



Newly Explored Microlithic Sites in Baruan Localities on the Rocky Outcrops of Salandi-Baitarani Basin, Keonjhar District, Northern Odisha: A Preliminary Observation

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Abstract: The present paper is a preliminary report based on surface exploration conducted in and around the Salandi River valley, particularly in the Baruan locality of Keonjhar District, Odisha. This investigation has revealed two prehistoric microlithic sites within semi-primary contexts. The cultural artefacts found in this area display numerous distinctive traits commonly observed in other river valleys of Odisha. The abundance of raw materials along the riverbank has led prehistoric communities to utilise microliths to establish settlements in this region. Furthermore, the area has significant potential to advance understanding of human adaptation from the Pleistocene to the Holocene. The Salandi River valley is characterised by a remarkable landscape of hills, rock shelters, and a succession of hillocks, collectively contributing to the region's cultural richness. This valley has served as a significant centre of human activity, as evidenced by the discovery of a wide variety of lithic tool types.

Keywords: Rock outcrop, Pleistocene, Holocene, Geomorphological, Microlithic, flake, fluted core, crypto-crystalline rock, percussion, etc.

Received : 30 October 2025

Revised : 29 November 2025

Accepted : 12 December 2025

Published : 30 December 2025

TO CITE THIS ARTICLE:

Rajashree Puhan, Paramatap Pradhan & Nishikanta Dwibedi (2025). Newly Explored Microlithic Sites in Baruan Localities on the Rocky Outcrops of Salandi-Baitarani Basin, Keonjhar District, Northern Odisha: A Preliminary Observation. *Journal of History and Archaeology*, 1: 2, pp. 169-184.

INTRODUCTION

Our ancestors' adaptation to diverse climates drove significant changes in the human body and brain, transforming technology across time and regions. Modern humans developed advanced cognition, artistic expression, and microlithic technology, which enhanced hunting and gathering, increased populations, and expanded territories. The shift from Middle to Upper Palaeolithic marked a major revolution driven by biological and techno-cultural factors, like microliths—small tools made through systematic production—used by modern humans worldwide. Exploring these factors offers insights into human evolution and cultural development during this key period. The technology of microliths

exhibits considerable variation globally and is often defined regionally. The term "*microlith*" denotes small stone blades and bladelets that have undergone retouching to produce highly standardized forms, such as backed blades or segments. These typically comprise assemblages characterized by a high proportion of small tools (Kuhn and Elston 2002). The most well-known microliths are linked to the Mesolithic period, appearing abundantly in assemblages from that era. Notable examples include composite tools made from bone, antler, or wood with lithic inserts. As a result, the Mesolithic culture is recognized as the most widespread and prolific prehistoric period in the Indian subcontinent, found across various geographical and ecological settings. However, the use of microliths was not exclusive to the Mesolithic era; they were also utilised by prehistoric humans from the Upper Palaeolithic through to the Neolithic period. In recent times, pieces of evidence recovered from microlithic cultures of Mehtakheri in Madhya Pradesh and Jwalapuram in Andhra Pradesh suggest that in the Indian subcontinent, the earliest date of microlithic tradition goes up to 45000 and 35000 years ago (Clarkson; Petraglia & Korisettar 2009: 12261-12266). However, it has also been mentioned to exist in the Iron Age (Mishra 1989: 17-64). Microlithic tools have also been found to be associated with historical periods. The continuous Prehistoric archaeological studies reveal that the earliest microlithic tool-making industries reported high production rates from three continents: Howiesons Poort in southern Africa, Bondaian in eastern Australia, and the microlithic period in India (Hiscock; Clarkson and Mackay 2011: 653-664). Microlithic settlements have been discovered across various geographical settings in India, ranging from the sand dunes of Rajasthan (Singh et al., 1974) to the plains of the Middle Ganga Valley (Pant & Jayaswal, 1991). The Mesolithic is characterized by the appearance of small, highly differentiated stone implements, suggesting a foraging economy with an emphasis on small-scale hunting and fishing.

