Human Skeletal Studies in India: A Review

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Chapter 10
Human Skeletal Studies in India: A Review

Veena Mushrif-Tripathy

> …… *South Asia remains a vortex of indigenous cultural development into which are swept certain elements of the Western intellectual tradition imported over the course of five centuries. Conversely, the west has sought support for many of its ideas from South Asian written accounts, archaeology, skeletal biology and ecological reconstruction of past events taking place in the subcontinent.*
>
> (Kennedy 2005)

India comprises a huge land mass with a total area of 3,287,263 km^2 (1,269,219 square miles). The northern frontiers are defined largely by the Himalayan mountain range, and it is bounded to the south-west by the Arabian Sea, to the south-east by the Bay of Bengal and to the south by the Indian Ocean. The country, which is a part of South Asia, has evidence of human habitation from the Middle Paleolithic (Table 10.1, Fig. 10.1). Tracing the developments of subjects such as anthropology and archaeology is an enormous task, and the present article is based on a number of earlier review chapters (Murthy 1974; Tavares 1993; Kennedy 2003a, b, 2005; Walimbe 2011a, b). Most of the data presented here are taken from these sources.

The arrival of European colonial powers in late eighteenth century and their curiosity to know about the land and its inhabitants provided the impetus for the start of explorations of different aspects of India. The establishment of geological, botanical and trigonometric surveys by Europeans helped to develop interest in the past. These developments led the foundation of the Asiatic Society in Kolkata by William Jones in 1788, which contributed to the foundation of Archaeological Survey of India in 1861. If we examine the various developmental stages of the subject, we notice that India was at the receiving end of theories that were developed mainly in Europe and were verified, testified and implemented on the subcontinent.

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Table 10.1 Time brackets of different cultures with human skeletal findings from India

Culture	Main regions	Time brackets
Middle palaeolithic homo erectus?	Narmada, Madhya Pradesh	0.15 MYA–40,000 YBP
Mesolithic	Gangetic doab	8000 BC
Harappan culture	North-west part of India, Gujarat	3500–1500 BC
Neolithic-Chalcolithic	Maharashtra, Karnataka, Kashmir	2000–700 BC
Later Mesolithic	Gujarat	2000 BC
Megalithic	Vidharbha, Southern states	1000 BC–2nd century AD
Early historic, medieval and pre-modern	At various places	2nd century AD–17th century AD

