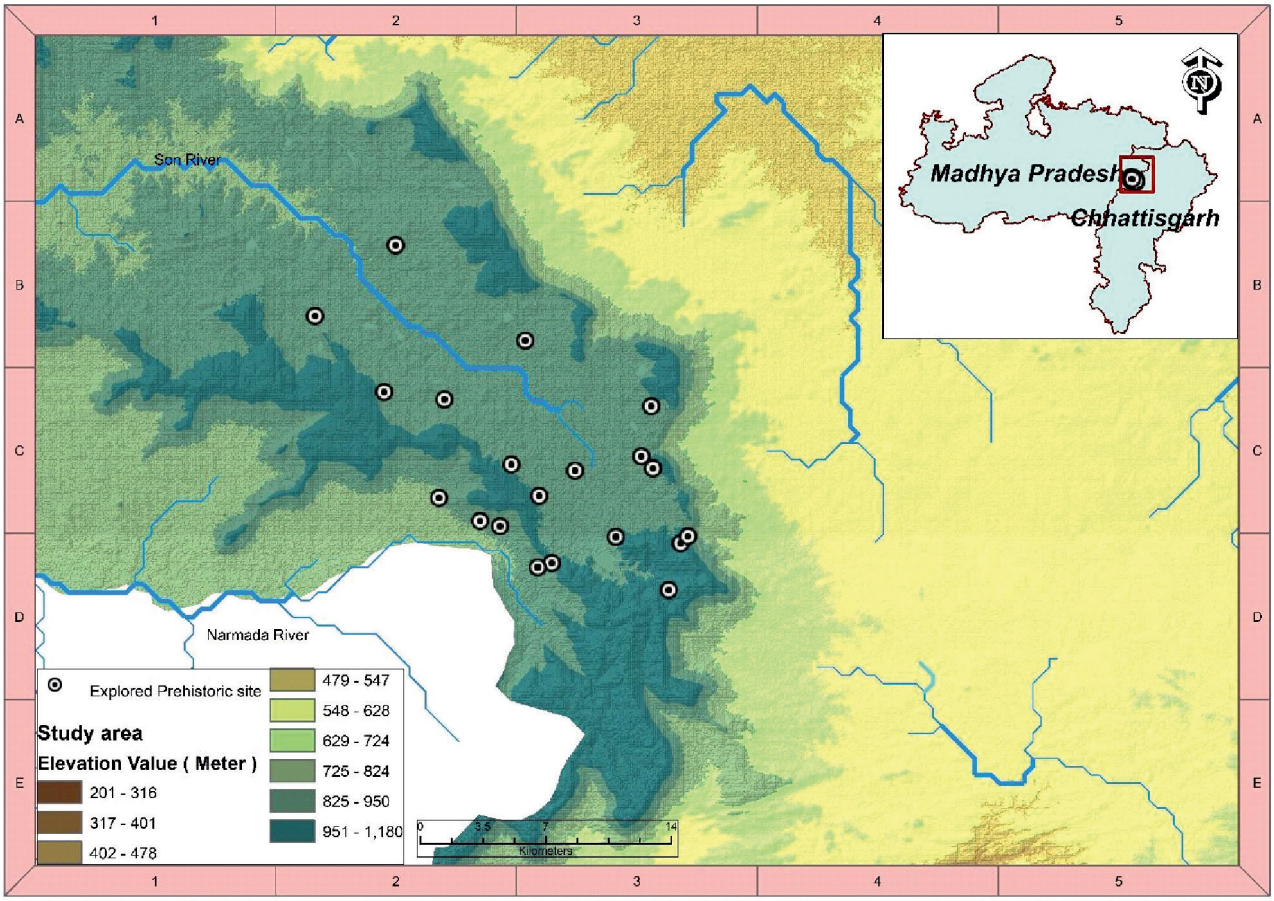


Figure 3: Digital Elevation Model (meter) of study area (Data Source: USGS, May 2024, Map generated in ArcGIS 10.8.2)

Description of the Explored Sites

***Lalpur* (LLP)** (22^{0}47'21'' N. 81^{0}44'29'' E.): This location can be found on the western slope of the Maikal Hills, east of Lalpur Village, on the Pondki-Gaurela-Karangara Road. The village is located southeast of Pushparajgarh Block at a distance of 24 km. The site is about 500 meters away in the north-east of the Johila river dam. The primary source of water for the inhabitants is a water spring that can be located on the site's slope. Upper Palaeolithic and Mesolithic tools are found scattered over the site. It is reasonable to imagine that numerous tools may have been swept away during rain because the site slopes 600 to 1200 degrees from east to west (Fig. 4).

***Farrisemar* (FRS)** (22^0 46'21'' N. 81^0 42'31'' E.): This site is located on the Pondki-Dindauri road on the left side of the weekly market area. Pushparajgarh Block and the Anuppur District headquarters are both 28 and 59 kilometres away, respectively, to the south-west. It can be approached by moving 4km in west from Pondki village. Narmada River flows 500 m west of the village. Most of the population in the village belongs to Gond and Baiga tribes. The site is vandalized by farming activities being carried by villagers in present (Fig.5).

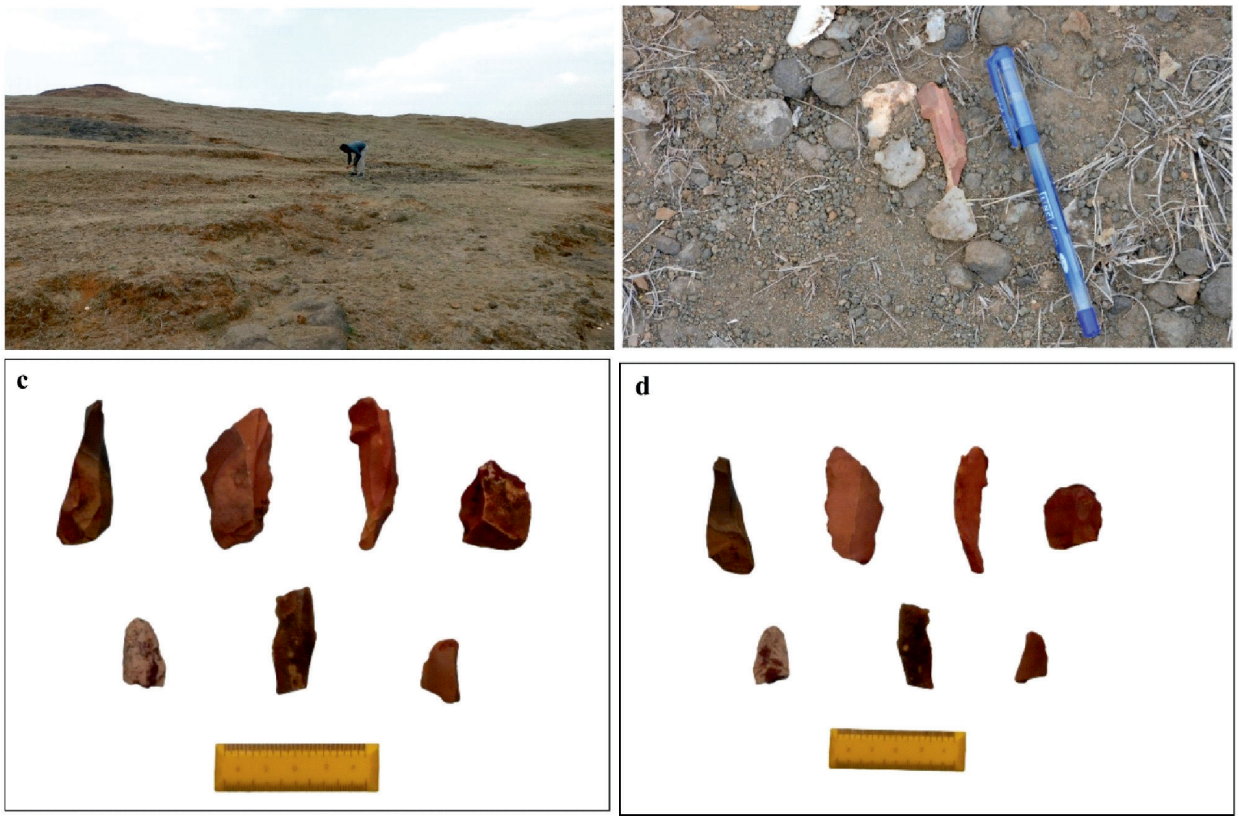


Fig. 4. a: General view of the site Lalpur, b: Close view of the artefacts on the surface, c: Dorsel image of the artefacts, d: Ventral view of the artefacts.

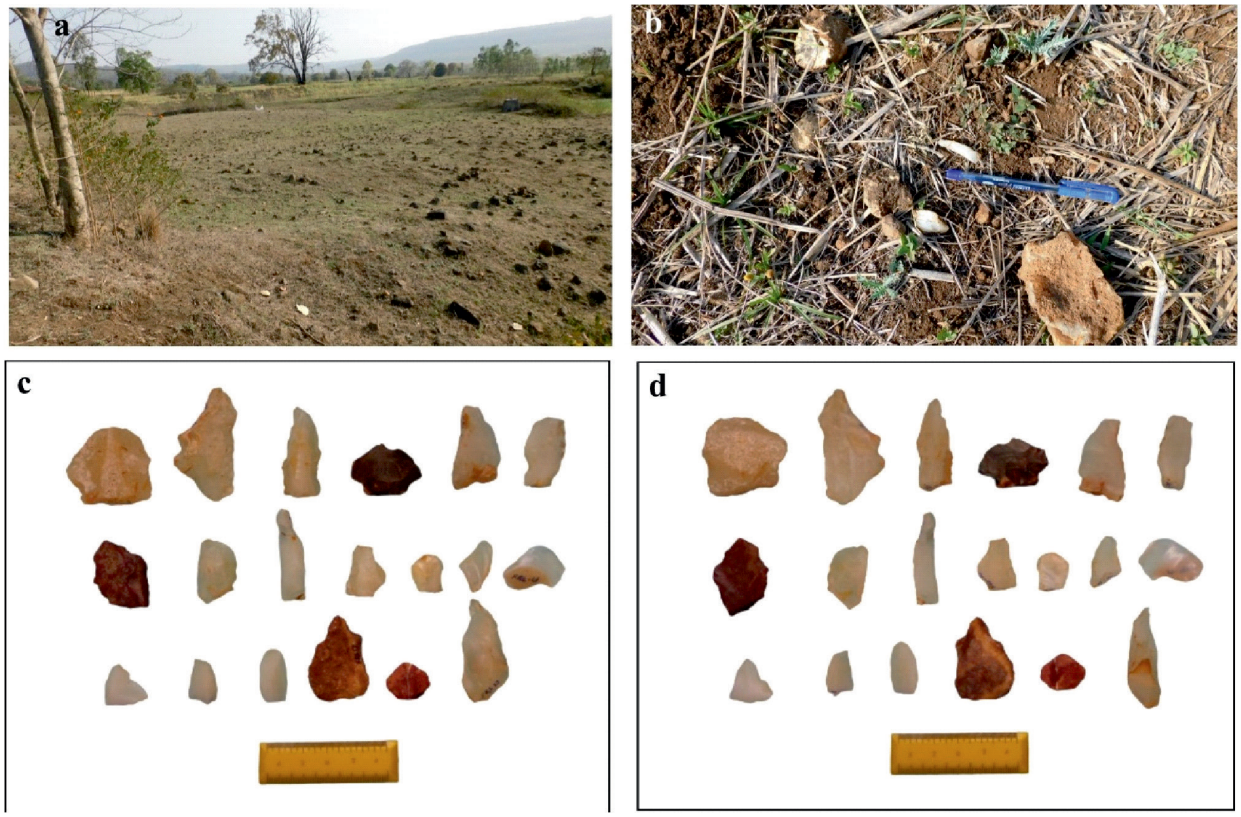


Fig. 5. a : General view of the site Farrisemar: Close view of the artefacts on the surface, c: Dorsel image of the artfacts, d: Ventral image of the artefacts.