Numerous scholars have studied Stone Age culture in various regions of Odisha since 1876. However, systematic prehistoric research in Odisha only began after 1939 A.D. From the early 20th century onward, extensive and focused prehistoric studies have been conducted throughout different regions of Odisha. The scholars like Acharya (1923-24) and Banerji (1930: 38-39) played significant roles in highlighting the rich Stone Age heritage of northeastern Orissa. Following Independence, G.C. Mohapatra (1962) initiated his research in Mayurbhanj, Dhenkanal, Sambalpur, and Sundargarh, uncovering eight microlithic sites. Subsequently, Tripathy (1972), Nanda (1984, 1985), and Mohanty (1989) made important contributions in this field. The work of Mohapatra holds considerable significance as it was the first to elucidate a succession of Stone Age cultures in Orissa, demonstrating that the Paleolithic industry extended beyond the confines of the Mayurbhanj district and thrived over a substantially larger geographical area. In the late 1950s and early 1960s, numerous isolated discoveries of Stone Age sites were reported, including microliths from Kaniha in the Talcher subdivision, documented by Ghosh (1958: 29-36), and from Baramandar, Bonaikala, and Danguaposi within Keonjhar district, explored by Mitra (1961-62: 32-37). Additionally, findings from the Tel River and its tributaries as well as from the Balangir, Ganjam, and Kalahandi districts were contributed by Raghunath (1963-64: 27). During the early 1970s, Tripathy's research in Southwestern Orissa revealed several Stone Age sites along the Tel River basin, including three sites indicative of a pebble tool industry, sixteen sites associated with flake tool industries of Middle Paleolithic cultures, and twenty-seven sites representing flake-blade industries attributed to Mesolithic culture, spanning the districts of Phulbani, Balangir, Kalahandi, and Sambalpur. Furthermore, extensive exploration conducted by P.K. Behera (1983-1984:64-67, 1984-85: 60-61) unearthed multiple sites from the Lower, Middle,

Upper Palaeolithic, Mesolithic, and Neolithic periods in the upper Brahmani valley and its tributaries located in the Sundergarh district of Odisha. Reports from S.B. Ota (1982-83, 1986) also indicated the occurrence of Late Stone Age assemblages in the Tel River valley. The presence of a microlithic industry in Western Odisha has been documented by several scholars, including S. Panda (1998) in the Ong Valley, S. Gadtia (2000) in the lower Ong and Suktel regions, K. Seth (1998) in the lower Jira Valley, S. Mishra (1998) in the Upper Jira Valley, A.K. Sethi (1996) in the middle Mahanadi Valley, J. Naik (2002) in the lower Bheden Valley, S. Mendaly (2012) in the Girisul Valley, B. Patel (2002) in the Raul Valley, and S. Deep (2016) in the Jira Valley. In the context of the Northern part of Odisha, the microlithic industry has been documented by Mohanty (1989), Dehuri (2013) and the recent work of Dwibedi (2024).

STUDY AREA & ENVIRONMENTAL SETTINGS

The study area, i.e. the Salandi River valley in the Anandapur subdivision of the Keonjhar district, can be broadly divided into two natural divisions: the hill region and the valley. The hilly region lies in the north-eastern part of the subdivision, covering an area of about 950 sq. km, while the remaining 1100 sq. km are valleys lying in the western and central parts of the subdivision. The entire area contains a series of low hill ranges between Santoshpur and Atai reserve forests extending towards the valley of the Baitarani. The northeastern part of the subdivision along the right bank of the Salandi Valley is covered with the Satakosia-Hadagarh reserve forest. The average heights of these hills range from 200 to 700 m. Several water courses originate at these hills and join the others. Finally, these give rise to the numerous tributaries of the Baitarani River. Geologically, the area is an extension of the Chhota-Nagpur Region, and it is drained by the Baitarani River and its numerous tributaries, such as the Salandi, Kusei, and other small Nullahs. The average annual precipitation is 900 mm. The vegetation is of the tropical deciduous type, and the climate is characterised by hot summers, high humidity, and well-distributed rainfall. The river Salandi and its catchment areas must have formed an equally important region in the past due to its strategic location, geography and suitable geology for the rise of ancient settlements. Raw materials such as quartzite, limestone, quartz, chert, chalcedony, dolerite, dolomite, and others are readily available as river pebbles and cobbles, and as blocks and slabs on adjoining hill slopes. These must have provided sufficient raw materials for prehistoric settlers in the Salandi River valley throughout the Pleistocene.

