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# New Insight on the Tool Assemblage of the Early Holocene Epoch from Amarkantak Plateau, Madhya Pradesh, India

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**Abstract**

This study investigates the Holocene tool assemblage of the Amarkantak Plateau, Madhya Pradesh, India. The research gives insights into the technical and socio-cultural features of human populations that thrived in this region throughout the Holocene period by systematic archaeological surveys and examination of recovered artefacts. The discoveries reveal a wide range of stone tools, including blades, scrapers, points, etc., demonstrating the versatility and resourcefulness of ancient dwellers in the Amarkantak Plateau. The presence of microlithic tool producers in the plateau differs from the other topographical pockets where microlithic tools were reported earlier. The metric analysis of the tool typologies retrieved during the surveys points towards the diversity of the artefacts. The presence of distinct lithic typologies prepared with various technologies and materials suggests a sort of contact with neighboring locations, which might have influenced the cultural dynamics of Amarkantak. Additionally, the study examines the geographical distribution of archaeological sites across the plateau, offering insights into Holocene settlement patterns, land use practices, and resource management. Emphasizing the importance of multidisciplinary research and collaboration, this study underscores the potential for reconstructing the past and enhancing our understanding of human history.

**Keywords**: Amarkantak Plateau, Holocene, Johila River, Microliths, Upper Palaeolithic.

**Article Type:** Research Article

## Introduction

The term "Holocene" refers to Earth's current geological period, which started around 11,000 years ago. It's often thought to have begun 10,000 radiocarbon (14C) years ago or approximately 11,500 calendar years ago (Gibbard & Head 2020: 1217-1219). In terms of cultural development, this period is significant due to the extensive human growth, alterations, and interventions that have occurred in response to its specific environmental conditions. Compared to the preceding epoch, the Holocene has seen notable changes in climate and sea levels, which, along with local and regional tectonics, have greatly influenced the development of humans, cultures, and civilizations, as well as plant and animal life, landforms, water, and other non-living resources (Padmalal *et al*. 2021:163-167).

During the Late Pleistocene and Early Holocene, the Indian subcontinent experienced semi-arid conditions and was significantly drier (Padhan 2017:96-110). This era saw the invention and emergence of Microliths, a new class of stone tools and technology, which appeared primarily to collaborate with the hunting and gathering lifestyle and to fulfil the increasing demand for small, efficient, robust, portable tools with multiple uses, to collaborate with the changing environmental factors. This technique spanned over 50,000 years, from the Upper Palaeolithic to the Mesolithic eras and significantly impacted human demographics and facilitated the settlement of previously uncolonized regions (Misra 2001:491-499).

From 48,000 years ago to the present, microlithic evidence is found across the Indian subcontinent, except for the Himalayan region and some parts

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of northeastern India (Mishra *et al*. 2013 and Roy 2008). The Mesolithic phase is typically identified by younger assemblages, although older microlithic assemblages significantly overlap with the Upper Palaeolithic phase. Lithics are often found in spatial relationships with rock art sites, in both rock shelters and open-air sites, and have historically been categorized typologically into non-geometric and geometric shapes (Misra 2001:491-531). The evidence of microliths have been reported from various ecozones, including sand dunes and grasslands. In a few Indian studies, microliths have been linked from the Palaeolithic period to Megaliths, associated with ostrich eggshells, animal bones, human graves, and pottery pieces. Therefore, due to the lack of absolute dates to categorize the sites in this study, we do not use the term "Mesolithic" and instead refer to our reported sites as "Microlithic" regardless of their assumed age.

In India, the beginning of the Holocene, which saw a climatic improvement, is associated with advanced stone tool-making processes linked to the Mesolithic period (Cummings *et al*. 2014:14). Despite this, there is still considerable confusion and doubt regarding the cultural and historical contexts of Holocene microlithic assemblages in South Asia. This confusion is exacerbated by the scarcity of sites with confidently dated microlithic remnants. To gain a deeper understanding of the lithic toolkits of the Mesolithic Period, evidence from sites reliably attributed to the Mesolithic, including direct evidence of plant and animal exploitation tactics, is required. This study examines the characteristics of the Holocene hunter-gatherer toolkit discovered at various sites on the Amarkantak plateau, using morphometric and statistical approaches to analyse the newly surveyed microlithic production sites. The findings reveal a general consistency in raw materials and manufacturing methods across all sites. However, variations in the relative abundance of tool types between these sites, despite their proximity, suggest different resource-exploitation strategies by the Holocene hunter-gatherer groups on the Amarkantak plateau.

**Amarkantak Plateau**

The Amarkantak Plateau offers a valuable opportunity to trace past human occupations, primarily because parts of this area lie within the Mekal range and along the region where the river Narmada and its tributaries originate. The discovery of lithics dating back to the Upper Palaeolithic and Mesolithic periods in this area sheds light on ongoing human mobility throughout the terrain. This strategic location, with its availability of water, food from wild flora and fauna, and suitable raw materials for tool production, likely served as a crucial junction for hominin and faunal migrations into various regions and directions.

At the Amarkantak plateau, most of the microlithic sites with artefacts are open-air. Their distribution pattern indicates a dynamic and enduringly mobile prehistoric population in this area, who maximised the landscape's resources. Mostly the artefacts are found at the base of hills and along small tributaries, invariably associated with fine-grained sediments or exposed bedrock outcrops. These fine-grained sediments range from reddish-brown to orangish-brown and reddish-grey, comprising sandy silt or silty sand; some associated sediments may be aeolian, given their homogenous lithology. However, the core area or upper Amarkantak plateau region shows a lower concentration of microlithic material, likely due to the lack of raw materials in the area. Therefore, it is evident that the presence of microliths in the study area was relatively unrestricted both in terms of topography and ecology.

**Study Area and Methodology**

After observing and comprehending the site distribution patterns and microlithic occurrences, a strategy for the fieldwork was developed. The current land use pattern of the Amarkantak plateau includes extensive forests, limited agricultural land, constrained government lands, and inaccessible non-agricultural holdings. The surveys revealed a gradually developing understanding of the terrain over many field seasons. The goal was to monitor and record the development of the sites and the distribution of microliths in various open-air settings. Environmental adaptations, land use methods, and raw material acquisition were revealed through tracing sites and hunter-gatherer migration in the region. Surveys were conducted in areas with minimal disturbance, such as foothills and isolated patches near agricultural fields. The technique was also developed for additional locations, such as slopes and forest edges, where anthropogenic activity was less than in core floodplains.

The study area for the present work mainly comprises the upper part of the Johila River basin. The survey began at the Jaleshwar temple complex, where the Johila River originates. Although this locality falls in the eastern part of the core area of the Amarkantak plateau, its landscape is somewhat different from the other parts. It resembles a colossal depression surrounded by high terrain on three sides, making it suitable as a river source. Like the Narmada, the Johila also originates from a groundwater source and collects numerous water streams, particularly in the rainy season, which originate from the neighbouring higher areas. Since the northern part is comparatively low, the river flows north, almost between the centre of two terrains, nearly parallel to the Narmada River. After flowing about 4-5 km further north, the river joins the lower region Figure 1, (B-1) of the Amarkantak plateau.