***Bagharra* (BGR)** (22^0 29' 46'' N. 81^{0}31'41''): This location is on the Baihar major route, which connects Jaitahari and Rajendragram, to the west of Bagharra village. It lies 7 km to the north-east of Pushprajgarh Block, 31 km to the south-east of Jaithari Block, and 38 kilometres to the Disrtrict Headquarters of Anuppur. It is located over the inclination of 45^{0}on the North-South slope of Maikal Hill. Upper Palaeolithic tools have been found at the site (Fig.6).

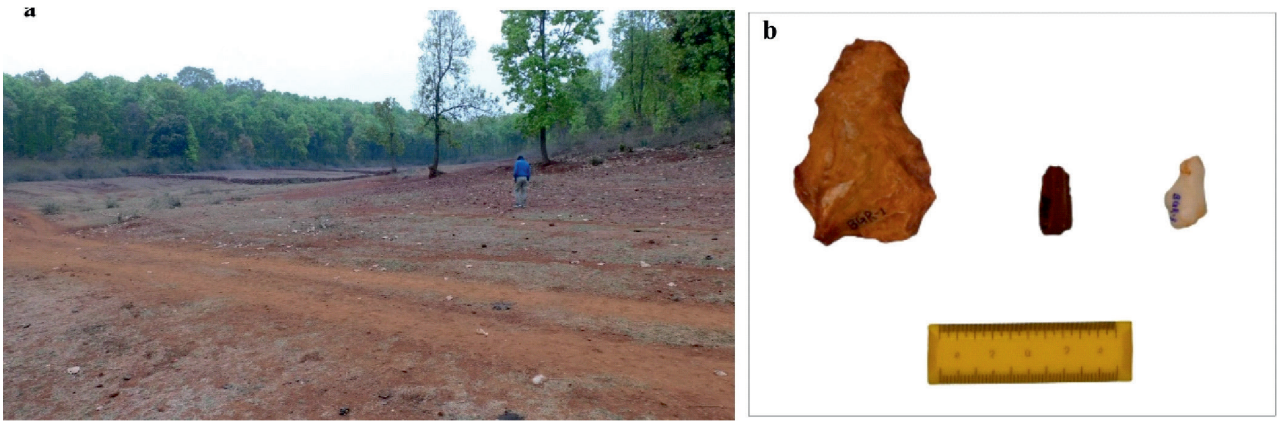


Fig. 6: a:General View of the siteBagharra, b: Artefacts from the site.

***Bartola* (BRT 1)** (22^{0}46' 21'' N. 81^0 42' 31''): The location is west of State Highway 9A, which runs from Pushparajgarh to Amarkantak and is to the north of the village of Bartola. Pushparajgarh block and Anuppur district's administrative centres are 6 km and 38 km south-west of it, respectively. Khareef crop is grown over the site by villagers. Maikal Hills are only 100 m away in the west of the site. The inclination of the site is 45^0 to 60^0. Upper Palaeolithic and Mesolithic tools are found from the site (Fig.7).

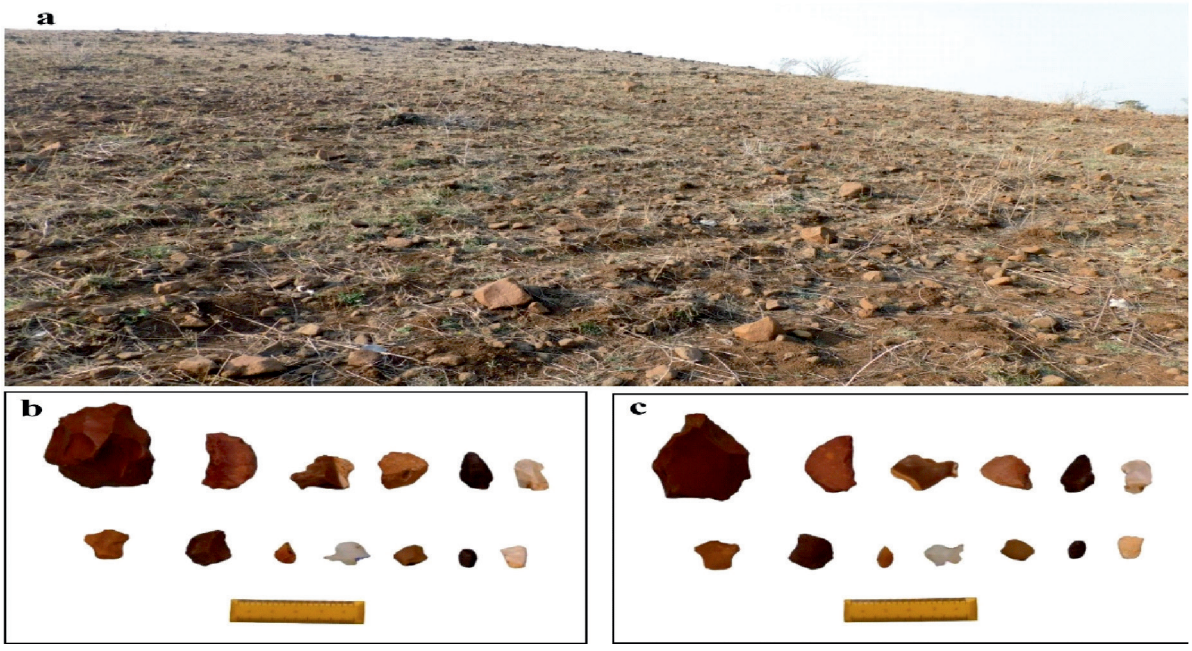


Fig. 7. a:General view of the site Bartola, b: Dorsel image of artefacts c: Ventral image of artefacts.

***Bharni*(BRN)**(22^{0}49'32'' N. 81^{0}45'51''): This location, which spans the Maikal Hill and is inclined 450 degrees from east to west, is situated 1 km to the northeast on the left side of Bijauri Road

that runs from Rajendragram to Gaurela. It is 60 kilometres from the administrative headquarters of the Anuppur district and 29 kilometres from Pushparajgarh Block. About 100 m east of the site, there are some *kachcha* houses and a farming field where *Khareef* crops are cultivated in present. Stone tools of Upper Palaeolithic period are found spread over the land (Fig.8).

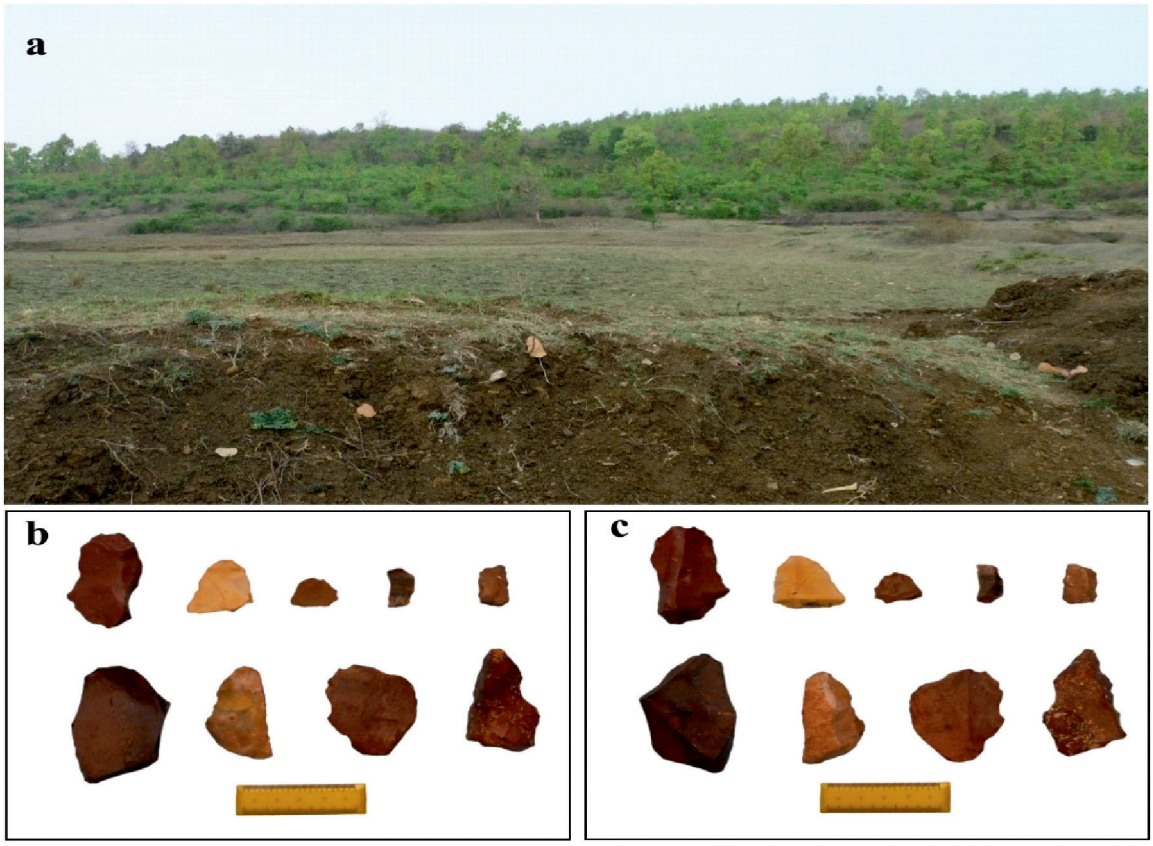


Fig. 8. a:General view of the site Bharni, b: Dorsel image of artefacts, c: Ventral image of artefacts.

***Bharra Tola* (BRT 2)** ($22^0$51'23" N. $81^0$45'48"): This site is located on the left side, to north of Bijauri road running from Rajendragram to Gaurela. The nearest village Bharra Tola is located on its north side. It is 10 km east of Pushparajgarh block, and 41 km south of Anuppur district headquarters. About 50 km west of the site, Seasonal River flows from south to north. The site is spread on 45^0 inclinations of hill. Tools of the Mesolithic period have been found on the site during our exploration (Fig.9).

***Bhejri* (BJR)** ($22^0$49'36" N. $81^0$41'31"): On the left side of Amarkantak State Highway No. SH-9A, the location is situated northwest of Bhejri Village. Pushparajgarh and the Anuppur district headquarters are respectively 20 km and 52 km apart in the south (Fig.10).

***Harra Tola* (HRT)** ($22^0$46'35" N. $81^0$42'58" E.): This site is located on the left side of Farrisemar-Dindori village road and is 2 km west of Pondki village. The site is approachable with two or four-wheeler easily. The village would have been named after the Harra tree (Terminalia Chebula), which grows in the area in large numbers. It is 26 km and 57 km away in the south-west direction from Pushparajgarh block and Anuppur district headquarters respectively. Gond, Baiga and Panika tribes are the main residents of the village, and they are currently farming on the site. There are Bauxite mines in the village. The village is surrounded on its both sides by Maikal Hills running into east-west directions. Stone stools from Upper Palaeolithic and Mesolithic periods are scattered over the site (Fig.11).