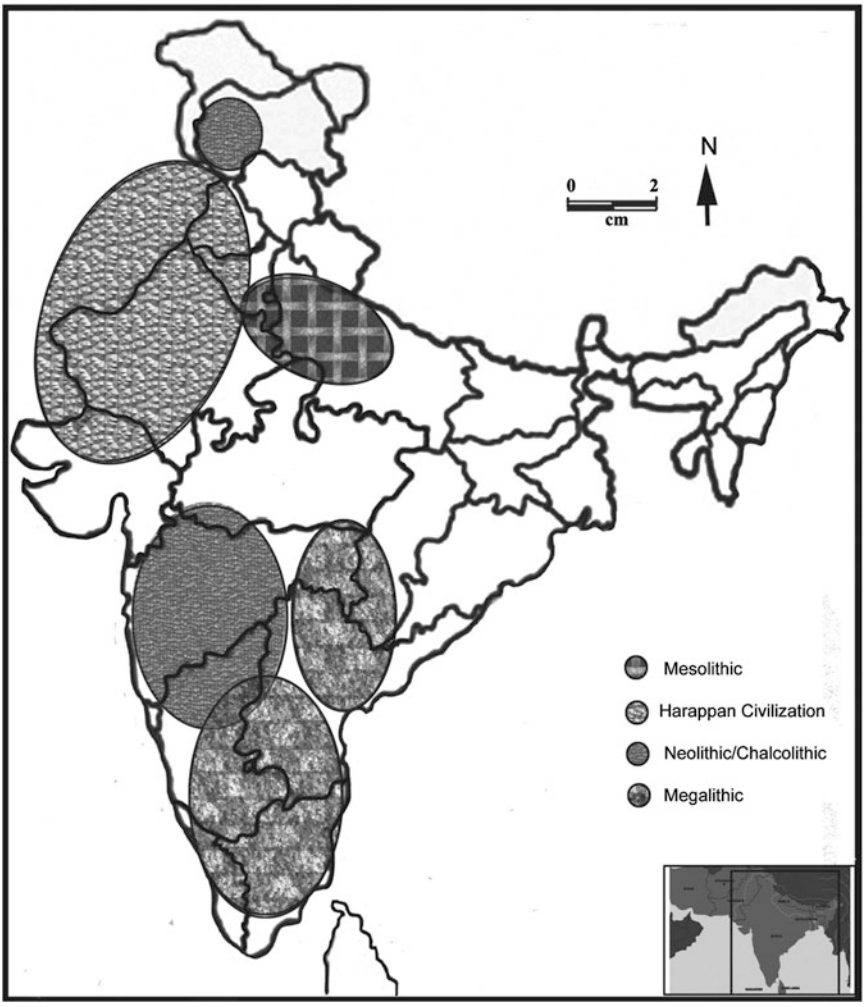

Fig. 10.1 Map of India: geographical distribution of the sites belonging to different cultures

The Era of Discoveries and Racial Classifications

Before the independence of India in 1947 and the creation of the Anthropological Survey of India in 1946, there were many discoveries of human remains from different parts and belonging to various past cultural entities. These discoveries were made and studied by a range of British officials, geologists and enthusiastic amateur explorers/excavators such as Tucker (1846), Taylor (1853), Blanford (1864), Boswell (1872) and Aderson (1883) (references cited in Murthy 1974; Kennedy 2003a). The main focus of these studies was to establish the ethnic identity of the remains, their relationships with contemporary populations and their racial categorization. The cranium was the focal point of discussion and post-cranial bones were collected but only used for age, sex and the stature estimations.

This approach lasted until the late 1970s despite the impact on archaeology of events such as the discovery of the Bronze Age city of Harappa in the 1920s. This was not only a very important discovery in Indian archaeology but also a major event from the perspective of the development of physical anthropology as a discipline in India. Numerous discoveries followed which provided physical anthropologists with many skeletal assemblages for population comparisons. This provided an ideal environment to evaluate theories of migration, diffusions and invasions (Sewell and Guha 1931; Guha and Basu 1938). A 'foreign' population was held responsible or given credit for any new trend or material artefact (mainly during the protohistoric period), rather than ascribing the development to local evolution. At times, foreign invaders were held responsible for the extinction of a culture, and for that reason, it was the necessity to 'classify' the population 'racially' (Walimbe 2011a). British civil servants and Indian anthropologists followed the guidelines of the Biometrika School. Prior to the Second World War, the majority of Indian biological anthropologists who studied abroad received training in Germany. The anthropometric basis for population divisions was not only seen in the colonial mindset, but it was also prominently reflected in the Census of India report in 1931, which was responsible for establishing the model of how the native populations of British India were classified (Guha 1935; Risley 1908). Thus, anthropometry became a very important part of anthropological research in India; cranial shape differences (in the form of dolichocrania or mesocrania) were understood in terms of 'mixing of blood' as well as establishing biological affinities between ancient and living populations on the basis of comparative measurements and morphology.

The Period of Training and Collaborations

This scenario started to change in the 1970s, when processes like adaptation were considered as one of the major factors for population differences. At the same time, concepts such as migration, diffusion and 'mixing of the blood' came under

criticism. The skeletal data were no longer regarded as isolated evidence, but the assemblages were seen in the context of culture. A strong trend persisted though in the use of anthropometric interpretations of population affinities. Many skeletal assemblages were studied during this period at the Anthropological Survey of India and Deccan College Post-Graduate and Research Institute, Pune, two prime places for skeletal studies.

At this stage, it is important to know the role of Indian anthropologists and their foreign collaborators who created a niche for human skeletal studies in Indian archaeology. Under the guidance of Prof. Iravati Karve, an anthropologist at Deccan College, studies of human remains started around 1945. She strove to understand biological variation in extant populations. At the same time, the archaeology department excavated a few sites (e.g. Chandoli, Nevasa, Langhnaj, Mahujhari and Baghor) which yielded skeletal remains. The archaeology department also began a collaboration with Prof. K. A. R. Kennedy of Cornell University in the USA. He studied some skeletal assemblages in collaboration with S. Ehrhardt, a German anthropologist (Ehrhardt and Kennedy 1965). Kennedy encouraged his students to study skeletal findings, while at the same time he also trained his Indian colleagues in different methodologies. Dr. Karve encouraged one of her students, Dr. K. C. Malhotra, to conduct human skeletal studies, and this resulted in a number of publications on the Nevasa human skeletal remains (Kennedy and Malhotra 1966; Malhotra 1965, 1967, 1971).