Significantly, no sites have been found around the source area of the Johila River. However, exploration continued in the lower plateau areas where the Johila meets several dominant streams. The survey was carried out up to the Batki Nala, an essential tributary of Johila, covering a distance of about 15 km, and the entire area of the Johila basin covered in this fieldwork was about 110 square km. Special attention was given to the neighbouring foothills and numerous small tributaries from the small hills flanking the Johila basin. By adopting this methodology, many sites yielded evidence of microliths in two contexts: near the foothills and along the tributaries (Figure. 2). It is also significant that very few of the discovered sites are found along the main course of the Johila River.

1. Sites discovered along the foothills –Nonghati, Harra Tola, Umargohan and Bedkhodra. These sites

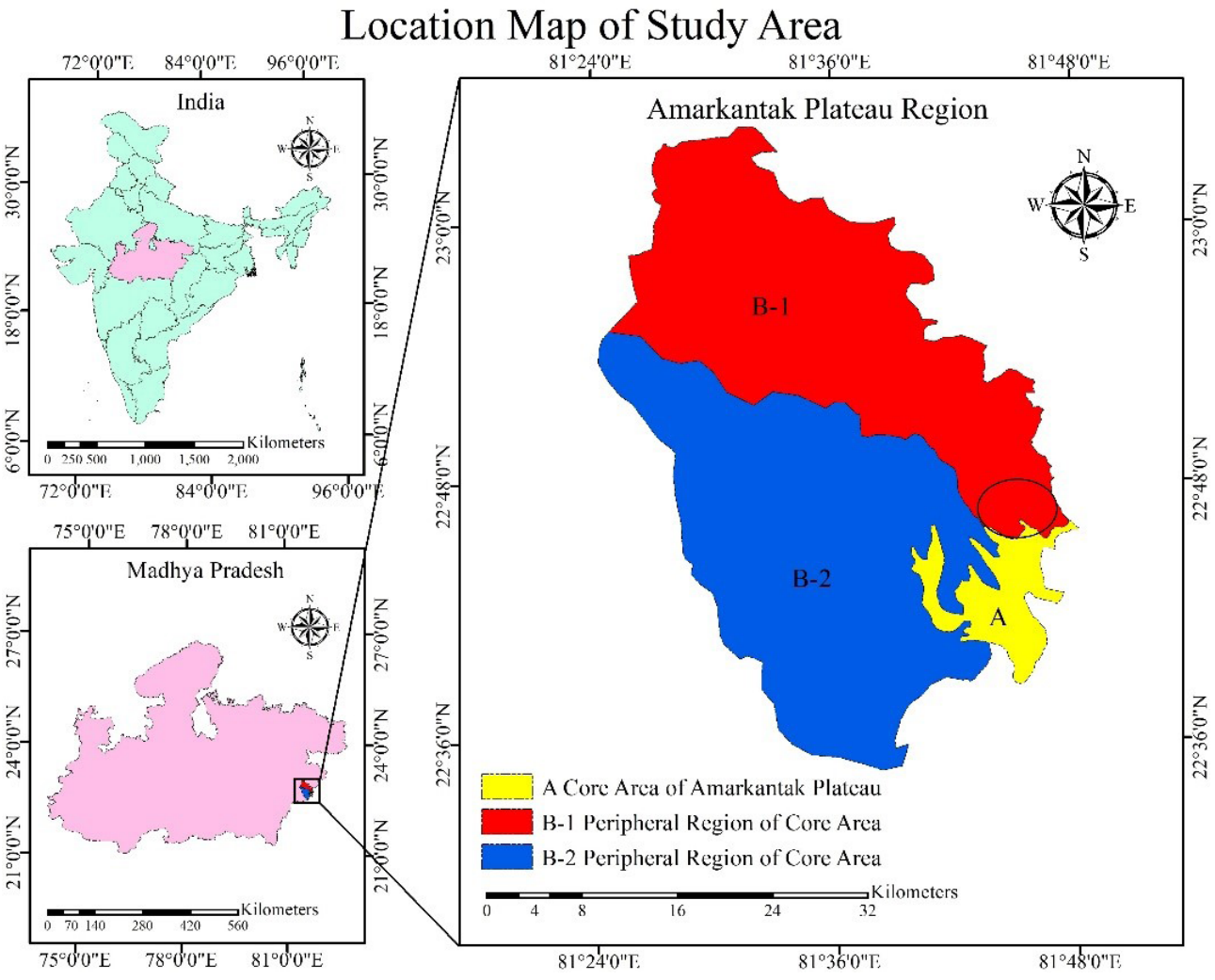



***Figure. 1:****The area shown in the black circle (in B-1) is dealt with in this paper.*

are located either on the foothills or very close to them, at elevations of 930-950 metres above sea level. Pointedly, these sites are invariably found near the origin or source of small water channels.

2. Sites discovered along the tributaries/seasonal water channels – Sendur Khar, Bijauri, Donia, Pamra, Bharni, Lalpur and Batki. Notably, the sites in this group are located at elevations of about 900-930 metres above sea level and are on the bank of the feeding channels of Kantur Nala and Batki Nala, the important right-hand tributaries of the Johila River.

The village name, landmarks, context, landscape orientation, ecology, plants, stratigraphic context, geography, site size, site distribution, artefact dispersal size, number of disperses, artefact density, artefact dispersion, raw material, and site type were all reported in the research, and also were used to identify independent scatters. The quantity of specimens, specimen type, raw material, region, and previously described sites were used to identify stray artefacts. Digital field photography was utilised to capture landscapes from various perspectives and objects in situ with sedimentary context for archiving reasons and descriptive interpretations.