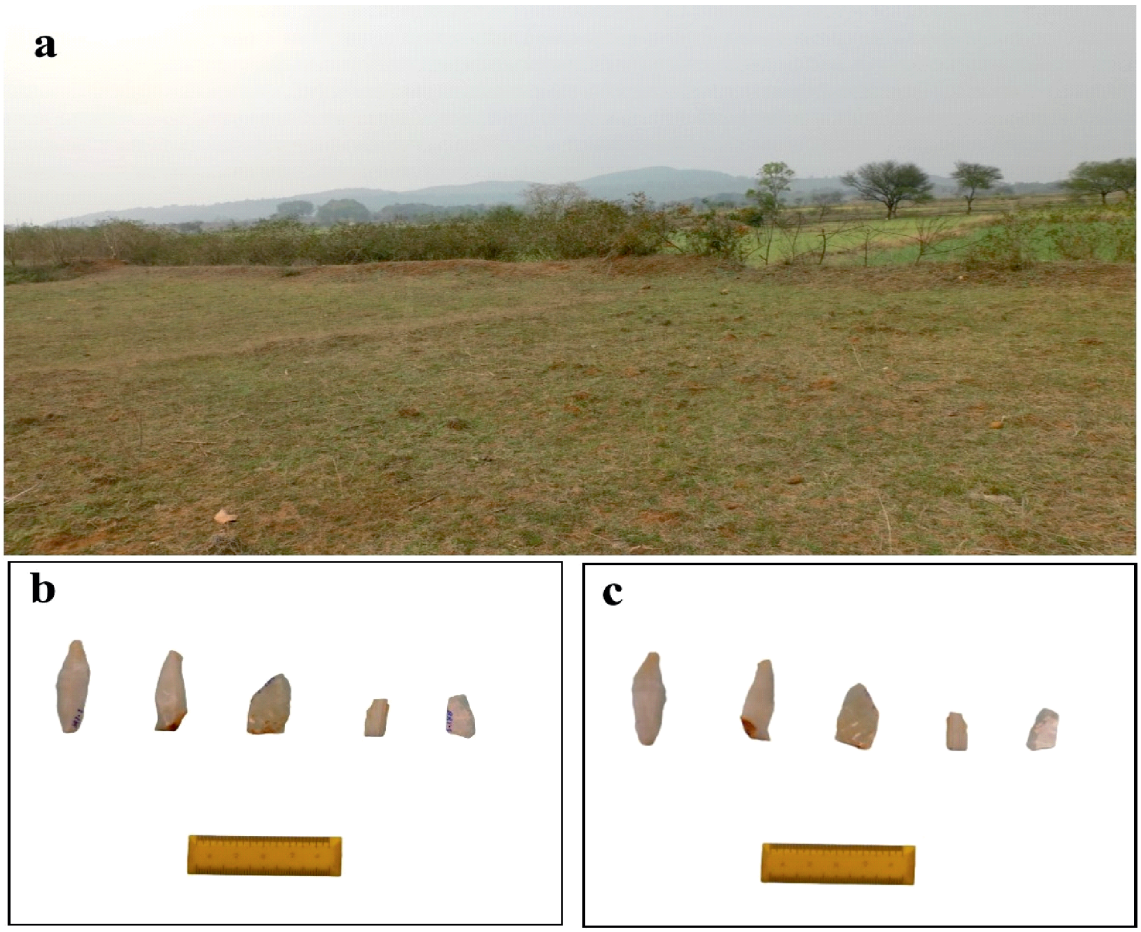


Fig. 9. a:General view of the site Bharratola, b: Dorsel image of the artefacts, c: Ventral image of the artefacts.

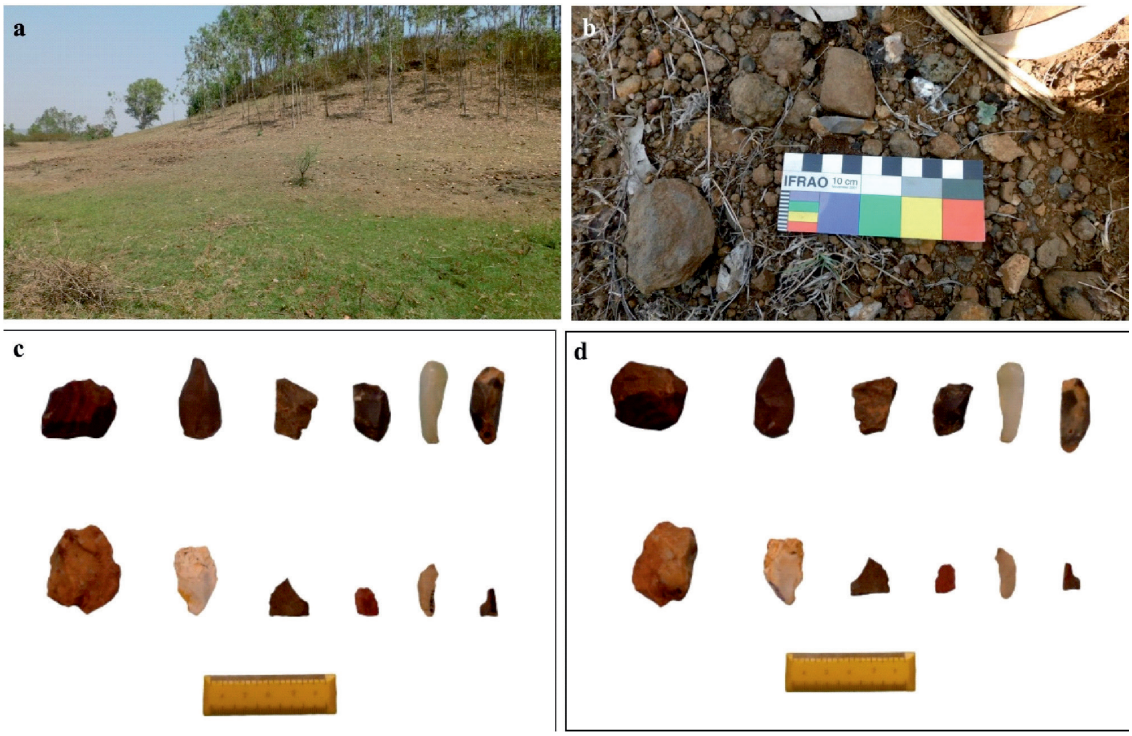


Fig. 10. a: General view of Bhejri site, b: Close view of the artefacts on the surface, c: Dorsel image of the artefacts, d: Ventral image of the artefacts.

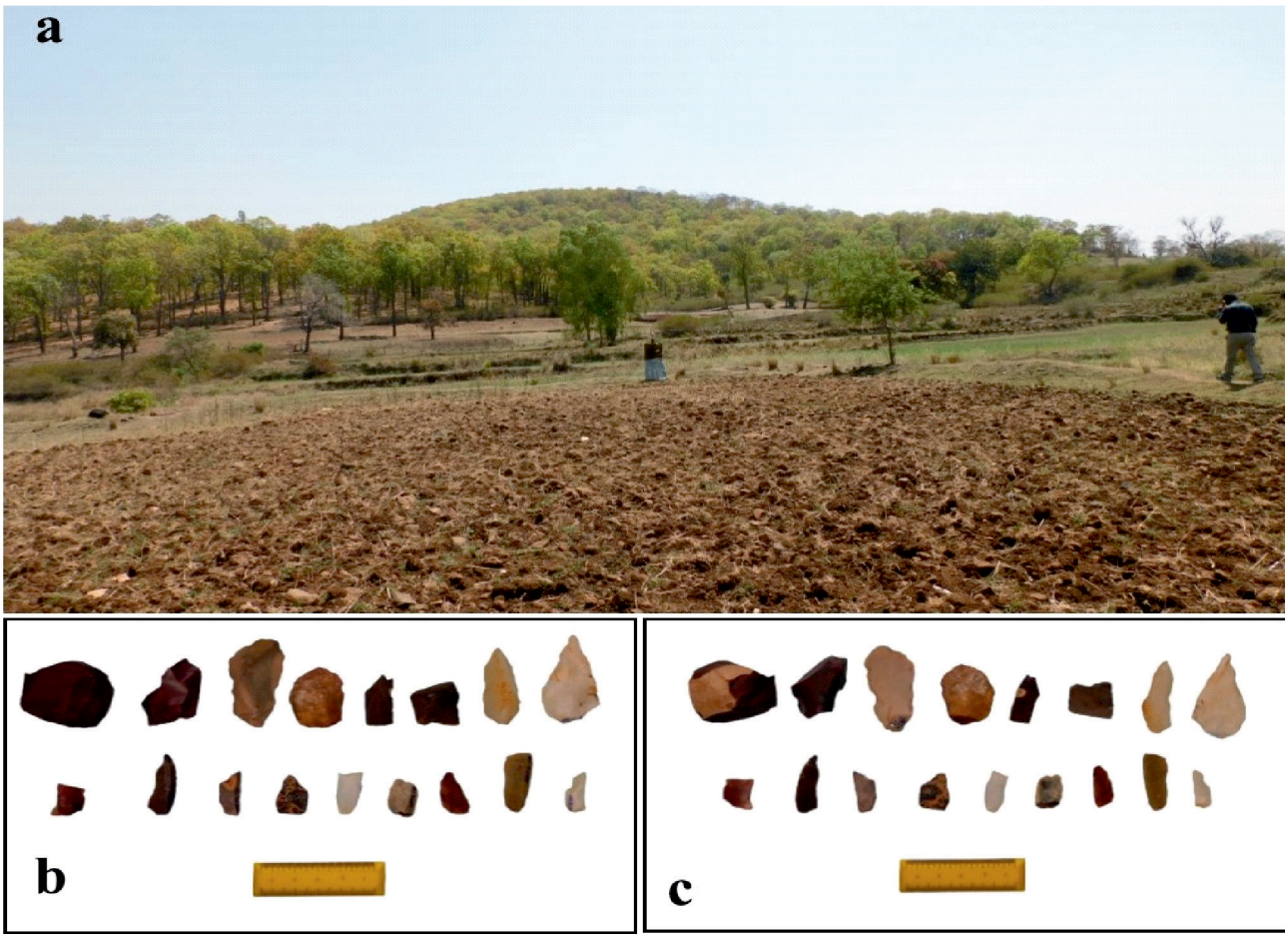


Fig. 11. a: General view of the Harra Tola site, b: Dorsel image of the artefacts, c: Ventral image of the artefacts.

***Harrai* (HRI)**(22^{0}46'35" N. 81^{0}42'58" E.): This site is in the form of a mound located 2 km northwest of Miriya village and on the left bank of Khol river. The site is 3 km south of the road running from Nonghati to Bilaspur via Dindori village. It is 22 km and 51 km south from Pushparajgarh block and Anuppur district headquarters respectively. A wooden pillar has been erected on the mound and surrounded with circular stones, which is currently worshipped as *Shiv-Linga* by locals. The wooden pillar is known as 'Latth' by villagers. Gond and Yadav communities live in the east, west and north directions of the site. The mound is spread over an inclination of 60^0 from east to west and 120^0 from south to north. Microliths have been found from the mound (Fig.12).

***Jamkakshar*(JMK)** (22^{0}51'23" N. 81^0 45'48"E.): The location of this site is 6.5 km north of the village of Taligaon, 200 m east of the Rajendragram-Gaurela-Bijauri road, and it is spread out on both sides of the Jamkachhar-Mirchadadar road in both the north and south directions. The location slopes 600 northeast towards Maikal Hill. The site was being used by the local farmers for growing *masoor* (Lentil) and chick-pea at the time of exploration. Upper Palaeolithic tools have been found from the site (Fig. 13).