Beyond Dry Bones: Scenario of 1980s and Forward March

During the early 1980s, skeletal studies gained a new importance within the field of Indian archaeology. Concepts such as adaptation, growth and nutrition and their effects on the skeleton were better understood, and these criteria were used for understanding ancient populations. Models from social anthropology and ethnographic studies on health helped to understand the changes in human body due to different aspects including diet, diseases, infant mortality, life expectancy. This 'biocultural' approach is where skeletal remains are understood as reflecting past societies and not just bundles of bones.

Earlier studies focused only on the human skeletal remains of adults resulting in small samples for understanding the nature of populations. During the 1980s, subadult individuals were incorporated in the analysis. Fragmented bones were also considered for analysis. This resulted in a drastic increase in numbers of individuals available to represent the extant population. The questions of infant mortality rates, age of weaning, the role of infections and malnutrition were prioritized. At the same time, the publication of the edited book '*Palaeopathology at the Origins of Agriculture*' (Cohen and Armelagos 1984) had a major impact on skeletal biologists all over the world.

Deccan College played a prominent role in the development of the subject (Walimbe 2007a). This is only university in India where the post of lecturer was

created in the field of skeletal anthropology at an archaeology department. A laboratory was established for the same purpose from 1980. The research goals of the Anthropological Survey of India shifted from skeletal analysis to projects like 'People of India' which has the biggest human skeletal repository of ancient and modern populations from different regions. As a result of these developments, anthropological research for the last two decades was primarily remained confined to the Deccan College where ancient skeletal assemblages are kept and studied. In India, the subject was developed by Prof. S. R. Walimbe (retired professor, University of Pune). He was associated with Deccan College for a long time and initiated the establishment of the anthropology lab at the College. He has studied more than 40 skeletal assemblages from different sites (Walimbe 1986, 1990, 1994, 1998; Lukacs and Walimbe 1984); (Walimbe and Selvakumar 1998) and (Walimbe and Paddayya 1999). The complete list of work is available at www.adimanav.org. This remains the only working laboratory in India dedicated to work on skeletal anthropology. The present author has worked on many skeletal remains from India and is trying to implement new technologies to improve the subject at the same department (Mushrif and Walimbe 2006; Mushrif et al. 2008; Robbins et al. 2009; Mushrif-Tripathy et al. 2011; Mushrif-Tripathy and Walimbe 2012; Robbins et al. 2006, 2007; Jonnalagadda et al. 2011, etc.). Allahabad University also invited foreign collaborations (Walimbe 2011a) and understood the importance of human skeletal remains.

A few unsuccessful attempts were made for extracting Ancient DNA, as outlined in a chapter published in the American Journal of Physical Anthropology (Kumar et al. 2000). The authors concluded that 'there is insufficient DNA surviving in Indian specimens for analysis from tropical environments', and they also suggested that samples should be collected from sites in non-tropical environments and/or cave sites (Kumar et al. 2000 pp. 132). This situation has changed recently. Collaboration between Deccan College and CCMB (Centre for Cellular and Molecular Biology, Hyderabad) has given a positive result in studies on archaeological DNA. A 'state-of-art' ancient DNA laboratory facility has been created in the premises of CCMB. Studies undertaken in this laboratory on the human remains from Roopkund, a glacial lake in Uttarakand, mark the first ever successful attempts of isolating ancient DNA in this part of the world (Walimbe 2007b).

There are many foreign investigators who directly or indirectly helped the growth of the subject in India. As mentioned earlier, K. A. R. Kennedy was among the first external scholars to engage with the subcontinent, followed by his student J. Lukacs (retired professor from University of Oregon, Oregon). They established new palaeodemographic trends in skeletal and dental research. Dr. Diana Hawkey, another student of Kennedy, worked extensively on the dentition of Indian samples (Hawkey 2002). Lukacs's students B. Hemphill (California State University, Bakersfield) and G. Robbin-Schug (Appalachian University, Appalachian) also worked on Indian material. Robbin-Schug is currently working on a project involving Harappan skeletal remains.