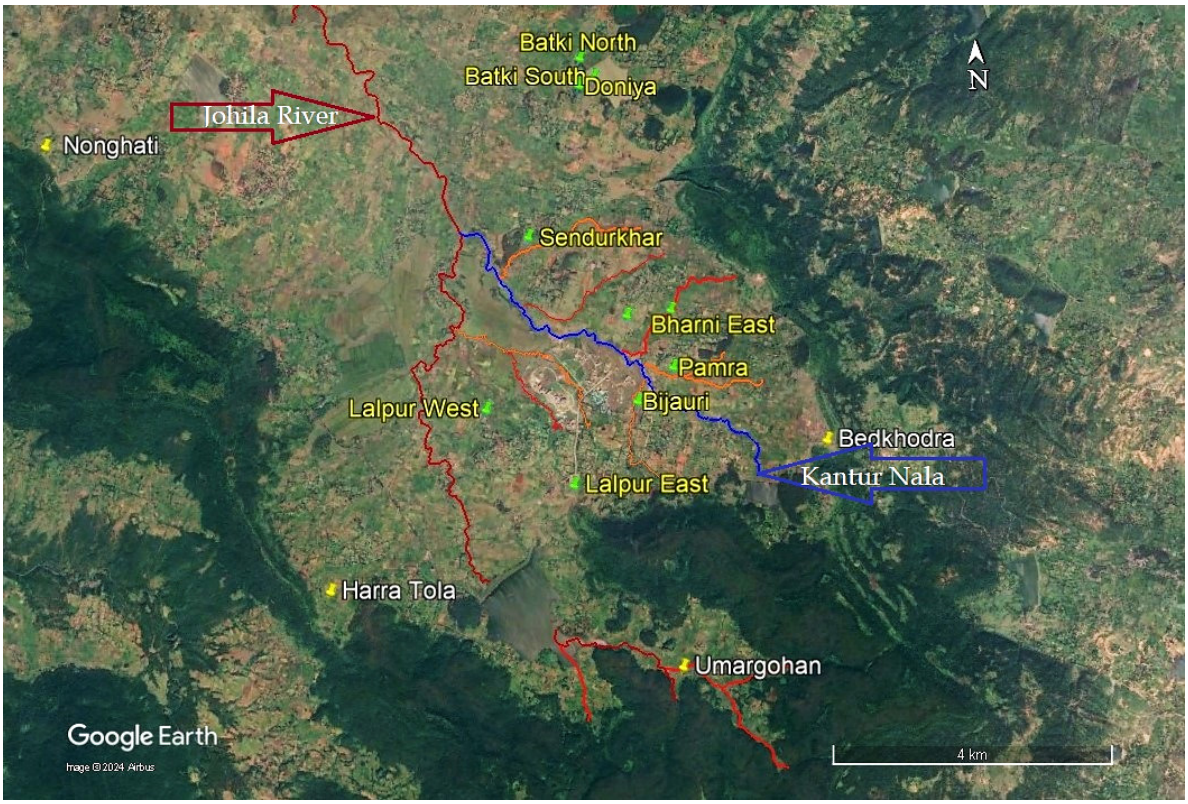



***Figure. 2:*** *Google Earth map showing the distribution of Sites.*

The process of documenting sites and artefacts included rigorous documentation of both qualitative and quantitative features. The size of sites was determined by inspecting scatter borders, and further scatter characteristics were recorded. The distribution patterns of artefacts were documented to better understand the site's nature, formation, context, and independent dispersion. Predetermined parameters were utilised to distinguish between sites, independent scatters, and stray artefacts or find-spots. All occurrences were documented by recording the variable properties of all three types.

Artefact collection primarily focused on open-air sites with minimal disturbance. Random collections were made based on site size. Most occurrences was documented, but collections were limited to minimally disturbed sites. Extensive photography was conducted at each site, with close-up shots of many in situ artefacts. The post-survey process involved washing, typological sorting, counting, labelling, packing, and preparing photography and photo plates. The study used digital callipers to measure length, breadth, and thickness (LxBxT) in millimetres (mm) from the proximal to distal

end of each lithic type. After sorting, comparisons with established types were made to determine specific assemblage compositions in Amarkantak assemblages.

**Research Objectives**

The study focuses on Late Quaternary microlith records from the lower Amarkantak Plateau, examining the significant technological advancements during the Late Pleistocene and Early Holocene. Prehistoric communities' behavioural habits and terrain utilisation are studied in open-air settings. This research also lets us better comprehend microlithic technologies and hominin migrations. It seeks to address the following points and revolves around the variables influencing the creation of microlithic records in this region. In addition, the presence of 'Blade-Burin' typology with microlithic technology raises the question of the genesis of both types during the Late Pleistocene and early Holocene epochs in the study area.

The primary objective of this study is to gain insight into the geoarchaeological and geographical settings of the microlithic record belonging to a plateau region of the upper Narmada Basin. It also focuses on geochronology, developing a basic framework for microliths and recording evidence to reconstruct hominin landscape alterations in this area in the early Holocene period. The microlithic typology, technique, and chronology of the research area are examined, and they are similar to other locations in India—the distribution of microlithic sites aids in understanding the resource utilisation of hunter-gatherer cultures. The region's rich faunal resources, easy access to raw materials, lush foliage, and Narmada River paleochannels provide a diverse potential for prehistoric archaeological research.

**Primary Tool Typology**

The tool types were determined based on typology and morphology: cores, flakes, blades, scrapers, core tablets, core fragments, minimal flaked nodules, natural nodules, and debitage (Falcucci *et al*. 2017). Based on a knowledge of the lithics' typological and morphological traits, qualitative aspects were noticed and documented in each lithic category. Raw material types, conditions, observations, striking platform, bulb, notch, retouching, backing, raw material quality, shape types, and dominating tool type were among these qualities.

**Tool Production Technology**

The study also examined lithic production techniques, standardisation in lithic manufacturing, use-wear, raw material quality, production tactics, form kinds, and standardisation. To provide tabular information on the technology used to produce the various microlithic tools, the general method or technology, raw materials commonly used, and primary function where applicable. This information in the table (Table. 1) is based on archaeological and anthropological research into stone tool technology, primarily focusing on lithic reduction techniques, raw material selection, and tool use across different prehistoric cultures.

This table offers a comprehensive overview of the lithic technology and typical uses associated with each tool type. The specific methods, materials, and functions may vary depending on the cultural context and technological capabilities of the tool-making society. The development and refinement of these technologies represent significant advancements in human prehistory, enabling our ancestors to adapt, survive, and prosper in various environments worldwide.

**Raw Material**

Microliths were found in dark brown, pale brown, orangish, or red sediments and are often sandy-silty, silty, or alluvium. Calcrete nodules were also found with pale brown sediments, pebbly gravel, and bedrock. Microliths were commonly encountered eroding from these sediments in their fresh state, particularly in heavy sedimentation.

**Metric Analysis of Microliths of Early Holocene Epoch in the Area of Study**

Microliths are tiny reworked stone tools that are typically regarded as being hafted as a component of composite tools (Lewis and Petraglia 2015:9). An agreed-upon standard description of microliths hasn't emerged despite decades worth of attempts (Ballin 2000- 21:9-15; Hiscock and Mackay 2011:653-664; Gould 1969:229-237). Existing criteria frequently impose size restrictions and call for the usage of geometric forms, microblade blanks, and backing retouches (Leplongeon 2014:100–116). Microlithic assemblages have been found in many parts of the world since they were initially discovered by A. C. Carlyle in the Vidhya Hills of Central India in 1867 (Padhan 2021:1-11). Although microlithic enterprises were more prevalent throughout the

***Table. 1:*** *Various Types of Microlithic Tools and their Preperation Technology*

| Tool Type | Technology/Method | Common Raw Materials | Primary Function |
|---|---|---|---|
| **Cores** | Direct percussion, pressure flaking | Flint, chert, obsidian | Source of flakes and blades, not a tool itself |
| **Flake** | Direct percussion, pressure flaking | Flint, chert, obsidian | Cutting, scraping |
| **Blade** | Pressure flaking, indirect percussion | Flint, chert, obsidian | Cutting, slicing |
| **Micro-Blade** | Pressure flaking with specialised preparation | Flint, chert, obsidian | Precision cutting, drilling |
| **Scraper** | Retouching flakes into shape | Flint, chert, obsidian | Scraping hides, wood, and other materials |
| **Notch** | Retouching to create an indentation | Flint, chert, obsidian | Sawing, gripping, hafting |
| **Awl** | Pressure flaking to produce a pointed tool | Bone, antler, flint | Piercing soft materials like leather |
| **Burin/Borer** | Pressure flaking to produce a sharp edge with a chisel-like tip | Flint, chert, obsidian | Engraving, boring holes |
| **Point** | Direct or indirect percussion, retouching | Flint, chert, obsidian | Hunting weapon tips, knives |
| **Lunate** | Retouching to create a crescent shape | Flint, chert, obsidian | Sickle blades, symbolic uses |
| **Denticulate** | Retouching to create a serrated edge | Flint, chert, obsidian | Sawing, cutting with a serrated edge |
| **Spearhead** | Flaking to form a symmetrical point | Flint, chert, obsidian | Hunting, warfare |
| **Trapezium** | Retouching to create a trapezoidal shape | Flint, chert, obsidian | Arrows, symbolic uses |
| **Triangle** | Flaking and retouching to create a triangular shape | Flint, chert, obsidian | Arrowheads, spear points, symbolic uses |
| **Rectangle** | Flaking and retouching to achieve a rectangular shape | Flint, chert, obsidian | Blades, scrapers, symbolic uses |
| **Blank** | Initial flake removed from a core without further modification | Flint, chert, obsidian | Precursor to other tools |
| **Utilized Flake** | Flake used as a tool without modification or with minimal retouch | Flint, chert, obsidian | Cutting, scraping, based on existing edges |

Holocene, there was a global tendency towards frequent microlith production during the Late Pleistocene (Lewis and Petraglia 2015:33-34). However, the fact remains that by ten kya (thousand years ago), foraging groups on every inhabited continent were routinely manufacturing and using a substantial number of highly tiny tools (Kuhn and Elston 2002: 1–7).