METHODOLOGY

The research conducted employed various systematic and scientific methods commonly utilized in archaeological investigations. Google Earth and topographic maps were utilized to gain a comprehensive understanding of the site's location, geomorphology, coordinates, altitude, communication infrastructure, and settlement patterns. Intensive surface exploration was imperative for the identification of sites, including primary ones, encompassing hill, foothill, piedmont, and river valley areas. Detailed examinations were carried out in multiple locations and along riverbanks to ascertain the site's cultural deposits and stratigraphy. Additionally, comprehensive field mapping was undertaken to illustrate the site's broad geomorphology.

RECENT FIELD SURVEY

A recent field investigation in the Salandi River basin was carried out between September 2024 and December 2024. The field exploration resulted in the discovery of two Microlithic sites in the Baruan

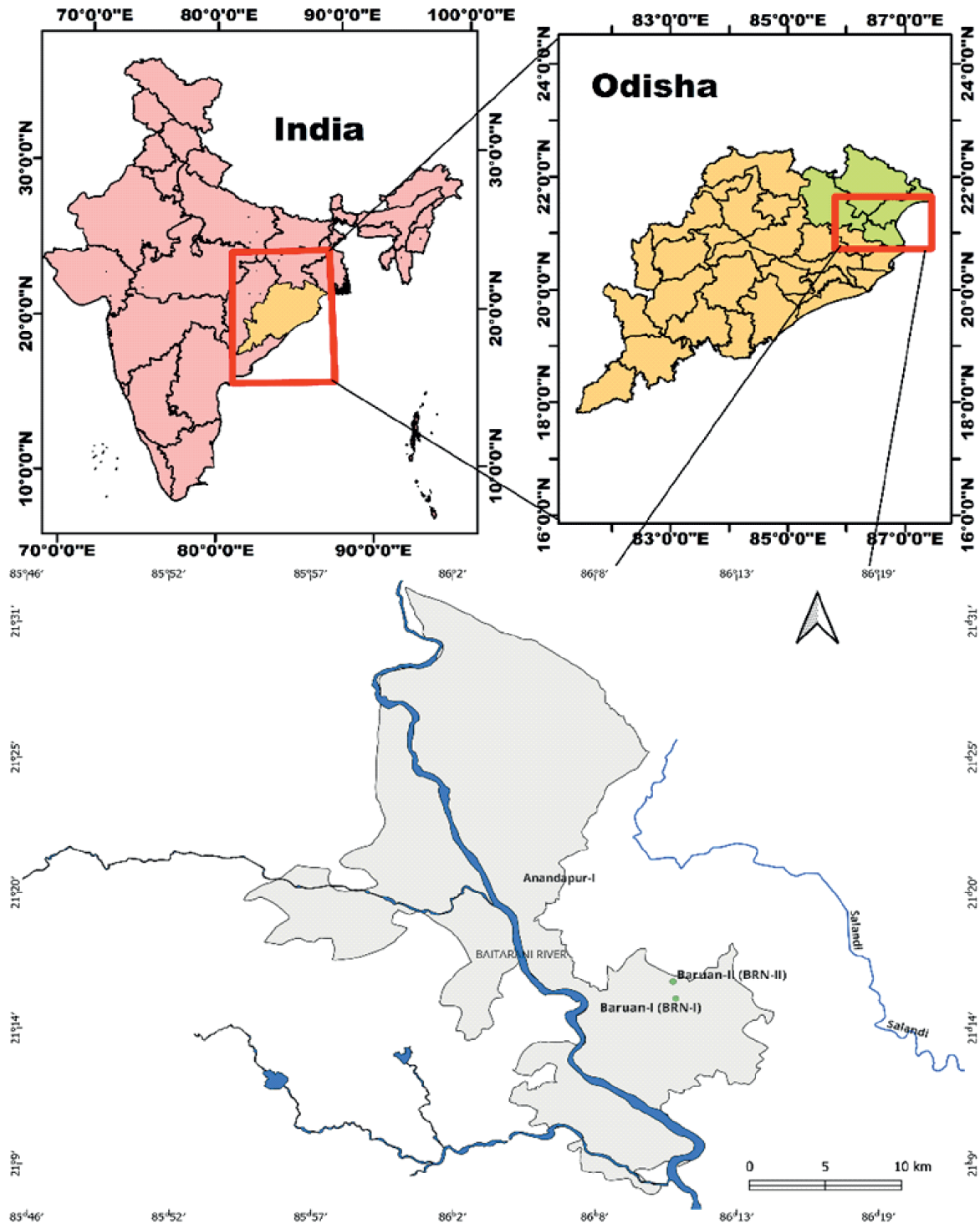


Figure 1: Location of newly explored Microlithic sites in the Salandi River valley.

locality of the Anandapur block in Keonjhar district, on the right bank of the Salandi River (Figure 1). A total of 499 microlithic artefacts were collected from the ten specified sites. The initial phase of exploration was conducted in the Middle Salandi Valley and focused intensively on the hill slopes, riverbanks, and areas away from the river (Table 1). A large number of microlithic artefacts of various shapes and sizes were randomly collected from these sites.

Table 1: Showing the distributional context of the microlithic sites in the Salandi River Valley

<i>SL NO</i>	<i>SITE NAME</i>	<i>BLOCK</i>	<i>DISTRICT</i>	<i>RIVER SYSTEM</i>	<i>CONTEXT</i>	<i>CULTURAL MATERIALS</i>	<i>LOCATION</i>
1	Baruan-I (BRN-I)	Anandapur	Keonjhar	Right bank of Salandi River	Erosional Surface on the granitic Hill top and slope	Microlithic	Lat: 21°15'34.38"N Long: 86°10'53.72"E
2	Baruan-II (BRN-II)	Anandapur	Keonjhar	Right bank of Salandi River	Erosional Surface on the Granitic Hilltop	Microlithic	Lat: 21°16'14.99"N Long: 86°10'47.36"E