Recent approaches have become more scientific in nature, but at the same time, the disciplines seek many explanations from sociological and cultural angles. This

Fig. 10.2 Some of the pathological changes encountered in remains from India

change in research strategies is reflected in two major ways. One is understanding the role of 'continuous' metric and 'discrete' non-metric (morphological) traits, their relevance in population movements and assessment of micro-evolutionary changes, particularly those seen in at the transition to agriculture; and secondly, in the field of palaeopathology where cultural aspects have become more important and instead of 'what is it?', the quest now is for 'why and how is it there?'.

Palaeopathology has become a centre point as it reflects physiological stress and health during adaptation to different subsistence strategies, economies and environments. Occupational stress markers on skeletal remains indicate the life ways of the population. The presence of maxillary sinusitis, vertebral arthritis, clavicular bone changes, squatting facets on the tibia, dental abrasions and wear patterns are some of the common indicators of habitual activities and disease (Fig. 10.2). India still has some pockets where people are living using primitive technologies. These ethnographic parallels also hint at the health hazards of the bygone population. Unhygienic conditions, repetitive pregnancies and low-nutritious diets in present societies give an indication of past vulnerabilities in terms of malnutrition, high infection rates and increases in child mortality rates.

There are also attempts to incorporate the details from ancient Indian texts to understand bygone societies. These texts contain information about mortuary practices, general life of the people and also pathology. Texts like *Atharvaveda* (around 1200 BC) discuss various health problems and associated remedies, from medico-magical perspectives. *Sushruta samhita* (fifth century AD) deals with surgeries, and *Ayurveda* is very popular even today for its healing capacity.

The 'Aryan Invasion' and Indian Anthropology

While debunking the 'Aryan invasion theory', Walimbe (2011a: 324) discussed how the concept of an Indo-Aryan group of people and their 'invasion' has played a prominent role in explaining the cultural history of the Indian subcontinent. This concept can be traced back as early as the nineteenth century, when Max Mueller (1867), thrilled by the complexity of Indian culture, used the word 'Aryan Race' and thus emerged an imaginary creature 'Aryan Man'. Borrowing from earlier ideas about Aryans in Europe, he propounded the theory that the group invaded the Indian subcontinent around 1500 BCE, later settled in India and that they were the people who destroyed the big cities at Harappa and Mohenjo-daro.

The discovery of Harappa and Mohenjo-daro in 1920s was a very crucial moment from an anthropological point of view. These are huge cities located on the north-west of India that provide early evidence of urbanization. Other than these sites, Chanhu daro, Kalibangan and Lothal show uniformity in their architectural and pottery assemblages and together have been named as Harappan civilization or Indus civilization which flourished from 3000 to 1500 BCE. Around 1500 BCE, there is archaeological evidence indicating the sudden decline of this civilization. This was a big question to address. At Mohenjo-daro, the excavators encountered disarticulated skeletons on roads and in other parts of the city rather than in cemeteries (Fig. 10.3). Many skeletons were either disarticulated or incomplete. Sewell and Guha (1931) attributed plague, famine and 'sudden' events as causes of death. Guha and Basu (1938) suggested that these individuals had been slain by raiders while attempting to escape from the city during a military attack. Several disassociated causes, including the enigmatic absence of a formal mortuary area at the site, were taken as supporting evidence for this 'massacre', and this idea was immediately seized upon as awful proof of the invasion of the subcontinent by the 'Aryans'. Wheeler (1968), while accusing the Aryans of destroying the cities of the Harappan civilization and for the 'massacre' at Mohenjo-daro, cited the Vedic texts describing that the 'Aryan' were brave, efficient and dreadful warriors who knew the bow-and-arrow; that horses were used to pull their chariots; and that they were protected by armour and shields (Walimbe 2011b).