The technical features of microlithic artefacts vary greatly. From 45 Kya onward, Late Palaeolithic microlithic technologies in South Asia started appearing in the archaeological record (Basak *et al*. 2014:1167-1171 and Mishra *et al*. 2013: e69280). These technologies were used by hunter-gatherer tribes for many of the Holocene, during which time they were known as Mesolithic industries (Blinkhorn 2018:168-182). This post-glacial period has frequently been depicted as nothing more than a temporal gap between what came before (the Palaeolithic) and what would come after (the Neolithic, which witnessed the first persistent use of domesticated plants and animals) (Cummings *et al*. 2014).

Semi-nomadic human communities engaged in hunting, gathering, foraging, and fishing throughout the Mesolithic period in India. The much higher number of locations (Misra 2001:491-531) indicates a noticeable rise in the human population. During this time, the Ganga Plains, West Bengal's delta, the West Coast, and Kerala had their first human settlement (Lal 1958: 4-48; Misra 1997: 321-328; Todd 1950:6). Microlithic toolkits, which have been described from all across the subcontinent, (Ajithprasad 2014:16-28; Williams and Clarke 1995:282-308) were used for all everyday household tasks. Therefore, traditionally, microliths have been regarded as diagnostic instruments for dating a site to Holocene hunter-gatherer tribes (Sonawane 2000:137-146). The Holocene hunter-gatherers did not have a specialised industry or technology, and even though microlithic technology may have served as a diagnostic marker for the Mesolithic era, it is not the same as Mesolithic Jayaswal 2010:8-23). Regional variation is frequently seen (Basak *et al*. 2014:1167-1171; Gadekar and Ajithprasad, 2016:13-22). Furthermore, microliths have been

identified in various historical and archaeological settings (Gadekar and Ajithprasad 2016:13-22), making it problematic to define a site purely based on the existence of these tools, particularly during the Holocene.

However, despite their uncertain chronology and potential contemporaneity with Neolithic, Chalcolithic, or Iron Age deposits, archaeologists working in the subcontinent continue only to associate microliths with the Mesolithic period. They frequently label all microlithic scatters discovered during surveys as "Mesolithic." It is essential to define and adopt a more precise standard for classifying South Asian microliths of various dates according to their shape, size, kind of retouching, and technique.

The artefacts from all the explored sites have been considered in this study since its goal is to evaluate the nature of the lithic assemblage from a solely hunter-gatherer occupancy. The essential elements used to classify the lithic assemblage came initially. According to their morphological characteristics, the lithic assemblage was further divided into completed tools (retouched into predetermined shapes) and lithic debitage/flakes/chips (the production waste). All of the tools were divided primarily into four broad categories:

1) different types of blades, such as simple blades (parallel-sided blades without any retouches but with edge damage), backed blades (blades with retouches along one longitudinal side), obliquely blunted blades (with oblique retouches on one of the traverse sides), and retouched blades (with random retouches).

2) Different types of handles were directly used by hands, i.e., scrapers, few blades, etc.

3) geometric tools, like isosceles triangles (two equal sides), scalene triangles (without equal sides), lunates (shaped like a crescent), and trapezes (two parallel horizontal sides and two non-parallel shorter sides, the non-parallel or the transverse sides are retouched).

4) non-geometric tools, like points (with a pointed end achieved by retouching the surface all around) and double-sided scrapers (flake).

A digital calliper was used to measure each tool's length, width, and thickness to examine the possibility of standardisation in tool manufacture. Tool edges underwent careful analysis, and unintended edge damage was interpreted as usage proof. The justification is that only after use would tools display edge deterioration (not deliberate retouches). Amarkantak Plateau metrics were compiled in tables and shown as pie charts and clustered columns for visualisation.

**The Blades**

The 354 total blades, including microlithic blades reported, were further divided into simple blades (59.14%), backed blades (17.06%), obliquely blunted blades (10.91%), and retouched blades (12.88%) based on their characteristics. Chert (25.52 %), chalcedony (48.40 %), agate (0.00 %), quartz (4.62%), and carnelian (0.0 %) make up the bulk of the blades. Most of the blades were discovered to be fractured (86.53%), and they were further divided into proximal (35.71%), mesial (34.76%), and distal pieces (7.99%) based on the location of the fracture. 89.87% of the blades did not exhibit cortical presence. We found that all retouched blades lacked cortex because secondary blades are purposefully chosen to make specialist instruments.

Tables and charts display metric data from the condensed artefacts. The investigation did not include blade flakes since only three of these artefacts were in total (n = 3). Although there are few whole blades across all categories, they have been included in the data to be contrasted with broken blades from comparable categories. Simple blades with no retouches but evidence of use in edge wear (macroscopic analysis) exhibit slight size variation. The only variation in backed blades, which were purposefully chipped to make hafting easier and apply more force to the material being worked (Andrefsky 2005), is in the length values, and the parameters for their breadth and thickness hardly vary.

Due to their form, obliquely blunted blades, also known as penknife blades (Sankalia 1964), appear to have been hafted and may have been employed as an arrow/lance tip or as a barb for harpoons. These blades' lengths fluctuate between those that are whole and those that are broken, but not between those that are whole and those that are broken. Last but not least, even though most of the blades were discovered to be broken, the length of retouched blades, which have sporadic retouches on their lateral edges, shows minimal variance.

The widespread use of small, finely made blades and bladelets was integral to these hunter-gatherer communities' toolkits (Finlay 2003). These tools were crafted using advanced lithic reduction techniques and served various functions, from hunting and processing games to woodworking and crafting. Below is a table (Table. 2) that outlines multiple types of microlithic blades and bladelets, their functions, and the production technologies used to create them.