THE NATURE OF SITES AND TOOL ASSEMBLAGES

1. Baruan-I (BRN-I)

The village Baruan is situated at a distance of 1.5 kilometres south-west of Kantipala, on the right side of the Baruan to Baunshagarh village road. It is nearly 10 kilometres northeast of Anandapur Township. The exact site is located by the right bank of a streamlet called Patta Nala, about 500 meters west of the village of Baruan. It has an elevation of 154 meters above mean sea level. It lies between 21°15'34.38"N latitude and 86°10'53.72"E longitude. The artefactual scatters in the form of small clusters were found exposed on the eroded surface of the granitic hilltop. The site is spread over an area of 100 sq. meters. The nearby area of the site is disturbed due to the rock and soil quarry. A total of 429 artefacts were collected randomly from the eroded surface of the rock sheet, measuring an area of 10 m × 10 m. The majority of the collected artefacts are in fresh condition. Furthermore, the artefacts collected primarily consist of medium to fine-grained sediment deposits (Plate 1). At this site, artefacts of microlithic components are made on Chert, Jasper, and Quartz in fine and milky varieties. The microlithic tool assemblage from the site is characterized by a composition where Cores account for 14.91%, and flakes constitute 53.61% of the total assemblage. A significant portion of the flakes exhibits utilisation or edge damage marks. In addition to these, a varied collection of finished tools has been identified, which includes Blades at 4.89%, Bladelets at 5.36%, Backed Blades at 1.86%, Crescents at 2.89%, Points at 1.63%, and Scrapes at 1.63%. Notably, Burins and Notch Blades each represent a minimal 0.46% of the assemblage. While flakes are predominant at this site, the quantity of tools made from the flakes is notably high. Conversely, Chips and Chunks represent only 12.35% of the assemblage (Table 2). From a techno-typological perspective, the assemblages observed at Baruan-I exhibit similarities to those found in the Baunshagarh area.