***Kirgahi* (KRG)** (22^{0}49'23" N. 81^{0}43'49"): This site is located 2 km east of state highway no. 9A from Pushparajgarh to Amarkantak Road. It is 22 km south of Pushparajgarh block and 54 km south of Anuppur district headquarters. A rain drain cuts the site mound into two parts running south to north. The present settlement is located to the west of the rain drain and mound. A wooden pillar has been erected on the mound as a village deity. Villagers use the rain drain for irrigation and bathing. The inclination of the site is 60^0 from east to west. Upper Palaeolithic tools have been found from the site (Fig. 14).

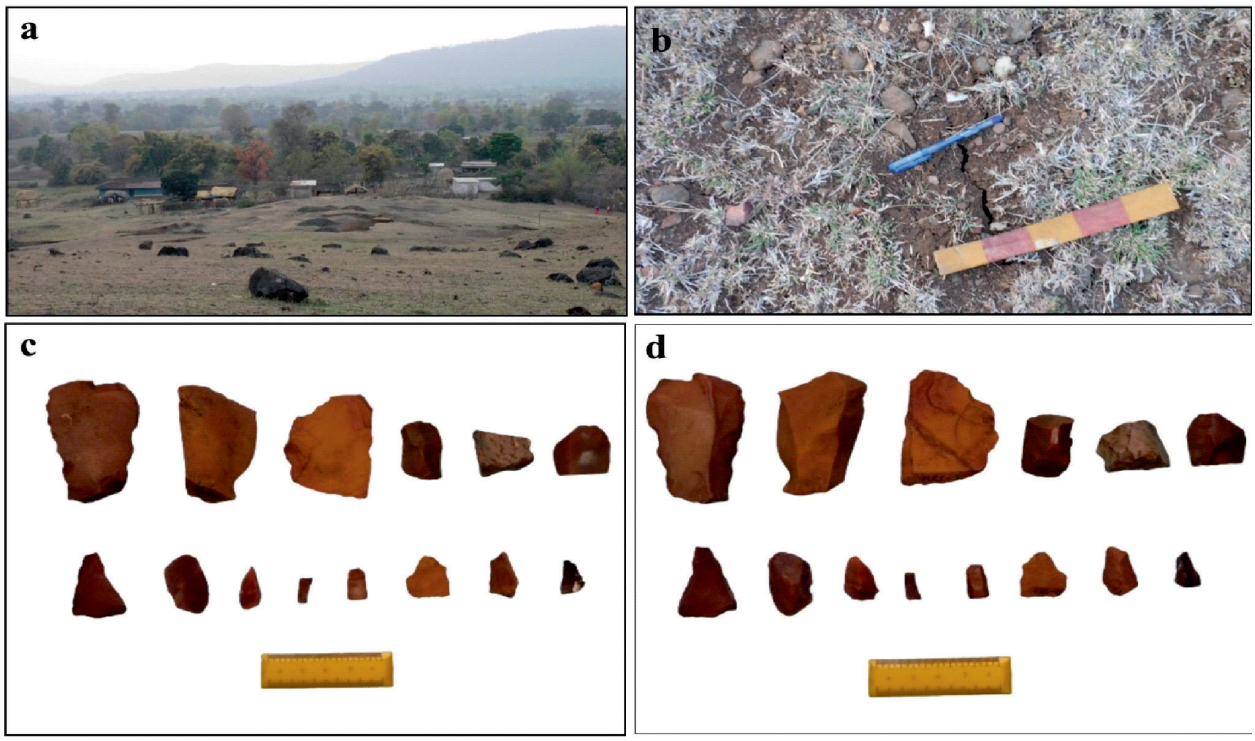


Fig. 12. a: General view of Harrai site, b: Close view of artefacts on surface, c: Dorsel image of the artefacts, d: Ventral image of the artefacts.

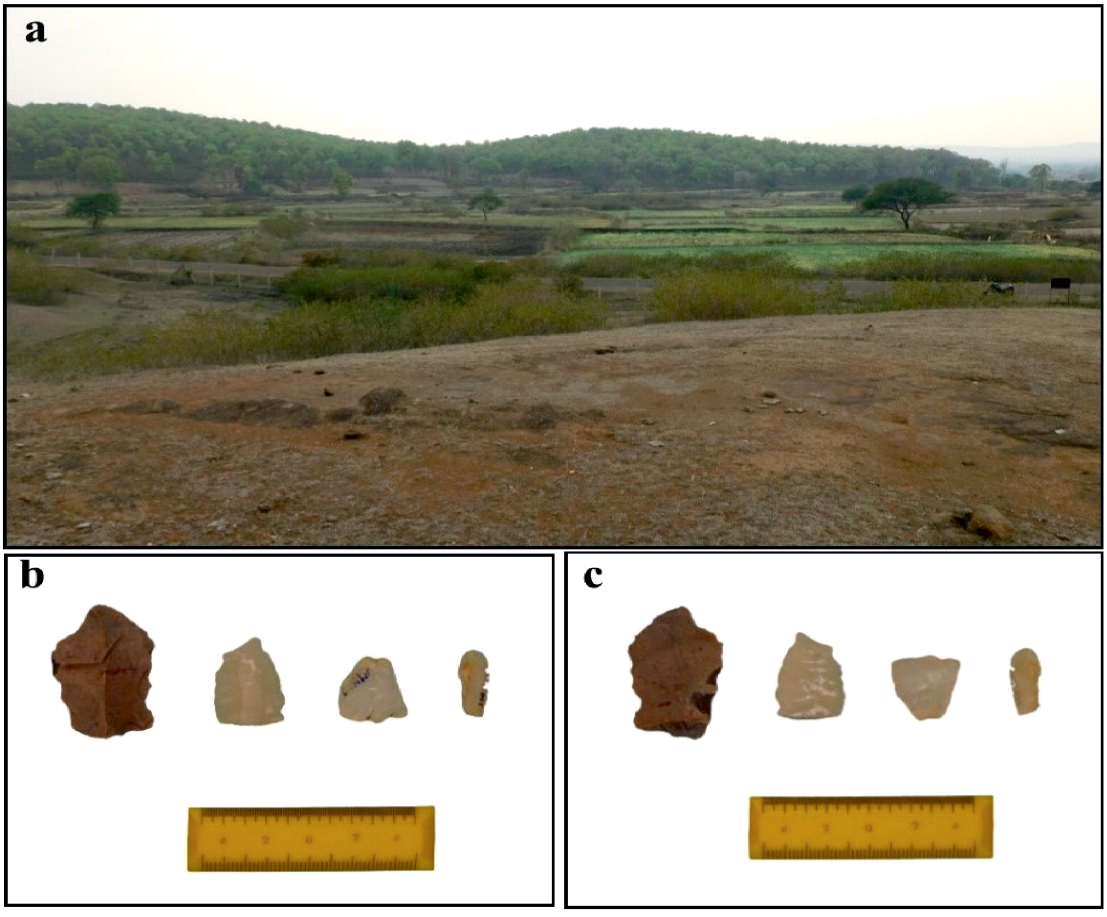


Fig. 13. a: General view of Jamkachhar site, b: Dorsel image of the artefacts, c: Ventral image of the artefacts.

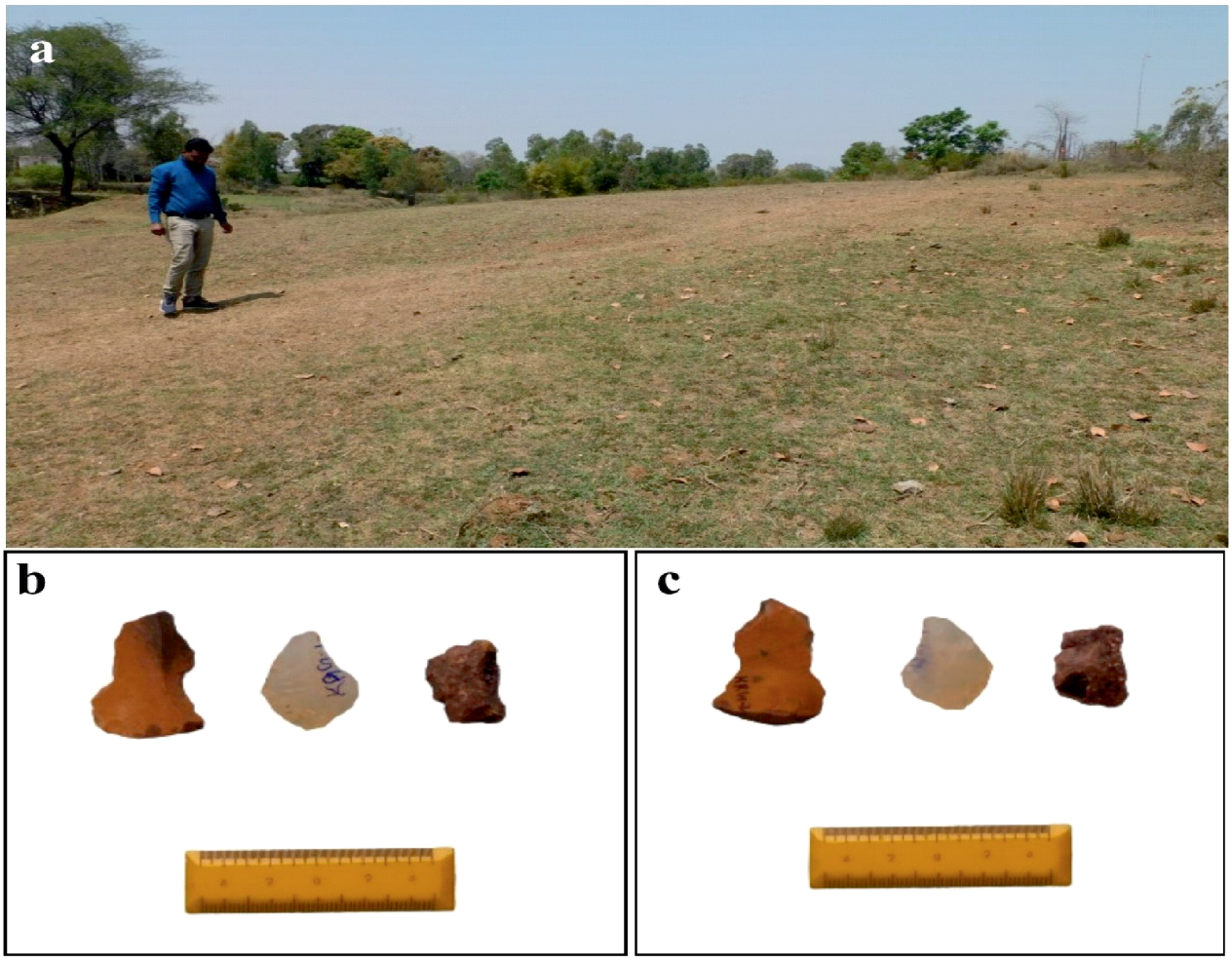


Fig. 14: a: General view of Kirgahi site, b: Dorsel image of the artefacts, c: Ventral image of the artefacts.