**Table. 2:** *Various types of Blades and their Possible production Technology*

| Type of Blade/ Bladelet | Function | Production Technology |
|---|---|---|
| **Straight Blade** | General cutting tasks; could be used for processing animal hides, cutting meat, or woodworking | Produced from a prepared core through direct or indirect percussion, creating long, narrow flakes with parallel edges |
| **Backed Blade** | Safe handling for cutting or scraping tasks, such as processing hides or plants | One edge is deliberately dulled or backed to allow for safe handling or hafting, made using fine retouch |
| **Tanged Blade** | Hafting into handles or shafts for use as knives or spears | A tang or projection is created at the base of the blade for insertion into a handle; produced through careful shaping and retouch |
| **Microblade** | Delicate cutting tasks, such as working with small games or detailed crafting | Produced from a core using a punch technique, yielding tiny, uniform blades |
| **Serrated Blade** | Sawing wood, bone, or other hard materials | Edges produced with a series of notches to create a serrated effect, often through retouch |
| **Leaf-shaped Blade** | Hunting projectiles or knives; aerodynamic and suitable for piercing or cutting | Broad, leaf-shaped blades crafted through bifacial flaking, with retouch to refine the shape and edges |
| **Truncated Blade** | Detail work, possibly in crafting or soft material processing | Blades with ends intentionally truncated or snapped off to create a straight or angled working edge |
| **Burin on Blade** | Engraving or grooving wood, bone, antler, or hard materials | A specialized tool made by striking a blade to create a sharp, chisel-like tip at one end |

The production of these blades and bladelets required significant skill and knowledge of lithic materials. Crafters would select high-quality flint or similar stone and prepare a core in such a way that it could produce multiple blades with consistent shapes and sizes. Techniques such as pressure flaking, where a pointed tool is used to apply precise force, were employed to create fine edges and points (Bonsall 1989; Finlay 2003). These advancements in tool-making technology allowed Mesolithic people to efficiently exploit their environment and resources, aiding their survival and social development.

## Scrappers

The production technology of these scrapers involved sophisticated flintknapping techniques that enabled Mesolithic peoples to control the shape and sharpness of the tools' edges. This often-involved direct percussion with a hard hammerstone early in the process to shape the scraper, followed by finer retouching with a softer tool, such as an antler, to refine the edge and make it suitable for its intended use (Bonsall 1989; Finlay 2003). The development and refinement of these tools were crucial for the survival and advancement of Mesolithic communities, enabling them to process materials from their environment efficiently. Here's a simplified table (Table. 3) that outlines various types of Mesolithic scrapers, their functions, and the production technologies used to create them.

## Geometric and Non-Geometric Tools

Geometric tools found at these sites fall into the categories of isosceles (22.18%), scalene (35.22%), lunate (26.14%), and trapeze (16.45%). The majority of the tools were found intact. All tools

***Table. 3:*** *Various types of Scrappers and their Production Technology*

| Scraper Type | Function | Production Technology |
|---|---|---|
| **End Scraper** | Removing flesh from hides, smoothing wood surfaces | Direct percussion or pressure flaking on one end to create a thick, rounded edge |
| **Side Scraper** | Working edges of hides, precision scraping tasks | Direct percussion or pressure flaking along one or both long edges; sometimes retouched for specific shapes |
| **Hollow Scraper** | Creating concave surfaces, such as in woodworking | Specialized retouching to create a concave working edge; may involve complex flaking patterns |
| **Thumbnail Scraper** | Small, precise scraping tasks, often for finishing work | Acceptable pressure flaking to produce a small, curved scraper resembling a thumbnail in shape and size |
| **Nose Scraper** | Detailed work on hides and materials, tight areas | Pressure flaking to produce a pointed or narrow working edge at one end of the flake |
| **Keeled Scraper** | Heavy-duty scraping, typically on hides | Retouching to create a pronounced, ridge-like back (keel) for enhanced grip and control; often involves substantial material removal for shape |
| **Burin or Burin-like Scraper** | Engraving or grooving on wood, bone, or antler; fine, detailed work | It is produced by striking a flake in a way that a sharp, chisel-like edge is formed at an angle to the primary flake |

were included in the metric analysis, even those with minor breakages (e.g., slight damage to the tip). Secondary blades used in making geometric tools comprised 96.87%. Interestingly, approximately half of the artifacts in this study showed no signs of use. Given their apparent resemblance in length, width, and thickness, metric characteristics imply that the geometric instruments were manufactured from the same blades.

Points (n = 97) and scrapers (n = 128) are examples of non-geometric implements. The percentage of points was about 9.47%. Since a separate metric study of complete and broken points did not reveal any appreciable change in their values. In their metric measures, points and geometrical tools follow the same pattern. A separate metric analysis was impossible due to the small number of scrapers. The preferred material for making geometric and non-geometric tools was chert, followed by chalcedony, banded agate, and moss agate. A few objects were also made of quartz, carnelian, and bloodstone.

The tools were made in the location, as evidenced by the exhausted blade cores, core rejuvenation flakes, and lithic debitage/flakes. Chalcedony (57.55 %) makes up the bulk of the cores, followed by Chert (27.13 %), quartz (8.96 %), moss agate (0.0 bloodstone (0.0 %), and carnelian (0.0 %). From the assemblage, only one flake core has been recognised. The blade cores have been categorised into conical, cylindrical, wedge, block, and amorphous forms according to morphological characteristics. While wedge-shaped cores are generated when a nodule is quartered into pieces and then flaked from one surface, conical and cylindrical forms of cores are formed owing to unidirectional removal of blades and are related to the final product of blade technology and block cores have a cubical look since blades are removed from all sides. The blade cores exhibit homogeneity in size despite variations in their forms.

The cores' blade removal pattern reveals that 80.88% of the cores were rotated to remove their blades. More than 90% of the cores revealed one-way blade removal. It was discovered that 47.02% of core platforms only required the removal of a single flake, but 45.61% of core platforms required the removal of several microscopic flakes from the surface. Only 34.24% of the cores had no cortex at all.

Size and form are the traditional descriptors used to describe microliths. Compared to other groups of stone tools, it has been observed that most specimens are small, with typical lengths ranging from one to five cm. By softening a blade's naturally sharp border, geometric tool retouching aims to turn a blade into an effective tool. These tools, which are typically believed to have served as

projectile tips, arrow points, barbs, and side inserts, can also be utilised for various purposes, mainly to create composite tools like sickles or scythes. An examination of the lithic assemblages clearly demonstrates that sites exhibit a preference for one or the other type of tool assemblages, including various geometric and non-geometric tools. A subject that requires more research is why particular tools were favoured at specific locations.

## Site-wise Analysis of Various Types of Artefacts

### *Nonghati*

From the open-air site of Nonghati, the tools (Figure. 3) collected during the survey include the blade cores, blades (single and double-sided parallel blades), Notched blades, scrappers including side scrappers, single- and double-sided scrapers, concave and convex scrapers; Burins/Borers and points, etc. The site also shows the continuity from Mesolithic to Upper Palaeolithic culture identified through tool typology measuring 35 mm to 60 mm, like upper Palaeolithic flakes, Blades and scrappers. The metric analysis of the total 96 tools (Table. 4) from the site is cores (n=17) with average LxBxT 33.98mm x 16.24mm x 11.78mm, blades (n=14) 20.95mm x 12.63mm x 5.42mm, upper Paleolithic scrapers (n=9) 36.22mm x 18.31mm x 8.69mm, Mesolithic scrapers (n=25) with average dimensions (LxBxT) 20.98mm x 14.34mm x 6.60mm; flakes (n=30) 24.43mm x 7.77mm x 4.71mm, point (n=1) 22.29mm x 8.75mm x 4.90mm; borers/burins (n=0). There is also the need for more microblades from the site. However, the site is rich in blade-burin culture artefacts (n=31), with the metric analysis 43.46mm x 19.98mm x 9.76. The tools are prepared from raw materials from chalcedony, quartz, chert and lime.