Table 2: Metrics of Tools from Baruan-I

MEASUREMENTS	CORE	BLADE	FLAKE	CHIPS & CHUNKS	BURIN	BLADELET	BACKED BLADE	SINGLE SIDE SCRAPER	POINT	CRESENT	NOTCH BLADE
LENGTH (In mm)											
MAXIMUM	13.47	10.27	4.07	6.16	19.33	21.01	20.58	16.53	12.89	9.71	19.31
MINIIMUM	64.21	25.15	43.70	20.69	42.41	35.25	38.72	29.90	24.65	33.53	24.79
RANGE	50.74	14.88	39.63	14.53	23.08	14.24	18.14	13.37	11.76	23.82	5.48
STDEV	9.90	4.05	6.15	3.26	16.32	4.49	5.31	4.72	3.64	6.52	3.87
WIDTH (in mm)											
MAXIMUM	10.85	5.86	5.76	4.60	13.33	10.22	5.86	11.53	5.88	4.54	9.85
MINIIMUM	53.29	14.70	27.81	14.61	21.77	21.54	12.83	20.16	10.77	10.94	11.97

MEASUREMENTS	CORE	BLADE	FLAKE	CHIPS & CHUNKS	BURIN	BLADELET	BACKED BLADE	SINGLE SIDE SCRAPER	POINT	CRESENT	NOTCH BLADE
AVERAGE	42.44	8.84	22.05	10.01	8.44	11.32	6.97	8.63	4.89	6.40	2.12
STDEV	8.26	2.57	4.07	2.36	5.97	2.46	2.16	2.83	1.92	1.92	1.50
THICKNESS (in mm)											
MAXIMUM	5.84	2.04	0.00	1.25	4.53	3.48	3.85	2.66	1.72	2.41	3.38
MINIIMUM	13.82	5.52	14.53	8.47	12.56	9.07	8.57	7.91	4.55	7.27	4.21
AVERAGE	13.76	3.48	14.53	7.22	8.03	5.59	4.72	5.25	2.83	4.86	0.83
STDEV	17.25	0.94	2.15	1.72	5.68	1.44	1.70	1.60	1.06	1.48	0.59
TOTAL NO OF SAMPLES	64	21	230	53	2	23	8	7	7	12	2



Plate 1: Close-up view of the microlithic artefact cluster at the Baruan-I site.

2. Baruan-II (BRN-II)

The Baruan-II site is situated at a distance of 1.5 kilometres southwest of Baruan-I, on the left side of the Baruan to Biridiha village road. It is nearly 11 kilometres northeast of Anandapur Township, the sub-divisional headquarters in the Keonjhar district. It has an elevation of 154 meters above mean sea level. It lies between 21°16'14.99"N latitude and 86°10'47.36"E longitude. The artefactual scatters in small clusters were found exposed on the eroded surface of the low elevated granitic rock outcrop. The site is spread over an area of 50sq. meters. The nearby area of the site is disturbed due to the agricultural activities and soil quarry. A total of 70 artefacts were collected randomly from the eroded surface of the rock sheet measuring an area of 10 m × 10 m. Almost all the artefacts collected are of medium-sized brownish-coloured gravel deposits. The gravel lithology is dominated by granite, dolomite and dolerite pebbles mixed with quartz nodules. At this site, artefacts of microlithic components are made on Chert, Jasper, and Quartz in fine and milky varieties (Plate 2). The microlithic tool assemblage from the site is characterized by a composition where Cores account for 22.85% and flakes constitute 38.57% of the total assemblage. A significant portion of the flakes exhibit utilization or edge damage marks. In addition to these, a varied collection of finished tools has been identified, which includes

Blades at 4.28%, Bladelets at 4.28%, Backed Blades at 4.28%, Crescents at 1.42%, Points at 2.85%, and Scrapes at 1.42%. While flakes are predominant at this site, the quantity of tools made from the flakes is notably high. Conversely, Chips and Chunks represent 20.00% of the assemblage (Table 3). A significant quantity of flakes and chunks is detached during the core reduction process at the site. From a techno-typological perspective, the assemblages observed at Baruan-II exhibit similarities to those found in the Baruan-I and Baunshagarh areas.



