

Emergence of sociocultural norms restricting intermarriage in large social strata (endogamy) coincides with foreign invasions of India

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In an excellent article in PNAS by Basu et al. (1), the authors have undertaken an impressive genomic reconstruction of the history of extant populations of India. However, some limitations still remain in the sampling: the lack of genetic analysis of the patrilineal/matrilineal exogamous *gotras*, and the use of certain parametric values in the analysis of data presented.

Basu et al. (1) suggest that the historical period of formulation and adoption of sociocultural norms restricting intermarriage in large social strata (endogamy) coincides with the ancient regime of the Guptas. Upon using alternative, historically more appropriate, generation time parameters, another explanation that is more plausible emerges which cannot be ruled out, that endogamy originated around the time of foreign invasions of India.

The arbitrary generation time parameter of 22.5 y used in the study is unsupported by evidence and is historically unsubstantiated. The near universality of marriage at a very early age in the study populations' history posits that generation times were more likely in the range of 13–18 y, until a generation or two ago (2) (scienceblogs.com/gregladen/2011/03/01/how-long-is-a-generation/, accessed February 16, 2016). If a generation time parameter of 22.5 y is used and one selected value of 70 generations before present alone is used, the time period in history does indeed appear to fall during the Gupta period. The Guptas reign was restricted to the northern plains, whereas different kingdoms unrelated to the Guptas ruled the vast regions of the south and southwest. Thus, the Guptas

could not have enforced endogamy in the south. The authors themselves admit that the abrupt start of endogamy in the east of India appears to have started during the reign of the Buddhist Pala dynasty, after the Gupta period. Thus, the onset of endogamy in the east of India as well cannot be explained as a consequence of an edict from the Hindu Gupta dynasty enforcing Vedic Brahmanism of Hinduism.

Upon using alternative, historically more appropriate, generation time parameters (Table 1), another explanation that is more plausible emerges, that is, endogamy originated around the time of foreign invasions of India (Fig. 1). The population of India was estimated to be about 100–140 million 2,300 y ago and remained at about 100 million as late as 400 y ago. During this entire period of 1,900 y, India remained the largest economy in the world, followed by China. There are no recorded calamities in the history of India that could have kept the population stagnant and prevented it from growing despite a continuously booming economy (2, 3). Such invasions involved complete destruction of populations and their centers of learning, scholarly work, and culture (universities, schools, and temples), such as the ancient Nalanda University and Somnath temple, to give a couple of examples. A hugely disrupted Indian society might have thus been a very fertile receptive ground for the induction of a new social order. The newly established social order could have been influenced by the invading foreign cultures, because there are known genetic markers for such endogamous grouping within Islamic societies (4, 5).

- 1 Basu A, Sarkar-Roy N, Majumder PP (2016) Genomic reconstruction of the history of extant populations of India reveals five distinct ancestral components and a complex structure. *Proc Natl Acad Sci USA* 113(6):1594–1599.
- 2 Romaniuk A (2013) Glimpses of Indian historical demography. *Can Stud Popul* 40(3–4):248–251.
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- 5 Ambedkar BR (1941) *Thoughts on Pakistan* (Thacker and Company Limited, Bombay), pp 221–224.

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Table 1. Estimates of time (in generations before present and in years) of contribution of each of the ancestral components to the populations considered