***Figure. 3 :****Tools from Nonghati {Blades (1-6), Scraper (7), Point (8), Cores (9-10)}*

***Table. 4 :*** *Showing the Metric Analysis of the tools of Nongahti*

| Types of Tools | Average Length (mm) | Average Width (mm) | | Average Thickness (mm) |
|---|---|---|---|---|
| | | Max | Min | |
| Blade Cores (17) | 33.98 | 17.06 | 15.43 | 11.78 |
| Blades (14) | 20.95 | 14.28 | 10.98 | 5.42 |
| Points (1) | 22.29 | 12.85 | 4.60 | 4.90 |
| Scraper (9) (UP) | 36.22 | 23.50 | 13.13 | 8.69 |
| Burin/Borer (0) | - | - | - | - |
| Scraper (M) (25) | 20.98 | 15.91 | 12.78 | 6.60 |
| Flakes (30) | 23.02 | 14.33 | 10.28 | 6.08 |

### *Bijauri*

There are 68 artefacts (Table. 5) from Bijauri (Figures 4 and 5) comprising various types of microliths, and the counts are as follows: blade cores (n=16), blades (n=19), scrapers (n=7), trapezium (n=10), points/borers/burins (n=4), flakes (n=4), and a long point/spearhead (n=1). The raw material types used are chalcedony, quartz, chert and lime. The average LxBxT of the artefacts is recorded as Blade cores 25.86mm x 17.17mm x 9.32mm; Blades 20.36mm x 9.8mm x 3.96mm; Trapeziums 11.77mm x 6.56mm x 2.75mm; Triangles 12.43mm x 6.77mm x 3.25mm; Points/borers/burins 23.63mm x 13.67mm x 5.58mm and Scraper 50.21mm x 37.81mm x 13.56mm and long point/spearhead measures 62.44mm x 19.71mm x 8.85mm.

### *Sendurkhar*

Sendurkhar is one of the biggest sites for tool collection (Figures. 6 and 7), with enough archaeological potential. The tool assemblage at Sendurkhar includes the typical microliths, including Fluted Cores, Blades, bladelets, Scrappers, Points, Burins/Borers and flakes. These tools are found in geometric and non-geometric shapes like Triangles, Rectangles, Lunates, Backed-blades, Straight blades, single- and double-sided blades, convex blades, and notched blades. There are instances of retouching on the blades retrieved from the site. The raw material types used are chalcedony, quartz, chert and lime. There are 548 artefacts (Tables. 6 and 4) from the site comprising cores (n=47), blades

***Table .5 :*** *Showing the Metric Analysis of the tools of Bijauri*

| Types of Tools | Average Length (mm) | Average Width (mm) | | Average Thickness (mm) |
|---|---|---|---|---|
| | | Max | Min | |
| Blade Cores (16) | 25.86 | 18.79 | 15.55 | 9.32 |
| Blades (19) | 20.36 | 11.87 | 7.73 | 3.96 |
| Points/Borers/Burins (4) | 23.63 | 15.75 | 11.59 | 5.58 |
| Scraper (7) | 50.21 | 42.52 | 33.11 | 13.56 |
| Long Point/Spearhead (1) | 62.44 | 25.58 | 13.84 | 8.85 |
| Flakes (4) | 48.12 | 35.78 | 27.97 | 14.78 |
| Trapezium (10) | 11.77 | 7.43 | 5.69 | 2.75 |
| Triangles (7) | 12.43 | 8.93 | 4.61 | 3.25 |




***Figure. 4:*** *Tools from Bijauri {fluted cores (1,2), points (3), blades (4,5,8,9,10) and scrappers (6,7)*




***Figure. 5:*** *Tools from Bijauri {blade core (1), scraper (2,6,7) point-cum-scraper (3).*

(n=74), blade-burins (n=31), bladelets (n=201), Notched Blades (n=7), scrapers (n=77), flakes (n=30), trapeze (n=0), points (n=76), borers/burins (n=50), Lunates (n=4) and Triangles (n=0). The average size of the artefacts ranges from (LxBxT) 45mm x 22mm x 4mm. The average LxBxT of the blade cores is 40.72mm x 28.47mm x 16.89mm, the average number of flake scars is seven, and the average platform width is 10.44 mm. The average LxBxT of Blades, Micro blades and Upper Paleolithic Scrappers and Mesolithic Scrappers is 30.18mm x 29.88mm x 6.77mm; 19.45mm x 9.49mm x 3.21mm; 42.66mm x 25.84mm x 11.78mm and 17.22mm x 13.7mm x 4.48mm respectively.

### *Batki*

The Batki archaeological site is divided into two parts - Batki (North) and Batki (South), and both have yielded a good number of microliths and associated tools (Figures 8, 9 and 10). Microblade cores and Flake-let cores were extracted from which blades, Microblades, retouched blades, scrapers, points, drills/bores/burins, etc. A good quantity of artefacts was collected from Batki (North) compared to Batki (South). Overall, the tools typology reported during the survey of the site includes the blade cores, blades (straight, parallel, single and double sides), Blade cum point, Lunates, Notched blades, bladelets in various shapes like Rectangles, Triangles, Burins/ Borers and points, scrappers, etc. The metric analysis shows that the size of tools ranges from 8 mm to 35 mm. The number of artefacts collected from the two sites is 157 (Table. 8), including



***Figure. 6:*** *Tools of Sendurkhar consisting of Blades (1-4 and 6), Points (14,15,17, and 18), scrapers (7, 9-10), and borer/burin (11).*



***Figure. 7:****Sendurkhar Tools include micro-blades (1, 2, 7-8), scrapers (3-6, 9,11,24), burin (10) micro-point (14,23), trapeze (15-22), and rectangles (12-13).*

***Table. 6:*** *The Metric Analysis of the tools (Blade-burin assemblage) of Sendurkhar*

| Types of Tools | Average Length (mm) | Average Width (mm) | | Average Thickness (mm) |
|---|---|---|---|---|
| | | Max | Min | |
| Blade Cores (47) | 45.87 | 35.57 | 28.47 | 16.89 |
| Blades (28) | 36.51 | 27.76 | 13.98 | 8.83 |
| Points (27) | 28.87 | 22.07 | 11.52 | 7.86 |
| Scraper (36) | 42.66 | 29.31 | 22.38 | 11.78 |
| Burin/Borer (1) | 27.15 | 26.94 | 8.91 | 8.86 |
| Blade-Burin (31) | 43.46 | 25.29 | 14.68 | 9.76 |
| Flakes (09) | 38.67 | 26.21 | 15.65 | 10.12 |

***Table. 7:*** *Showing the Metric Analysis of the tools (Microliths) of Sendurkhar*

| Types of Tools | Average Length (mm) | Average Width (mm) | | Average Thickness (mm) |
|---|---|---|---|---|
| | | Max | Min | |
| Blade Cores (0) | - | - | - | - |
| Blades (46) | 23.85 | 13.81 | 10.54 | 4.72 |
| Micro-blades (201) | 19.45 | 11.36 | 7.62 | 3.21 |
| Points/Burins/ borers (49) | 20. 54 | 13.11 | 10.85 | 4.21 |
| Scraper (41) | 17.22 | 14.74 | 12.66 | 4.48 |
| Lunates (4) | 25.47 | 12.42 | 6.74 | 4.32 |
| Notched Blades (7) | 21.20 | 15.52 | 9.56 | 3.42 |
| Flakes (21) | 20.43 | 15.01 | 8.63 | 4.22 |

Flakes (n=33), blade cores (n=15), Blades (n=14) including a beautiful blade with tang (Figure. 10), Micro blades (n=38), scraper (n=10), points/burins/ borers (n=19). The average LxBxT of the artefacts are as follows: Cores 29.06mm x 15.55mm x 13.19mm; Blades 22.38mm x 14.34mm x 4.68mm; Micro-blades 16.66mm x 7.75mm x 4.2mm; Point 33.32mm x 18.29mm x 9.15mm and Burin/Borer 13.786mm x 6.89mm x 3.61mm; Flakes 23.52mm x 15.22mm x 8.22mm. The artefacts were produced from silicious material, including chalcedony, chert, quartz and lime.