Plate 2: General view of the microlithic site of Baruan-II site.

Table 3: Metrics of Tools from Baruan-II

MEASUREMENTS	CORE	BLADE	FLAKE	CHIPS & CHUNKS	BLADELET	BACKED BLADE	SINGLE SIDE SCRAPER	POINT	CRESENT
LENGTH (In mm)									
MAXIMUM	19.05	16.43	16.54	11.26	36.06	26.47	24.46	13.01	18.13
MINIIMUM	55.04	21.14	48.19	20.23	40.81	30.58	24.46	25.29	18.13
RANGE	35.99	4.71	31.65	8.97	4.75	4.11	0.00	12.28	0.00
STDEV	9.17	2.40	6.56	2.27	2.40	2.07		8.68	
WIDTH (in mm)									
MAXIMUM	10.02	8.77	9.89	6.00	15.02	6.46	17.47	6.28	8.05
MINIIMUM	61.87	13.54	29.12	14.60	22.48	16.87	17.47	13.10	8.05
AVERAGE	51.85	4.77	19.23	8.60	7.46	10.41	0.00	6.82	0.00
STDEV	12.41	2.46	4.35	2.79	3.88	5.33		4.82	
THICKNESS (in mm)									
MAXIMUM	6.76	3.18	2.65	2.85	5.23	2.63	4.46	1.30	2.58
MINIIMUM	80.68	6.07	14.43	7.14	6.64	4.95	4.46	5.59	2.58
AVERAGE	73.92	2.89	11.78	4.29	1.41	2.32	0.00	4.29	0.00
STDEV	17.70	1.57	2.51	1.36	0.71	1.19		3.03	
TOTAL NO OF SAMPLES	16	3	27	14	3	3	1	2	1

**Plate 3: Microlithic Blade Cores found from the sites of Salandi river valley.**



Plate 4: Microlithic Flake Cores recovered from the Baruan-I sites



Plate 5: Microlithic Bladelets found from the sites of Salandi River valley.



Plate 6: Different Varieties of Microlithic Crescents found from the Sites of Salandi Valley.



Plate 7: Different Varieties of Microlithic Blades recovered from the Sites of Salandi Valley.



Plate 8: Microlithic Points recovered from the Sites of Salandi Valley.

RAW MATERIAL COMPOSITIONS

The region is predominantly characterized by Proterozoic rocks overlaying the uneven surface of Archean rocks. Geological formations in the area manifest as outcrops, boulders, cobbles, and pebbles of various sizes. It is feasible that water-worn river pebbles or their fragments were utilized as raw materials to produce tools. The study area exhibits outcrops of granite, dolerite dykes, and veins. The region, traversed by the Baitarani River, is underlain by the Singhbhum Group, Lower Bonai Group, and Gorumahisani Group of rock systems. The crystalline rocks, including khondalites, granite gneisses, charnockites, quartzites, and anorthosites, which lack primary porosity, constitute approximately 80% of the district's area. These rock types are predominantly found in the undulating plains and topographic depressions. The region is particularly abundant in quartzite, dolerite and granite river pebbles, cobbles, and boulders. Notably, Keonjhar district features one of the most extensive intrusive dolerite dykes, extending nearly 89 kilometres. An analysis of the explored area has identified three types of raw materials: chert (94.79%), quartz (4.81%) and Jasper (0.40%) (Figure 2). Microlithic sites found near the river, as well as those located far away from it but close to granitic rocks, bedrock, and hilltops, show a clear preference for chert as the primary raw material utilized. In this region, chert, chalcedony, jasper and agate are recognized as the most favoured raw materials. Additionally, quartz emerges as a dominant material; notably, quartzite and dolerite are employed in significant quantities. Quartz is predominantly located in regions away from rivers, typically near granitic rock outcrops, bedrock, or hilly areas. Notably, while chalcedony and jasper have been found in the Salandi Valley, their use has been limited. The site-wise distribution of the raw materials used for the production of microlithic tools is highlighted in the table below (Table 4).