Population	Ancestral North Indian	Ancestral Austro-Asiatic	Ancestral South Indian	Ancestral Tibeto-Burman
Gujarati Brahmin	NA	69.3833	69.3265	*
13		902	901	
15		1,041	1,040	
18		1,249	1,248	
West Bengal Brahmin	NA	69.5409	68.3778	63.3518
13		904	889	824
15		1,043	1,026	950
18		1,252	1,231	1,140
Maratha	NA	48.7989	48.92	*
13		634	636	
15		732	734	
18		878	881	
Iyer	NA	69.1751	71.699	*
13		899	932	
15		1,038	1,075	
18		1,245	1,291	
Pallan	NA	74.3893	76.1979	*
13		967	991	
15		1,116	1,143	
18		1,339	1,372	
Kadar	47.5509	60.7911	NA	*
13	618	790		
15	713	912		
18	856	1,094		
Irula	39.4951	49.8475	NA	*
13	513	648		
15	592	748		
18	711	897		
Gond	77.6637	91.9575	70.509	58.1287
13	1,010	1,195	917	756
15	1,165	1,379	1,058	872
18	1,398	1,655	1,269	1,046
Ho	54.0405	NA	67.8753	52.9333
13	703		882	688
15	811		1,018	794
18	973		1,222	953
Santal	54.8661	NA	71.5929	61.5647
13	713		931	800
15	823		1,074	923
18	988		1,289	1,108
Korwa	46.5407	NA	55.7532	46.6478
13	605		725	606
15	698		836	700
18	838		1,004	840
Manipuri Brahmin	69.7002	67.6769	70.4008	NA
13	906	880	915	
15	1,046	1,015	1,056	
18	1,255	1,218	1,267	
Tharu	62.7826	65.2317	72.9749	NA
13	816	848	949	
15	942	978	1,095	
18	1,130	1,174	1,314	
Tripuri	65.1124	69.6447	70.5565	NA
13	846	905	917	
15	977	1,045	1,058	
18	1,172	1,254	1,270	

The numbers 13, 15, and 18 are historically more appropriate generation times; the units of corresponding values in cells below generations before present are years. NA, not applicable.

*The contribution of the ancestral component is too low for reliable estimation of time depth.

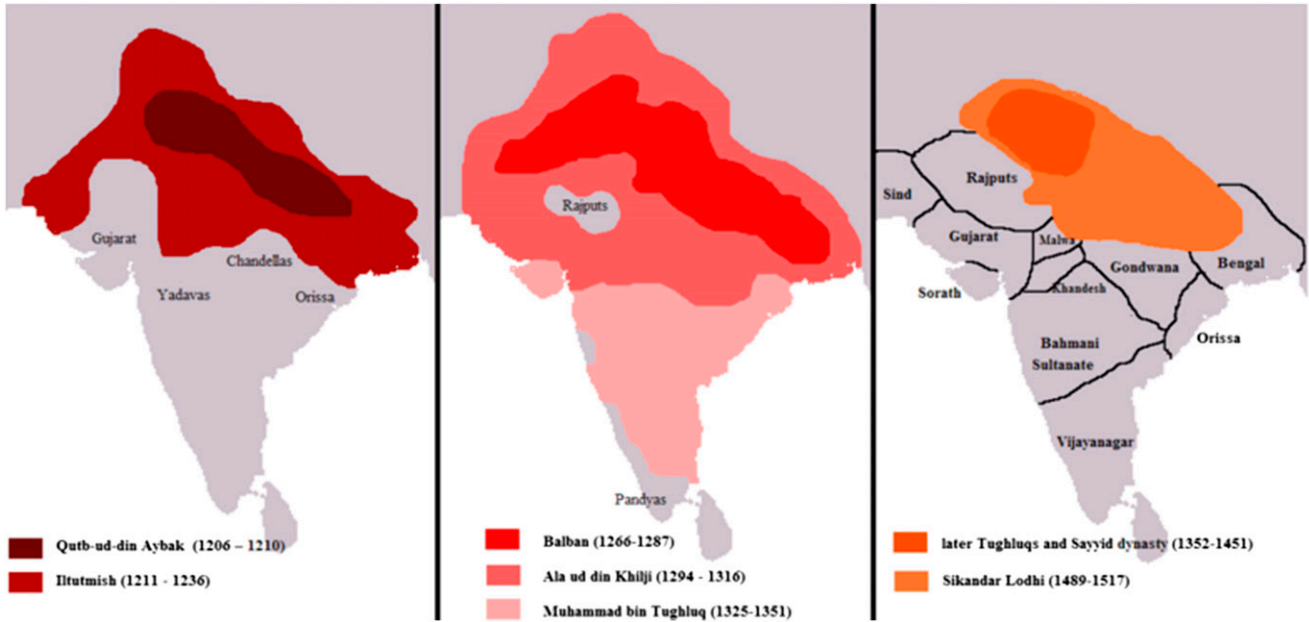


Fig. 1. Map of Islamic dynasties of India with their extent over relevant time periods. Image courtesy of Javier Fernandez-Vina (Florida International University, Miami, FL).