***Figure. 8:*** *Batki North tools include, blades (1-3); scrapers (4-6,17); points (7-10); fluted cores (11-14) and borers (15,16).*




***Figure. 9:*** *Batki South tools include, micro blades (1-9), points 11-18) scrapper (19-26)*




***Figure. 10:*** *An Upper Palaeolithic blade with Tang, Batki (South)*

## *Donia*

From Donia (Upper Tola), 28 Holocene artefacts (Figure. 11) were recovered (Table. 9) comprising blade cores (n=9), blades (n=0), microblades (n=11), Scrappers (n=5) and points/burin/borer (n=3). The average size of the surface collections is 11 mm to 50 mm. The raw material comprises chalcedony, chert and Jasper. The average LxBxT of the artefacts is calculated as: Blade cores 34.54mm x 19.92mm x 13.33mm; Microblades 18.11mm x 10.38mm x 4.07mm; Points/Burins 45.53mm x 15.67mm x 9.31mm and Scrapers 49.98mm x 26.28mm x 11.05mm.

***Table. 8:*** *Showing the Metric Analysis of the tools of Bataki North & Batki South*

| Types of Tools | Average Length (mm) | Average Width (mm) | | Average Thickness (mm) |
|---|---|---|---|---|
| | | Max | Min | |
| Blade Cores (15) | 29.06 | 16.33 | 14.77 | 13.19 |
| Blades (13) | 22.38 | 16.94 | 11.75 | 4.68 |
| Microblade (29) | 14.83 | 7.47 | 4.88 | 2.10 |
| Points UP (6) | 33.32 | 24.68 | 11.91 | 9.15 |
| Scraper (10) | 31.22 | 18.11 | 13.75 | 5.50 |
| Points/Burin/ Borer (19) | 13.78 | 8.33 | 5.46 | 3.61 |
| Trapezium (15) | 11.49 | 7.98 | 5.01 | 2..22 |
| Flakes (33) | 23.52 | 16.82 | 13.65 | 8.22 |
| **BATKI (South)** | | | | |
| Blade Cores (0) | - | - | - | - |
| Microblade (9) | 18.49 | 11.36 | 7.31 | 3.72 |
| Points (0) | - | - | - | - |
| Scraper (0) | - | - | - | - |
| Blade with Tang (1) | 61.54 | 25.99 | 11.46 | 10.44 |
| Flakes (07) | 34.09 | 27.47 | 22.04 | 14.36 |




***Figure. 11:*** *Donia tools include two fluted cores (1-2), scrapers (3,4, 8-9) and microblades (5 and 15), micro-point (6-7, 10-14)*

***Table. 9:*** *Showing the Metric Analysis of the tools of Donia (Upper Tola)*

| Types of Tools | Average Length (mm) | Average Width (mm) | | Average Thickness (mm) |
|---|---|---|---|---|
| | | Max | Min | |
| Blade Cores (9) | 34.54 | 22.46 | 17.39 | 13.33 |
| Microblade (11) | 18.11 | 11.45 | 9.32 | 4.07 |
| Points/Burin (3) | 45.53 | 17.56 | 13.78 | 9.31 |
| Scraper (5) | 49.98 | 31.88 | 20.68 | 11.05 |
| Flakes (0) | - | - | - | - |

During the comparative analysis of the tools at various sites, it is found that Microblade dominates at Sendurkhar (Figure. 12). The percentage of tool typology (Table. 10) from the sites include Cores 11.59%, Flakes 11.59%, Blades 13.37%, Microblade 27.87%, Scrapers 14.26%, Burins/ Borers 2.11%, Points 10.14%, Trapezium 2.78%, and Triangles 0.78%. The other column in the table represents the N=31 blade burins from Sendurkhar, n=01 Blade with Tang and n=1 Levallois scrapper from Batki (South), respectively. The ideal available raw material to produce the tools in the study area is silicious rocks, including Chalcedony, Chert, Lime, Quartz, Jasper, etc. The average percentage of the tools made from the Chalcedony is the highest, i.e., 57%, Chert 27% and Lime and Quartz 8% each (Figure. 13).