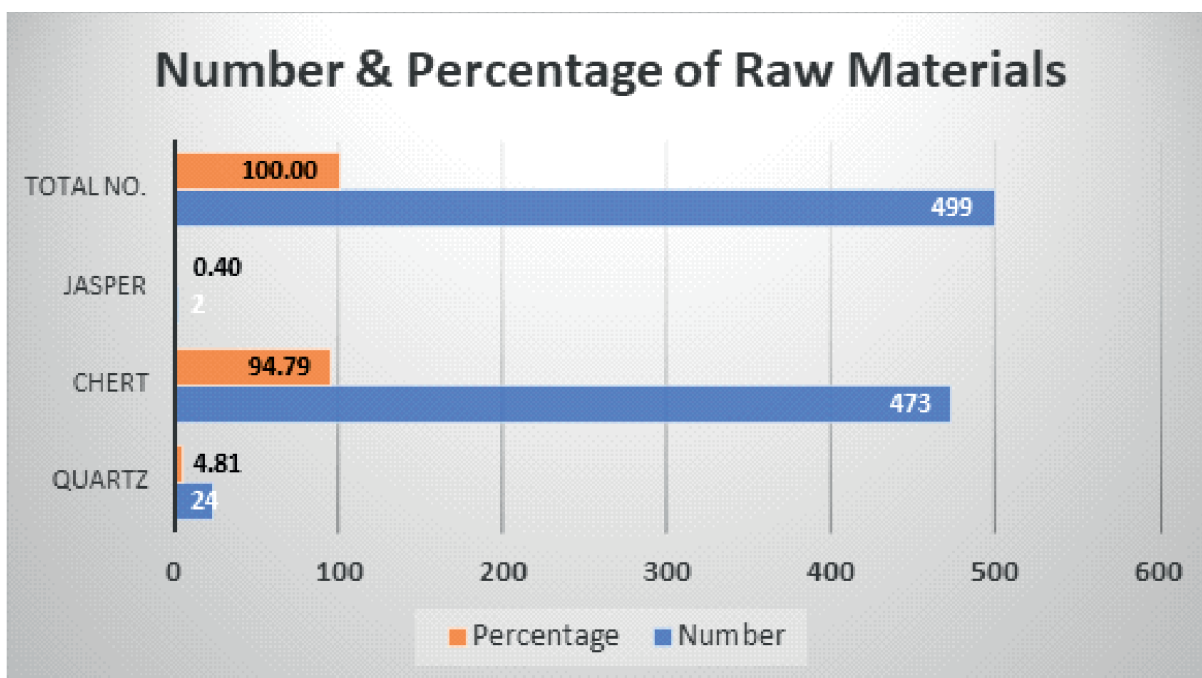


Figure 2: Number and Percentage of raw materials used for the production of microlithic tools.

Table 4: Site-wise distribution of Raw Materials

RAW MATERIAL	SITE		TOTAL NO.
	BARUAN-I	BARUAN-II	
QUARTZ	4	0	4
BLACK CHERT	264	42	306
GREY CHERT	67	8	75
GREEN CHERT	4	0	4
YELLOW CHERT	5	0	5
JASPER	2	0	2
MILKY CHERT	2	0	2
WHITE CHERT	7	1	8
BANDED BLACK CHERT	19	2	21
BANDED QUARTZ	8	5	13
Green Quartz	1	0	1
RED CHERT	1	0	1
CRYSTAL QUARTZ	3	0	3
BANDED WHITE CHERT	1	0	1
BANDED GREY CHERT	36	11	47
MILKY QUARTZ	1	0	1
GREY QUARTZ	1	1	2
BANDED YELLOW CHERT	3	0	3
TOTAL	429	70	499