As a result, skeletal analysis of these remains focused on answering questions related to identity including: who were these people and where did they come from? Craniometric data were used to classify and justify the 'foreign element' within the population. The first concise and well-documented report on the skeletal material from Harappa and Mohenjo-daro was by Guha and Sewell in 1931. In 1935, Guha (1935, 1944) recognized four racial groups while describing the Mohenjo-daro population, which he labelled as Mediterranean, Proto-Australoid, Alpine and Mongoloid. This classification became the basis for future studies involving the analysis of skeletal assemblages from different sites. In 1962, Gupta, Dutta and Basu restudied the skeletal findings from Cemetery R-37, Area-G, Area-AB and Cemetery-H at Harappa and classified them into similar categories. According to

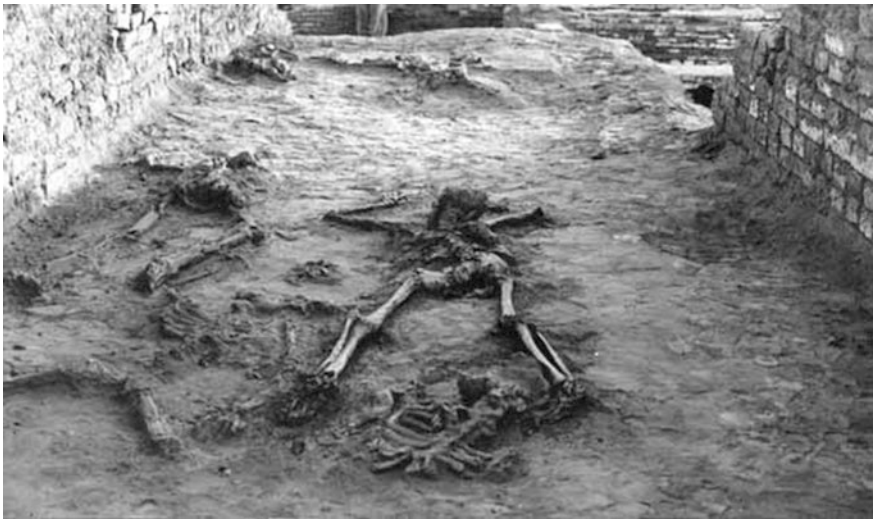

Fig. 10.3 Non-formal disposal of human remains at Mohenjo-daro (from published data)

this latter study, the presence of long-headed (dolichocranial) people was noted in all areas, whereas the round-headed or brachycranial population was only seen in Area-G, concluding that this was a new type.

There have been more recent attempts to understand differences seen in the Harappan population. Many physical anthropologists have studied Harappan crania (e.g. Hemphill et al. 1991, 1997), and Kennedy (1995) came to the conclusion that there is not much evidence to prove the presence of a foreign element in Harappa. Kennedy (1995: 54) mentioned that 'our multivariate approach does not define the biological identity of an ancient Aryan population, but it does indicate that the Indus Valley and Gandhara peoples shared a number of craniometric, odontometric and discrete traits that point to a high degree of biological affinity', thus completely denying the theory of 'Aryan invasion'. With new advances in studies and re-evaluation, no significant phenotypic differences in the population have been found, and even though the Harappan skeletal assemblages come from different deposits, they appear to belong to one homogeneous group. As these assemblages come from Harappan cities, the variation in size and shape can be explained with migrations and immigrations of different population from surrounding areas. As these cities had huge trade networks with other parts of the region, it is possible that many merchants or traders may have travelled to these locations.

The so-called invasion is also called into question from a palaeopathological point of view. A number of studies considered evidence of trauma in the disarticulated skeletal remains from Mohenjo-daro. Dales (1964, 1965) noted that the skeletal collection he studied and that examined by Marshall and Mackay in the 1930s (see above) did not represent a single archaeological time frame. The temporal and cultural contexts of these remains are uncertain, and it may not be

sound to consider them evidence relating to a single tragic episode. Dales (1964) also pointed out that on purely chronological grounds, no definite correlation between the end of Indus civilization and the 'Aryan invasion' can be established. The Harappan skeletal collection was restudied by Kennedy (1984, 1994) in the light of the new methodological approaches in the field of forensic anthropology and palaeopathology. He offered a very critical judgement of earlier narratives. He stated that 'when present, marks of injury are quite specific in their appearance, both microscopic and macroscopic analyses revealing tell-tale features which are not to be confused with abrasions or other marks of erosional and post-mortem origin….To be sure, individuals victimized by trauma may not bear the marks of their assailant or his weapons on their skeletal tissue (as with cases of drowning, strangulation, poisoning, cardiac arrest due to fright, etc.); but in cases of genocide (like military engagements, mass executions, ritual sacrifices) where multiple victims are involved it is usual for some individuals of a group to reveal marks of traumatic stress on their bones and teeth' (Kennedy 1984: 427). Death by an axe or sword may not be registered on the bone if the wound is superficial and if only soft tissues are injured. But it is reasonable to expect actual wound marks in case of unceremonious slaughter, which are not present in Mohenjo-daro specimens.