***Miriya* 1 (MRY 1)** (22^{0}47'38" N. 81^{0}41'23" E.): This site is located 2 km northeast from the Kachcha road running from Farrisemar to Harrai and spread over the inclination of 60^0 on Maikal Hill. River Narmada flows one kilometre south of the village. It is 32 km and 62 km south of Pushparajgarh block and Anuppur district headquarters respectively. At the time of exploration, pigeon pea (Arhar/Tur) crop was sown on the site. Baiga, Gond and Yadav are the main communities living in the village. Large numbers of stone tools are scattered over the site, including Upper Palaeolithic and Mesolithic tools (Fig. 15).

***Miriya* 2 (MRY 2)** (22^{0}48'12" N. 81^{0}40'5" E.): This site is located one kilometer west of Miriya 1 site at an inclination of 60^0 north-south slope of Maikal Hill and right side of the rain drain and the road. It is 33 km and 63 km south of Pushparajgarh block and Anuppur district headquarters respectively. At present, the field has been ploughed for farming by local people. Upper Palaeolithic tools have been found from the field, yet it seems that most of them have been buried inside the ground due to ploughing (Fig. 16).

***Pondi*1 (PND 1)** (22^0 48'34" N. 81^{0}42'32"E.): On the Anuppur-Pushparajgarh road, this site is situated on the left side and in the westbound direction of state highway (SH-9A). Gram panchayat house is built on the site at present. It is 20 km and 52 km south of Pushparajgarh block and Anuppur headquarters respectively. Maikal hills are extending from north to south, running through the west of the village. The site has a slope of 60^0 from west to east. Blade and bladelets are found from the site which belongs to Upper Palaeolithic and Mesolithic periods (Fig. 17).

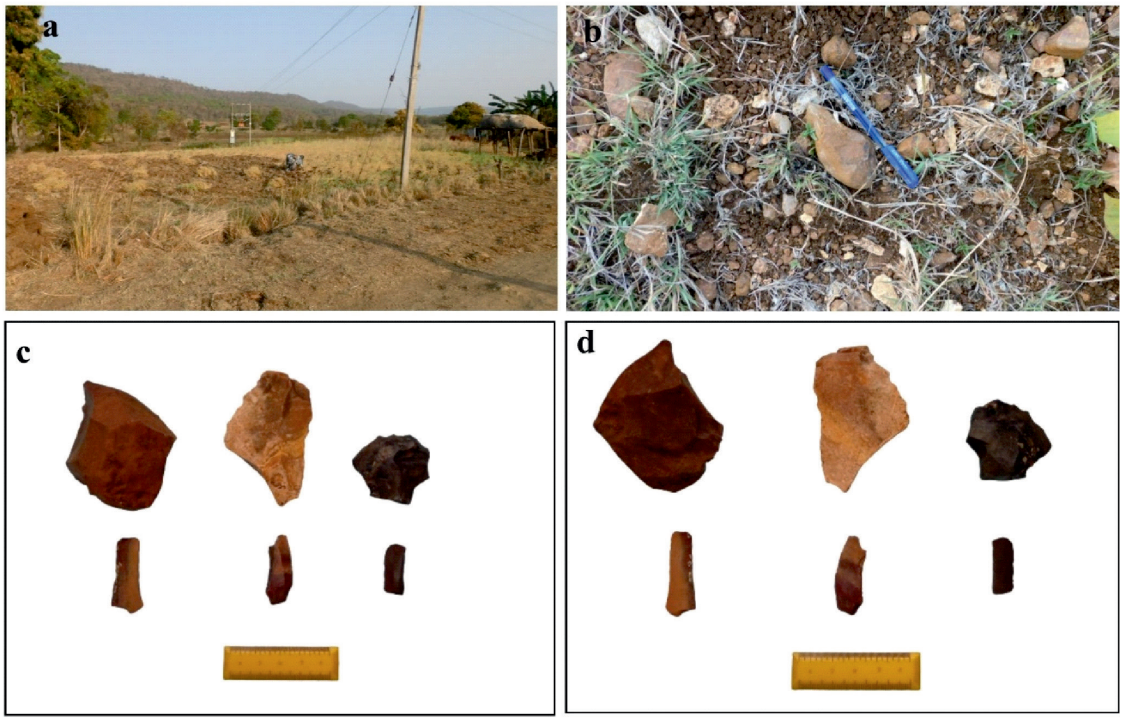


Fig. 15. a: General view of Miriya 1 site, b: Close view of artefacts on surface, c: Dorsel image of the artefacts, d: Ventral image of the artefacts.

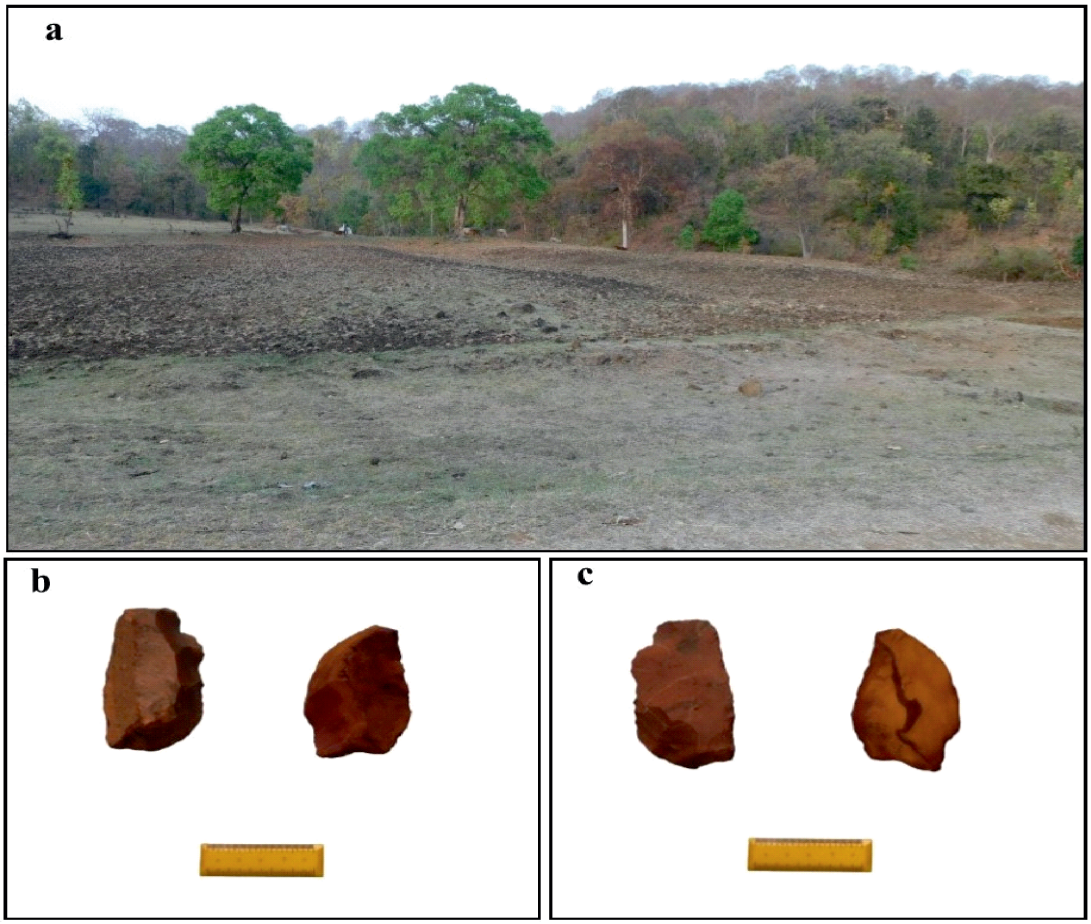


Fig. 16. a: General view of Miriya 2 site, b: Dorsel image of the artefacts, c: Ventral image of the artefacts.

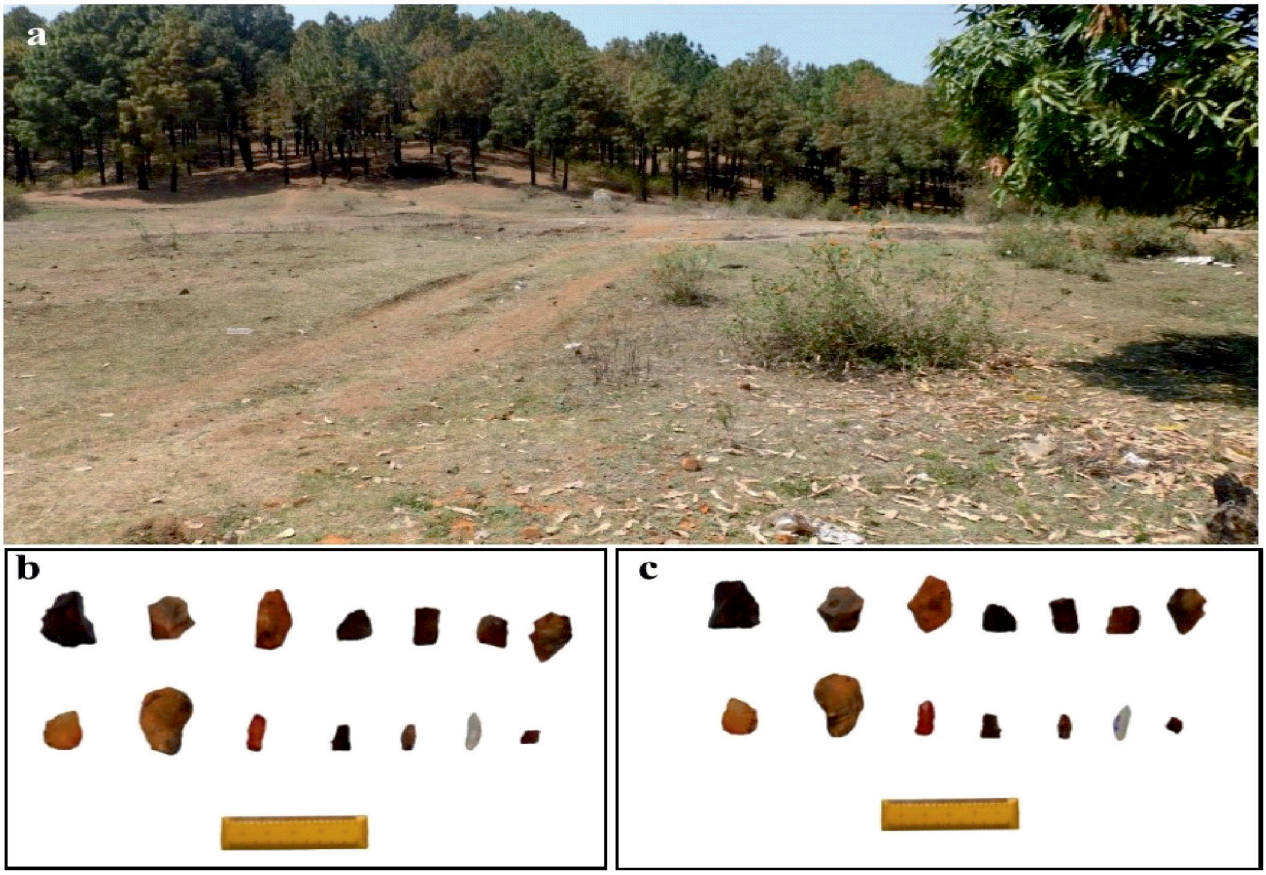


Fig. 17. a: General view of Pondi 1 site, b: Dorsel image of the artefacts, c: Ventral view of the artefacts.