DISCUSSION & CONCLUSION

The Keonjhar district is important from an archaeological perspective. This region of Odisha, like many other parts of India, showcases a rich history of continuous human habitation, spanning from the Pleistocene to the Holocene epoch. The stone tool artefacts and other cultural antiquities recovered from the study area show that this area was inhabited by human beings from the Paleolithic period to the present times. The early human habitational surfaces and pediments are exposed on the river bank of the Salandi and hill slopes due to actively undergoing erosion. All the recovered sites are mainly open-air sites, and they were predominantly situated near small streams. The nearby presence of forests likely facilitated access to various game animals and plant-based food sources. These sites were evidently utilized for habitation purposes (Issac 1960; Clark 1975; Paddayya 2006). The sites in this region have occurred in the bank of small perennial streamlets and on both low- and high-elevated granitic rock outcrops areas, which have always been major centres of attraction for the prehistoric people for settlement. There are some good reasons to settle in a semi-high land area; the hill slopes provide the raw materials for tool production and are used as a manufacturing centre. Again, many flat and high elevated granitic rock outcrops situated on the major river bank and along the Nullah banks provide a platform as a watchtower or strategic location to understand the animal movements of this region for hunting-gathering. The abundance of artefacts present on the exposed surface of the rock outcrops indicates that this area served as a tool manufacturing site. Additionally, our research indicates that this platform frequently provided shelter for small game animals, allowing prehistoric people access to both plants and small game. Moreover, it likely served as a secure location suitable for long-term habitation. Besides, as we know, the river has always played a great role in prehistoric human settlement because it provided the basic needs of man for subsistence (Binford 1980).

Prehistoric people of this region had a wandering lifestyle, moving across the landscape in search of various resources starting from raw material procurement to hunting-gathering. In the later part of the late Pleistocene and early Holocene period, due to the seasonal variations, the main economic activities of the people were also certainly changed from season to season. The riverside or river banks were continuously populated during the Microlithic period because of successful advancement in hunting-gathering techniques (Clark 1932; Elston and Kuhn 2002; Petraglia 2009). The microlithic assemblages in the study area are completely devoid of any ceramics, but associated with Neolithic-type ground stone tools, ringtones, hammer stones and any other types of heavy-duty tools, which are found in other parts of the state (Behera 2006: 1-62; Ota 1986: 79-85). The microliths are associated with heavy-duty tools, which are an integral part of the Mesolithic culture of the Keonjhar district (Mohanty, 1993). A wide range of microlithic artefacts was noted, such as a large number of blades, bladelets, backed blade tools and scrapers of various types, borers, Burins, Crescents and points were marked with variability within the sites (Figures 7 & 8). Microlithic cores of different varieties, such as flake cores, blade cores and flake-blade cores, were identified within the tool assemblage (Figures 3 & 4). Microlithic tools such as scrapers, blades, bladelets and backed blades found from the sites are mostly made on flakes (Figures 5 & 6). The availability of raw materials, the favourable landscape and the use of advanced technology in this region forced the prehistoric hunter and gatherer to settle in this valley. The analysis of raw material procurement and lithic reduction strategies employed by prehistoric populations in this region indicates that large flake blanks were transported to archaeological sites from areas abundant in raw materials. These blanks were subsequently reduced to manufacture various tools. The selection of raw materials, alongside a techno-typological analysis of the assemblages, has

yielded insights into the behavioural patterns of microlithic-using communities within this area. This ongoing discussion indicates that the persistence of the microlithic tradition in the Salandi Valley can be traced back to the later stages of the late Pleistocene epoch. The lithic assemblage characteristic of the microlithic period is notably identified in the Baitarani Valley and its tributaries, including the Salandi River. Moreover, these assemblages exhibit distinct features and tool traditions, thereby underscoring the significance of the region. The Salandi Valley is identified as a favourable geo-environmental setting for early human activity throughout much of the late Pleistocene. Consequently, this context provides an enriched understanding of the cultural ecology pertinent to the human-land relationship within this area.

ACKNOWLEDGEMENTS

I sincerely express my gratitude to my supervisor, Dr. Paramtap Pradhan, one of the co-authors of this paper, for his continuous support, guidance, and encouragement. I also express my gratitude to all my teachers at the School of History, Gangadhar Meher University, Sambalpur, for their support of my research work. I also owe sincere thanks to Dr Nishikanta Dwibedi, another co-author of this paper, for his help and support in assisting me during the fieldwork.

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