The proposition of a traumatic end of Harappan culture (Mohenjo-daro in particular) is based essentially on archaeological evidence of the disorderly disposal of the dead rather than on skeletal evidence of trauma. In this case, the problem of interpreting the disarray of skeletons becomes more complicated. This haphazard mode of disposal of the dead might have had some social implications rather than being solely related to violent events. Anthropology or archaeology has no conclusive answer to this puzzle at present. It may be mentioned that some scholars believe that the Mohenjo-daro individuals exhibit a unique pattern of regional phenotypic variability with striking differences that set them apart from skeletal series at other Harappan sites. It has been claimed that the skeletons in question may belong to a post-Harappan period and share no direct biological affinity with the population of the mature Harappan phase (Gadgil and Thapar 1990; cited in Walimbe 2011b).

To strengthen the 'no Aryan Invasion' hypothesis, data from human population genetics generated in recent years show that there is no material evidence for any large-scale migrations into India over the period of 4500–800 BCE. On the basis of the presence of sublineages of U2 frequencies (U2e and U2i), Basu et al. (2003) argue that Aryan speakers possibly came into India in small bands over a long period of time, as opposed to in a single wave of migration.

Peopling of the Indian Subcontinent

India is very interesting country when it comes to diversity, where huge biological and cultural variability can be seen in living populations. As pointed out by the 'People of India' project of the Anthropological Survey of India, there are 4,694

living communities in India (Singh 1998). According to linguistic studies, there are around 325 languages divided into four 'language families', namely Austic (Austro–Asiatic), Dravidian, Indo-European and Sino-Tibetan (Pattanayak 1998). Several attempts have been made to describe and explain these variations. Some claim indigenous origins for these diverse groups while a few other scholars attribute a considerable fraction of this variability to the large-scale migration of people at different time brackets (Walimbe 2007c; Walimbe and Mushrif 2007).

According to Gadgil et al. (1998), the Indian subcontinent has been populated by successive waves of peoples with knowledge of new technologies. The likely migrations according to this theory include:

1. Austric language speakers came soon after 65,000 ybp from north-east
2. Dravidian language speakers around 6,000 ybp from the Middle East bringing knowledge of cultivation of crops like wheat along with the domestication of cattle, sheep or goats
3. Indo-Europeans in several waves after 4,000 ybp introducing horses and iron technology
4. And the forth one, Sino-Tibetan speakers in several waves after 6,000 ybp bringing with them knowledge of rice cultivation.

Other than the first migration, the rest of these migrations occur in the proto-historic period from where the maximum numbers of skeletal remains are available in India. To understand present population affinities, it is essential to understand the peopling of India from ancient times. In this regard, skeletal assemblages are important. As discussed earlier, the skeletal evidence has been used in attempts to solve the 'Aryan invasion' question. But at the same time, there are certain limitations to the use of anthropological and archaeological data to understand population migration and dispersals. In addition, linguistic and other biological tools such as MtDNA and Y chromosome DNA are required to explain plausible scenarios in the process of the peopling of the subcontinent (Walimbe 2011a).

As noted above, 'ethnic' or 'racial' identity was drawn from three cranial indices, namely the cranial, facial and nasal index, which were inadequate to document the affinities in populations. In recent years, emphasis has been placed on traits where there is strong genetic component, with little to no sexual dimorphism, having low susceptibility to environmental changes and lacking age-related morphological changes. The best example of this change in research strategy is seen in Hawkey's study (2002), where examined the population affinities of protohistoric populations in the Indian subcontinent. She analysed 29 dental morphological features which characterize possible genetic affinity, using a large sample size of 4,198 individuals. Walimbe and Mushrif (2007) and Walimbe (2011) summarized the major conclusions of her research as follows.

1. The Indus and Deccan farming/herding communities share similarities with Indian Mesolithic hunter-gatherings reflecting a common origin for the protohistoric communities.