***Pondi* 2 (PND 2)** (22^0 49'6" N. 81^0 43'7"E.): This site is located one kilometer from Pondi 1 on the left side in the west direction of *Pradhanmantri Gram Sadak Yogna* road. It is 21 km and 53 km southeast of Pushparajgarh block and Anuppur district headquarters respectively. The site is situated in the middle of the village. At the time of exploration, the site was partially sown with lentil and chickpea and the left-over field was probably kept for growing Khareef crops in summer. The site is spread over the land inclined 45^0 from west to east. Upper palaeolithic tools have been found from the site (Fig. 18).

***Saraha Kona* (SHK)** (22^0 46' 52" N. 81^0 43'37"): (This location is 2 kilometres to the left of the Pondki-Gaurela-Bijauri road, to the southeast of the dam built on a rain drain that rises from Maikal Hill. Maikal hills surrounds the village from two sides. The site is 28 km and 60 km southeast of Pushparajgarh block and Anuppur district headquarters respectively, and on the east side it is situated on the border of Chhattisgarh state). Baiga and Gond populations inhabit the site. This site is spread over the land inclined 60^0 from south to north. A small number of tools are found scattered over the site and those are microliths (Fig. 19).

***Tali*(TLI)** (22^0 49' 32" N. 81^0 45' 51" E.): This site is 2 km northwest of Bharni village on the left side of Rajendragram-Gaurela-Bijauri road. Maikal Hill range surrounds the village from north to south running through the east. It is 27 km east and 58 km southeast of Pushparajgarh block and Anuppur district head quarters respectively. The site is plain and even. Few Upper Palaeolithic tools and a megalithic burial were found on the site (Fig. 20).

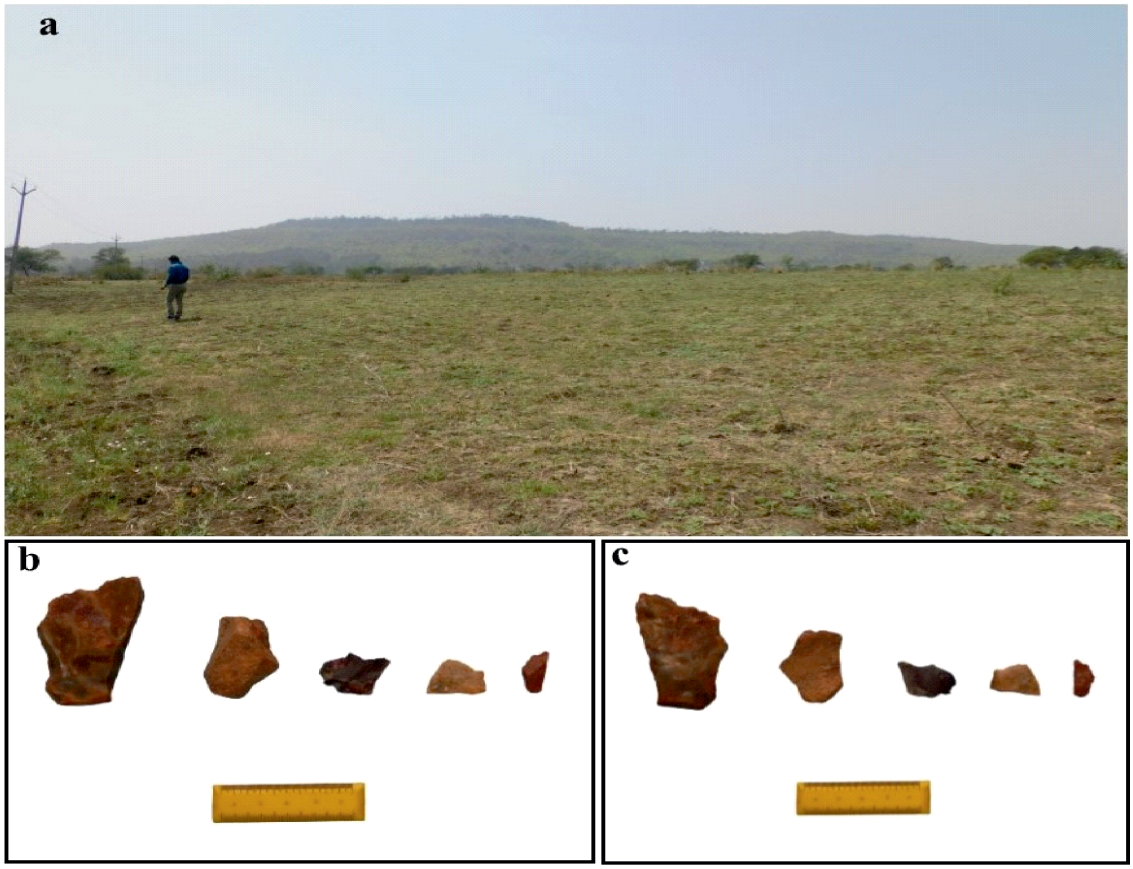


Fig. 18: a: General view of Pondi 2 site, b: Dorsel image of the artefacts, c: Ventral image of the artefacts.

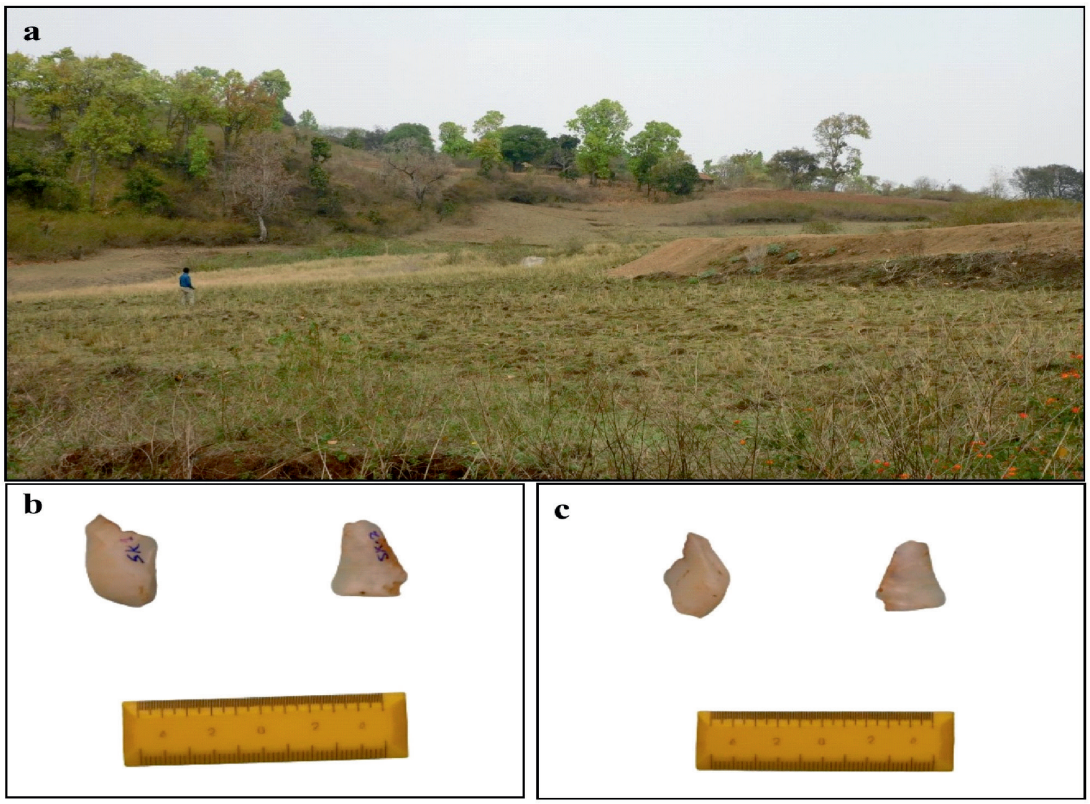


Fig. 19: a: General view of the site Saraha Kona, b: Dorsel image of the artefacts, c: Ventral view of the artefacts.

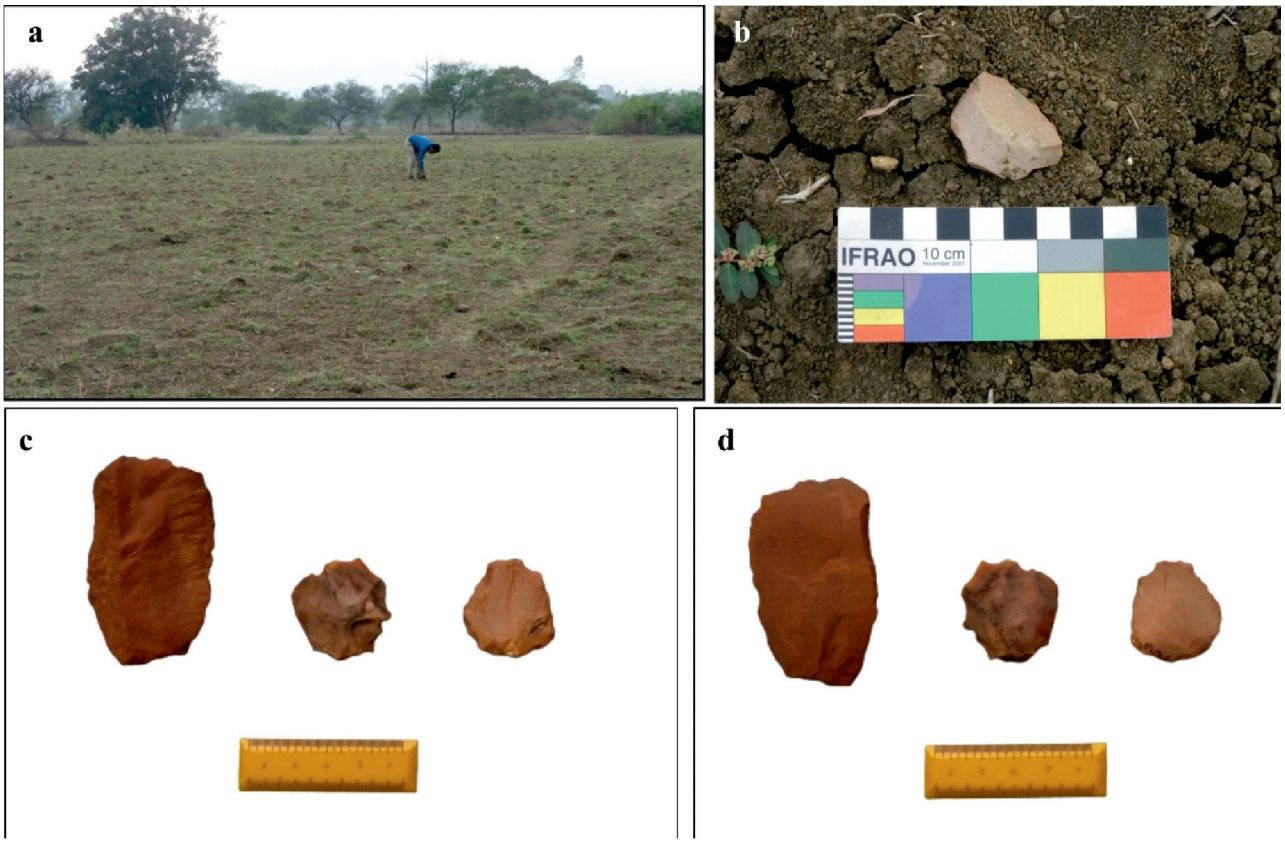


Fig. 20: a: General view of the site Tali, b: Close image of the artefact on the surface, c: Dorsel image of the artefacts, d: Ventral image of the artefacts.