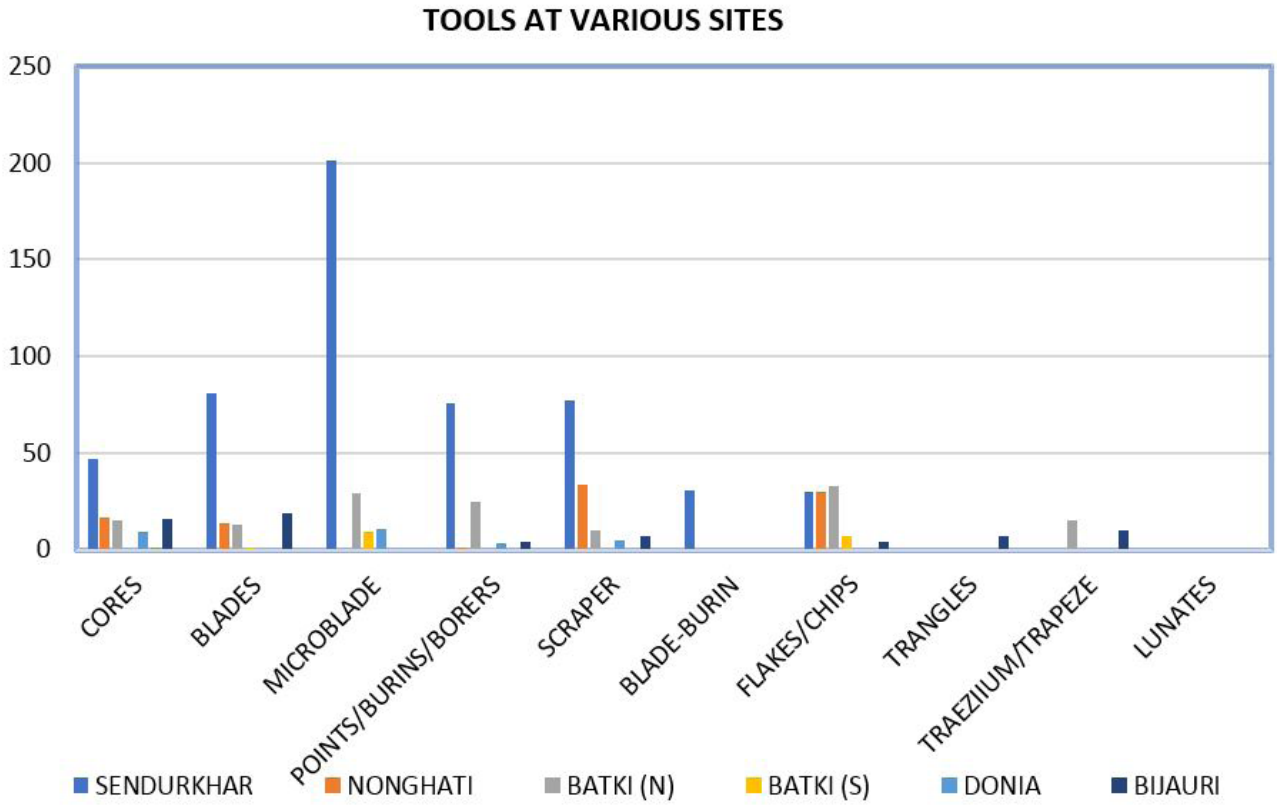



***Figure. 12:*** *Number of Artefacts from various Sites*

***Table. 10:****Typological analysis of the tools obtained from various sites.*

| Typology | Sendurkhar | Nonghati | Batki (N) | Batki (S) | Donia | Bijauri | Total | Percentage ( %) |
|---|---|---|---|---|---|---|---|---|
| Cores | 47 | 17 | 15 | 0 | 9 | 16 | 104 | 11.59% |
| Flake | 30 | 30 | 33 | 7 | 0 | 04 | 104 | 11.59% |
| Blade | 74 | 14 | 13 | 0 | 0 | 19 | 120 | 13.37% |
| Micro-Blade | 201 | 0 | 29 | 9 | 11 | 0 | 250 | 27.87% |
| Scraper | 77 | 34 | 10 | 0 | 0 | 7 | 128 | 14.26% |
| Notch | 7 | 0 | 0 | 0 | 5 | 0 | 12 | 1.33% |
| Awl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00% |
| Burin/Borer | 10 | 0 | 6 | 0 | 1 | 2 | 19 | 2.11% |
| Point | 67 | 1 | 19 | 0 | 2 | 2 | 91 | 10.14% |
| Lunate | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 0.44% |
| Denticulate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00% |
| Spearhead | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0.01% |
| Trapezium | 0 | 0 | 15 | 0 | 0 | 10 | 25 | 2.78% |
| Triangle | 0 | 0 | 0 | 0 | 0 | 7 | 7 | 0.78% |
| Rectangle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00% |
| Blank | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00% |
| Utilized Flake | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00% |
| Others | 31 | 0 | 0 | 1 | 0 | 0 | 32 | 3.56% |
| Total | 548 | 96 | 140 | 17 | 28 | 68 | 897 | 100% |

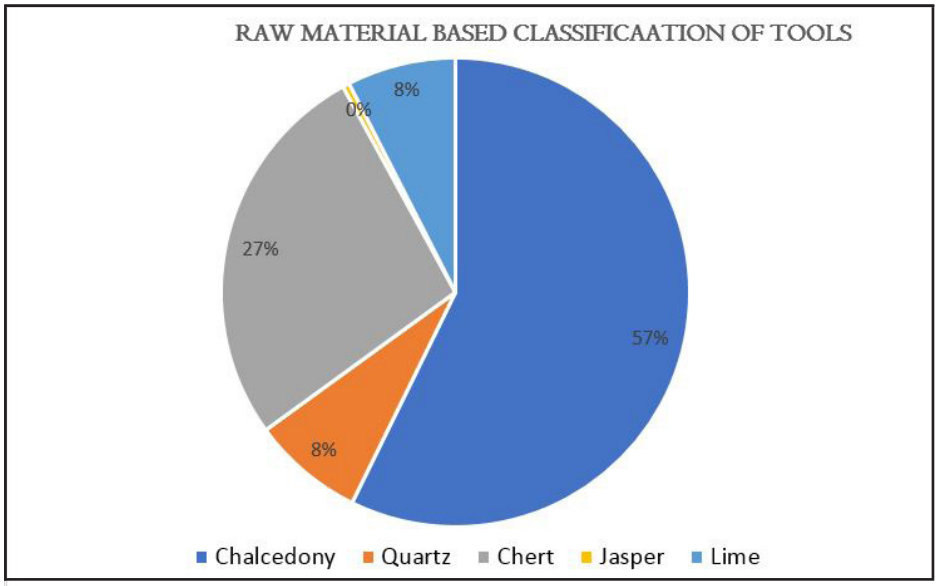



***Figure. 13:*** *Raw Material classification of artefacts*

## Discussion

This study primarily addresses the two prehistoric cultures, Upper Palaeolithic and Mesolithic, typically characterized by the presence of Microlithic. However, chert blades have reportedly been found at various South Indian Neolithic sites with ash mound deposits in Karnataka (Paddayya 2000:189-225). In North-West India and Pakistan, several Harappan sites have been extensively excavated (Law 2011:92, Starnini and Biagi 2011:1-60). No doubt renowned scholars of Prehistory have debated the terminology, technology, chronology,

regional variability, characteristics of the "Upper Palaeolithic" and "Mesolithic" in India as well as issues with evolution and change over time (Sali 1974: 154-158, James and Petraglia 2005:3-27; Murty 1979: 301-320; Paddayya 1970:165-90, 2012: 10-68; Misra 1989:17–64; Mishra 1995:11-16, Sonawane 2002:104-153; Varma 2002:347-355). However, most European terminology is outdated and does not relevant to the late Indian Pleistocene and early Holocene Stone Age societies. Hence, using conventional terminologies in prehistoric archaeology in India must be reevaluated.

In addition to typical Mesolithic artefacts, the study area has yielded artefacts belong to Blade-Burin culture, Levallois tools, long blades, and big scrappers, which are considered as the identity markers of the middle and upper palaeolithic tool typology and clearly indicate towards the continuity of Middle Palaeolithic culture in the Amarkantak plateau region. Additionally, it suggests that the origin of blade culture may have begun as early as the middle palaeolithic period, which coincides with the late Pleistocene and early Holocene epochs. In India, Mesolithic culture has been recognized as one of most well-known and in-depth researched prehistoric culture. In many parts it has been observed that the number of microlithic production sites drastically rose, and new zones and a larger landscape were inhabited. Although in Indian context, the Mesolithic people and their material culture are widely studied, but the Amarkantak plateau is yet to be studied intensively. One of the essential objectives of this study is the extensive archaeological survey and documentation of the study area, as well as the collection and analysis of the artefacts.

The study of the microliths of this region helps us to raise questions vis-a-vis Mesolithic culture and the tool typology in the Amarkantak region, a substantial part of the upper Narmada basin. The significant issue is that the microlithic tool technology, especially blades, originated in the Middle Palaeolithic (Padhan 2021:1-11), notably with the systematic fabrication of microblades, which was only noted in the Upper Palaeolithic. There is controversy on the origins of blade technology in India or whether it was imported from outside India. However, the logic behind the production of microliths is clear; compared to the more significant tools of earlier times, these microlithic implements seemed to be more effective for hunters. The low weight, durability, numerous razor-sharp cutting edges, and pointed tips that were more lethal, penetrative, and inflicted fatal damage to the game made employing microlithic instruments particularly successful. Considering the presence of several tool types at a location may signify a more significant variation in how many plants and animals were utilised during the hunting and gathering process. Small crescents, triangles, trapezes, and tanged points, which arose in the latter period, are examples of object variations due to a shift in subsistence pattern (hunting). The unanswered questions can be answered scientifically once the full-fledged excavations are done in the area under study.

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