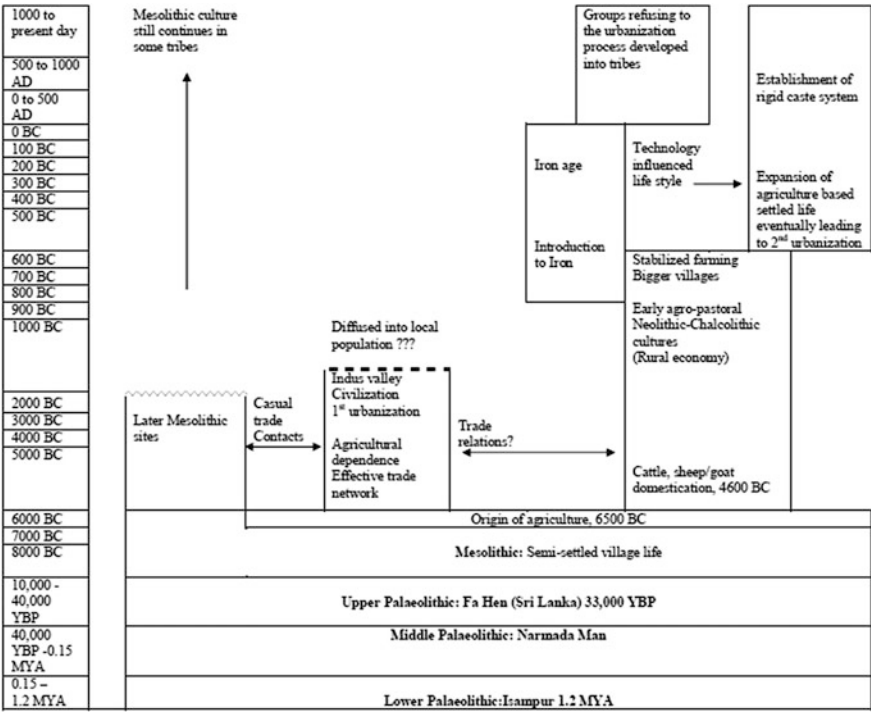

Fig. 10.4 Cultural relationships defined by using physical anthropological data (from Walimbe 2011)

2. There is no substantial gene flow between the Indus and the Deccan farming/hearding communities, indicating the Deccan Neolithic-Chalcolithic groups have evolved directly from the hunting-gathering Mesolithic communities and not from Indus population.
3. Data suggest the origins of the Iron Age populations within central and southern peninsular India and not from north-western regions.
4. The Iron Age and the early historic populations of the Deccan are dissimilar to the contemporary populations from both the north-west and the Indo-Gangetic regions. They, however, maintain affinity with the farming/herding groups of the Deccan. The lack of a closer relationship between the Iron Age/Early Historic populations of the north and Deccan suggests that gene flow between the two regions was disrupted in some manner, possibly due to the adaptation of the vedic caste system and marriage prohibitions after the urbanization process which may have helped produce distinctive regional dental patterns

Reliable and non-adaptive bodily features need to be used in taxonomic studies on skeletal or living populations. Also, the archaeological evidence needs to be re-evaluated independently without linguistic biases. Molecular knowledge can be applied to improve understandings of population movement in the past. The

approach thus demands proper synthesis of genetic, archaeological and anthropological data (Walimbe and Mushrif 2007). Walimbe (2011a, 330) has provided a graphic illustration of cultural continuity on the basis of physical anthropological data from the Indian subcontinent (Fig. 10.4).

I will finish with comments about new trends in Indian palaeoanthropology. Pathological changes not previously documented are being identified in the remains, and new aspects are been added to their interpretation. Ancient Indian literature is also taken into consideration to further our understanding of earlier populations.

New techniques such as isotope analysis, ancient DNA, identification of occupational stress markers on teeth and bones are being used. There are recent studies where strontium and lead are being used to characterize ancient migration, especially among non-adults. The characterization of palaeodiets through chemical analysis and the recording of dental morphological traits are also included in these analyses. At the same time, more and more skeletal assemblages are being analysed from these scientific perspectives.

The present generation of Indian physical anthropologists seeks collaborations with social anthropologists, archaeologists, geneticists, linguists and medical professionals in order to further the development of the subject.

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