***Umaniya*(UMY)** (22^0 49;23'' N. 81^0 43'49'' E.): This place is situated on the right side, to the east of Pradhmantri Gram Sadak Plan road, one kilometre left to the north of state highway (SH-9A), which runs from Anuppur-Rajendragram to Amarkantak. It is 14 km and 46 km southeast of Pushparajgarh block and Anuppur district headquarters respectively. On the east side of the site lies the Government Higher Secondary School building and in the north direction, a hundred metres away, a weekly market is held. The site is in a mound form and it inclines from east to west from 60 to 120 degrees. It seems to be a temporary site after seeing a small amount of artefacts. Mesolithic tools were found from exploration of the site (Fig.21).

Materials and Method of Data collection and classification

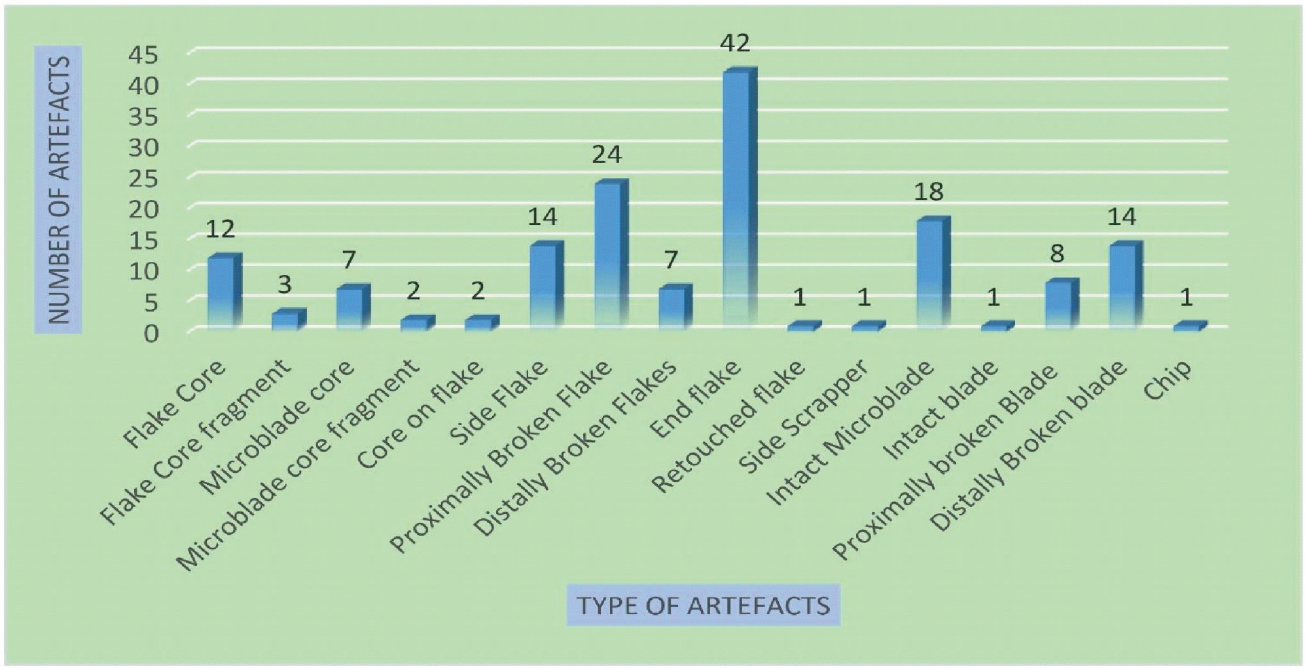
The study aims to understand the technological behaviour of the microlithic population of the Anuppur region in India and to fulfil this aim, microlithic artefacts from different sites of this region have been systematically collected. In the initial stage, the collected assemblages have been classified based on their raw material. Further, the classification was done according to the artefact type and later each artefact type was classified as per their preservation condition into intact and broken parts.

Statistical Analysis

The artefacts distribution chart (Graph 1 & Table 1) shows that the maximum number of artefacts were End flake (42) followed by proximally broken flakes (24), microblade (18), distally broken blade (14), side flake (14, proximally broken blade (8), distally broken flake (7), microblade core (7), flake core fragment (3), intact blade (1) core on flake (1), side scrapper(1), retouched flake (1) and chip (1). All

Fig. 21. a: General view of the site Umaniya, b: Dorsel image of the artefact, C: Ventral image of the artefact.

the artefacts recovered from this region are categorized into flake and microblade industries. In Figure 23, the pie chart reveals that in the survey 55% of artefacts were flake, 33% were blade, 11% were core artefacts and only 1% were chipped.

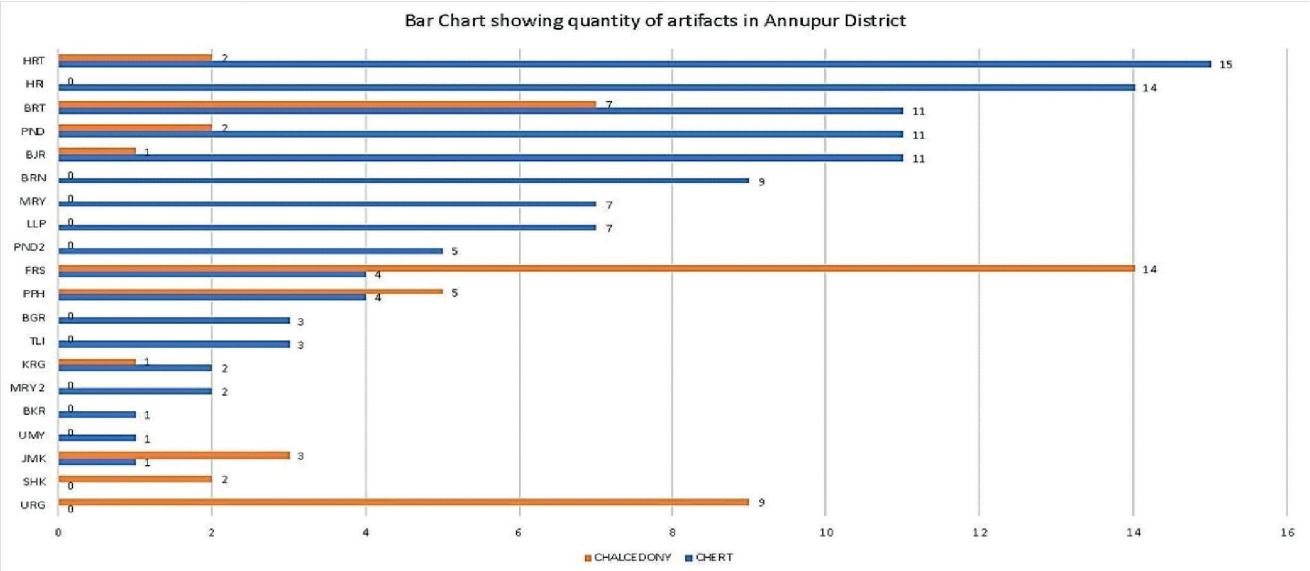


Graph 1: Number of Artefacts found from the concerned area

Table 1: Cross-tabulation of Artefacts type and Raw materials

Artefacts Type	*Sub-type*	*Chert*	*Chalcedony*	*Total*
Core	Flake Core	12	-	12
	Flake Core Fragment	3	-	3
	Microblade Core	3	4	7
	Microblade Core Fragment	-	2	2
	Core No Flake	1	1	2
Flake	Side Flake	12	2	14
	Proximally Broken Flake	18	6	24
	Distally Broken Flakes	4	3	7
	End Flake	32	10	42
	Retouched Flake	1	-	1
Scrapper	Side Scrapper	1	-	1
Microblade	Intact Microblade	7	11	18
Blade	Intact Blade	1	-	1
	Proximally Broken Blade	6	2	8
	Distally Broken Blade	9	5	14
Chip	Chip	1	-	1
Total		111	46	157

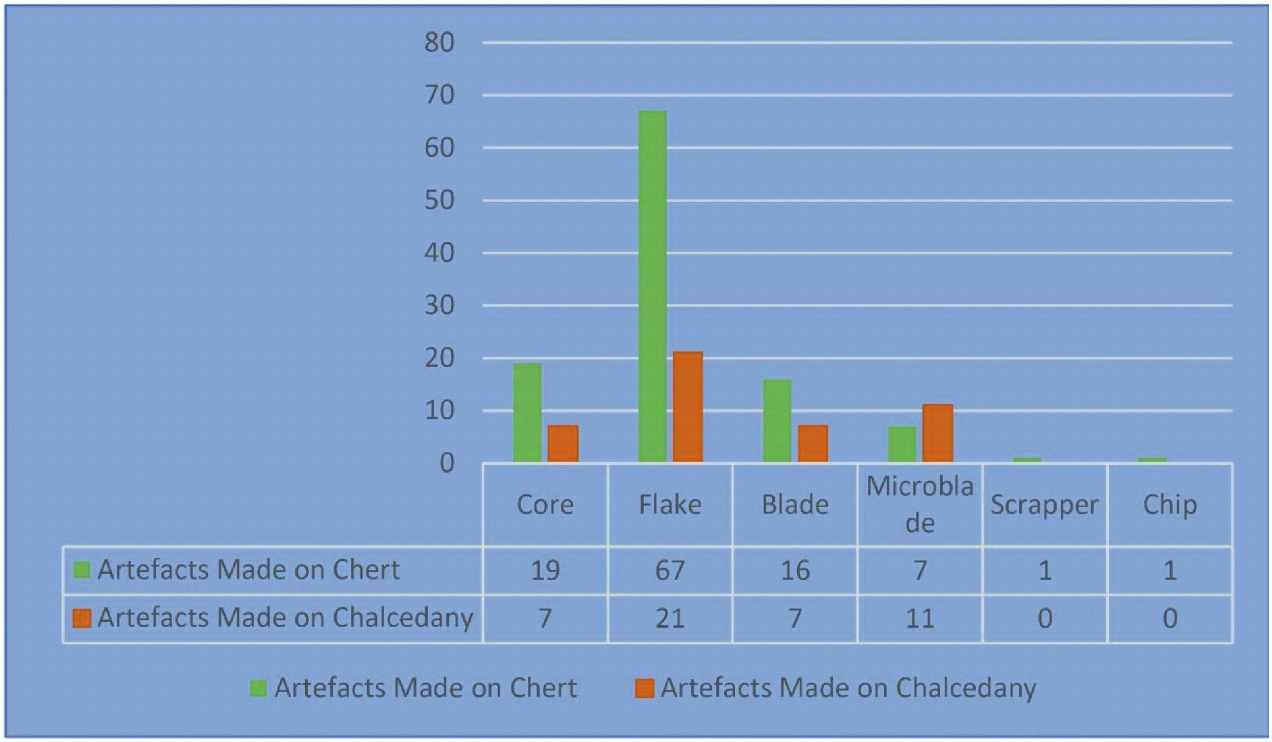
Table 1 shows the artefact types and the preference for raw material selection of prehistoric humans of this region. In the survey of the Anuppur district, a total of 157 items were found of which 111 (71%) were chert and 46 (29%) were Chalcedony materials. This demonstrates how chert is preferred in this area for the production of flake and microblade tools. The figure 24 shows the per-site preference for raw materials selection in this region, the data reveals inter and intra-site variation in procuring raw materials for stone tools production in this region.



Graph 2: Quantity of artefacts found from each site.

Raw material and Stone tools types

Table 2 & Graph 3 reveals that the average length, breadth and thickness of the artifices made of chert (5.27 mm x 3.48mm x 1.44mm) were more than that of chalcedony (2.57 mm x 1.48mm x .65mm). Further, the average weight of the artefacts made of chert (12.89gm) was more than that of the artefacts made of chalcedony (4.12 gm). ***Graph 3***, shows that the chert in this area is procured mostly for manufacturing flake materials like end flake, Flake fragment, side flake and core, followed by the microblade industry. While the preference of chalcedony for producing micro blade in this region. A high proportion of chalcedony-made specimens are belonging to the microblade industry.



Graph 3: Quantity of artefacts made on chert and chalcedony.

Table 2: Descriptive Statistics of Length, Breadth, Thickness (mm) and Weight (gm) of the artefacts made by Chert and Chalcedon

Raw material		*Minimum*	*Maximum*	*Mean*
CHERT (No.=111)	Length (mm)	0.77	65.30	5.2781
	Breadth (mm)	0.64	35.87	3.4807
	Thickness (mm)	0.05	15.16	1.4450
	Weight (gm)	0.11	157.86	12.8995
CHALCEDONY (No.=46)	Length (mm)	1.60	4.80	2.5761
	Breath (mm)	0.57	4.60	1.4874
	Thickness (mm)	0.20	2.71	.6522
	Weight (gm)	0.11	20.78	4.1243

Analysis Based on Measurement

Table 3 shows that the core product's maximum length, breadth and thickness (65.3 mm x 35.87 mm x 15.16 mm) was more than that of the flake, blade and chip. The same was the case with weight. Maximum value of the core was 157.86 gm in comparison to flake (58.13 gm), blade (31.53gm) and chip (.17gm).

Table 3: Descriptive Statistics of the product type

Product out of		*No.*	*Minimum*	*Maximum*	*Mean*
Core	Length (mm)	17	2.20	65.30	11.6094
	breadth(mm)	17	1.50	35.87	7.8094
	Thickness	17	0.71	15.16	4.0876
	Weight (gm)	17	2.38	157.86	42.7018
Flake	Length (mm)	87	1.30	40.88	4.1821
	Breadth (mm)	87	0.66	33.02	2.8483
	Thickness (mm)	87	0.05	9.20	1.0159
	Weight (gm)	87	0.11	58.13	7.6461
Blade	Length (mm)	52	0.77	7.00	2.7263
	Breadth (mm)	52	0.57	4.20	1.4150
	Thickness (mm)	52	0.20	1.50	0.6225
	Weight (gm)	52	0.11	31.53	4.4279
Chip	Length (mm)	1	1.40	1.40	1.4000
	Breadth (mm)	1	0.64	0.64	0.6400
	Thickness (mm)	1	0.16	0.16	0.1600
	Weight (gm)	1	0.17	0.17	0.1700

Table 3 shows that the maximum length of the artefacts was found in the case of core followed by flake, blade and chip. Similarly, the chip was the smallest in length followed by blade, flake and core. Further, on an average the length of the artefact core was more in comparison to the flake, blade and chip. The maximum breadth of the artefacts was found in the case of core followed by flake, blade and chip. The difference in breadth of the core and flake artefacts was 2.85mm. Similarly, the minimum value of the breadth of the artefacts was less in the case of chip but more or less similar in the case of the blade and flake and less than the core with a difference of -.84 mm. Further, on an average the breath of the artefact core was more in comparison to flake, blade and chip. The maximum thickness of the artefacts was found in the case of the core followed by flake, blade and chip. Similarly, the minimum value of thickness was found in the case of the chip followed by flake, blade, and core. Further, on an average, the thickness of the artefact core was higher in comparison to the flake, blade and chip. Whereas, the maximum weight of the artefacts was found in the case of core followed by flake, bade and chip. Similarly, the minimum weight of the artefacts was in was chip followed by a blade, flake and core. Further, on an average the weight of the artefact core was more in comparison to the flake, blade and chip.

Discussion: Preliminary observation of technological attributes

The technological assessment of the stone tools has been done based on statistical values and stuff observation. We have tried to identify the uniqueness of each industry in terms of techno-typology and raw properties to understand variability in stone tool assemblages. The Farrisemar is a chalcedony-dominant microblade industry with almost zero percentage of intact microblades (Table 1). The absence of complete tools suggests that it could be a production site. Umaniya industry belongs to the flake chaise operatoire with some doubtful microblade impression; it could also indicate post-depositional damage. Harrai is a chert-based microblade dominant industry with some long flakes of above 5 cm in length. These flakes might be core opening flakes for preparing the nodule. The microlithic population of Bhejari has well-utilised chalcedony as a raw material. The assemblage comprises of microblade core, Microblade, flake etc. The microblade industry of this site is technologically less developed. It seems that the cores of this site have been exhausted not through the maximum utilisation but from the imprecise flaking technique. The platform of the core has been crushed and the step fracture on the core denotes a 90-degree flaking attempt. All the microblades of this site are either broken or fragmented. The disappearance of intact blades from the site indicates that the blade has been manufactured here and was carried out later. Umargohan is a purely microblade industry made on chalcedony and refined microblade core is mostly exhausted which denotes higher technological advancement of the tool maker. The pressure technique has been applied here to detach the microblade where one side of the cortical surface might be left out for better hand grip during tool production. All the microblades are below 3 cm in length which is similar to the dimension of the exhausted core thus representing the final stage of microblade production from the core. The site of Pipraha contains 9 artefacts of different raw materials with chert being the dominant. The entire industry belongs to two different chaine opertoire which are flakes and microblades. A long side flake has the impression of microblade scars which denotes it was a core preparation flake. Some evidence of the flake industry made on chert and chalcedony has also been found from sites like Pondi and Kirgahi. Here microblades are absent which demonstrates variations in technological behaviour. Some exhausted chalcedony microblade cores are also recorded from Jamkakshar. The negative impression of this exhausted core denotes that the microblade produced from them would be 1.8 cm in length. Miriya 2 is a mixed industry where some long flakes have been used as core and the 7.7 cm flake with a prominent bulb indicates that the flakes were detached through the direct percussion hard hammer technique and from the same flake three microblades have been removed precisely with the pressure technique. The ratio of these microblades is 2.5×1.5 cm, identified from the negative flake scars. At the site of Bharni, an end flake was used to detach a small blade from the ventral side. The site of Baratola does not yield direct evidence of microblades rather some microblade cores and flakes made on chert and chalcedony have been found. The cores found here are exhausted through multidirectional removals. Since the cores are exploited through the unplanned strategy, it appears to be a primitive stage of microblade manufacturing. The flakes are used as cores and they have been efficiently utilised to produce microblades. The site Bharratola has a well-developed microblade industry. Though the microblades are refined, they are mostly proximally or distally broken. The Lalpur industry has utilised chert as a raw material and the industry includes broken microblades below 5 cm, microblade cores, and end flakes. The industry at the site of Harratola has 17 artefacts in total which are made of mixed raw materials. These artefacts are made by following the microblade and flake chaine opertoire. First, a prepared platform was used for microblade production, and it was discarded when the platform was crushed. All the microblades are below 4 cm, while the complete flakes are more than 5 cm in length.

The lithic assemblage of Anuppur represents the microlithic industry with dominant flake and microblade chaine opertoire . The industry exhibits significant technological and behavioural variations reflected in the tool production process and raw material selection, which is the fundamental source of information to understand the diversity among the prehistoric population of Anuppur. The evolutionary stages within microlithic technology can be observed in this industry. Different lithic raw material curation techniques have been adopted for microblade and flake production, which can be seen in the assemblages collected from a wide range throughout the different terrains across the Anuppur region. Farrisemar is a chalcedony-dominant microblade industry with almost zero percentage of intact microblades. The absence of complete tools suggests it could be a production site like Bhejari where the same raw material is dominant in nature and assemblage comprises of microblade core, Microblade, flake, etc. The microblade industry of this site is technologically less developed. The platform of the core has been crushed and the step fracture on the core denotes a 90-degree flaking attempt. It seems that the cores of this site have been exhausted not through the maximum utilization but from the uncontrolled flaking technique. All the microblades of this site are either broken or fragmented. The disappearance of intact blades from the site indicates the blade has been manufactured here and later would be carried out for use. Umaniya industry belongs to the flake chaine opertoire with some doubtful microblade impression; it could also be the mark of post-depositional damages or secondary retouching. The abundance of flake tools from this site indicates that the flakes produced were contemporary to the microblade technology or this technology has evolved from these regional long narrow flakes as a key subject of regional adaptation. Miriya 2 is a mixed industry where some long flakes have been used as core. A 7.7 cm flake with a prominent bulb indicates that the flakes were detached through the direct percussion hard hammer technique and from the same flake three microblades have been removed precisely with the pressure technique. It indicates the application of different flaking techniques at the same time accordingly and reflects the technological behaviour of the prehistoric tool producer. The site of Baratola does not yield direct evidence of microblades rather some microblade cores and flakes made on chert and chalcedony have been found. The cores found here are exhausted through multidirectional removals. Since the core is exploited through the unplanned strategy, it appears to be a primitive stage of microblade manufacturing. The flakes are used as cores and have been utilized efficiently to produce microblades. The site Bharratola has a well-developed microblade industry. Though the microblades are refined they are majorly fragmented or broken. The entire techno-typological analysis of stone implements registers that the region is densely occupied by the microlithic population for a long duration and exhibits some inter and intra-site variations in the development of microblade technology, which are the key questions to be answered by further analysis.

Conclusion

Our research offers insightful information about the microlithic industry in Madhya Pradesh, India's Anuppur region. We can characterise each site in great detail and assess a variety of tools using statistical techniques in our research of freshly found sites. Our results add to a clearer understanding of the significance of the microlithic industry in the larger context of human evolution by shedding light on the technical, economic, and social facets of prehistoric human communities. Our work has several limitations, though, and future research should concentrate on resolving them and pursuing fresh lines of inquiry. Our work emphasises the microlithic industry's ongoing relevance and significance in archaeological research and its ability to illuminate the evolution of human cultures. We have offered important insights into the typology, choice of raw materials, and production processes of microliths in

the region under study through our thorough descriptions of each site and our research of the tools we recovered. Additionally, by using statistical analysis using SPSS software, we were able to find trends and connections between various tool kinds, which can help guide further field study.

Environmental considerations undoubtedly had a key part in the growth and dissemination of the microlithic industry, according to the description of the region's topography. For the field of archaeology as well as closely connected fields like anthropology, history, and geography, the research has significant ramifications. It advances ongoing attempts to learn more about the history of humanity and emphasises the microlithic industry's continuing relevance and importance in archaeological study. To better understand human evolution and the emergence of human communities, we hope that our work will encourage more investigation in the Anuppur region and beyond.

Acknowledgements

The team is grateful to Mr. Paramatma Prasad Baiga for his support during the field exploration. We are thankful to Dr. Panchanan Dalai, Professor of English in the BHU for proof reading of the research paper. This study was supported by the Grants of Institute of Eminence, Banaras Hindu University. The grant ID is 6031.

Contributions: SKT conceptualized the idea and supervised the writing of the manuscript with support from NS, PP, BKD and RB. RB explored and documented the sites. PP and RB documented the artefacts. BKD analysis the documented tools. PP contributed to the landscape a study. All authors contributed and approved the submitted manuscript.

Conflict of Interest: The authors declare no competing interests.

Additional information*:* NO

Financial interests: No one have financial interests. The authors have no financial or proprietary interests in any material discussed in this article

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