

Original Research

Brahui and Oraon: Tracing the Northern Dravidian genetic link back to Balochistan

Prajjval Pratap Singh ^{1,2}, Ajai Kumar Pathak ^{2,3}, Sachin Kr. Tiwary ⁴, Shailesh Desai ¹, Rahul Kumar Mishra ¹, Rakesh Tamang ⁵, Vasant Shinde ⁶, Richard Villems ², Toomas Kivisild ^{2,3}, Mait Metspalu ², George van Driem ⁷, Gazi Nurun Nahar Sultana ^{8,*}, Gyaneshwer Chaubey ^{1,*}

1. Cytogenetics Laboratory, Department of Zoology, Banaras Hindu University, India; Emails: prajjval4777@gmail.com (P.P.S.); shaileshdesai76@gmail.com (S.D.); rahulmishra72@gmail.com (R.K.M.)
2. Institute of Genomics, University of Tartu, Estonia; Emails: pathak@ut.ee (A.K.P.); rvillems@ebc.ee (R.V.); toomas.kivisild@kuleuven.be (T.K.); maitb@ut.ee (M.M.)
3. Department of Human Genetics, KU Leuven, Belgium
4. Department of AIHC & Archaeology, Banaras Hindu University, India; Email: sachintiwary@bhu.ac.in
5. Department of Zoology, University of Calcutta, India; Email: rakesh.tamang7@gmail.com
6. CSIR- Centre for Cellular and Molecular Biology, Hyderabad, India; Email: vasant.shinde@dcpune.ac.in
7. Institut für Sprachwissenschaft, Universität Bern, Länggassstrasse 49, 3012, Bern, Switzerland; Email: george.vandriem@unibe.ch
8. Centre for Advanced Research in Sciences (CARS), Genetic Engineering and Biotechnology Research Laboratory, University of Dhaka, Dhaka, Bangladesh

* **Correspondence:** Gazi Nurun Nahar Sultana; Email: gyaneshwer.chaubey@bhu.ac.in; Gyaneshwer Chaubey; Email: nngazi@gmail.com

Supplementary Materials

Livelihood of Oraon: During the extensive field surveys in the Kaimur and Choṭā Nāgpur regions of Central and Eastern India, we had the privilege of encountering numerous archaeological findings that shed light on the rich cultural legacy of the Oraon tribe. This tribe, which has a deep and ancient history, has left behind tangible evidence of their culture and traditions in three significant ways:

1. Votive Animal Figurines: One of the most fascinating archaeological remnants that we came across during our research was the presence of terracotta animal figurines (**Figure S9**). These figurines are not only abundant but also widely distributed in the vicinity of Oraon settlements [1]. They are created using a variety of techniques, including both baked and sun-dried methods. The purpose behind crafting these figurines is multifaceted. They are often crafted as offerings to sacred trees, particularly the revered Kadam (Bur flower) tree [2]. These offerings are made on various occasions and for diverse purposes. For instance, Oraon individuals create these figurines to seek protection for the safe birth of a child, safe maternity, the well-being of their domesticated animals, the success of their agricultural endeavours, and, on occasion, to symbolise animal sacrifice rituals.

2. Rock Paintings: In the regions historically inhabited by the Oraon tribe, notably in the Kaimur region of Bihar and the Chhota Nagpur region of Northern Jharkhand, there are striking examples of rock paintings. These paintings serve as a valuable repository of the community's cultural, political, and economic insights. The Oraon tribe, in particular, has a significant connection to these rock art depictions (**Figure S9**). These

paintings narrate the story of their migration, which was necessitated by ongoing conflicts with neighbouring tribes, notably the Kharwar. These artworks offer a visual representation of their history, and they often depict episodes related to their migration and struggles [3]. The descendants of the Oraon people continue to regard these rock art sites as an integral part of their heritage.

3. Folklore: The oral tradition of the Oraon community is a treasure trove of their social, economic, and political history. The antiquity of these folklore traditions is difficult to ascertain precisely, as they have been passed down through generations orally [1]. According to their lore, the Oraon community was forced to migrate to the Chhota Nagpur region (Jharkhand State) due to persistent conflicts with the Kharwar tribe. These narratives contain accounts of the events that transpired during their migration, and intriguingly, many of these narratives find resonance in the form of rock art. Several rock art sites, especially those associated with significant historical events and conflicts, corroborate these oral traditions.

The tangible evidence of the Oraon tribe's cultural legacy is manifested through votive animal figurines, rock paintings, and their rich folklore. These artefacts provide invaluable insights into their history, traditions, and way of life. As researchers, it is our privilege to delve into these artefacts, decipher their meanings, and contribute to the preservation and appreciation of the cultural heritage of the Oraon community. It is crucial to emphasise the unique and distinctive nature of the Oraon tribe's cultural practices in the region. While the offerings of votive animal figurines are a notable aspect of their heritage, it's equally significant to highlight that these customs are not replicated among neighbouring communities such as the Kharwar, Santhal, Mushahar, and Gond tribes. Similarly, the Oraon community's connection to rock art is a distinctive feature that sets them apart from other neighbouring tribes and communities in the region.

This distinctiveness underscores the importance of preserving and studying the cultural practices and traditions of the Oraon tribe as a unique and valuable contribution to the cultural mosaic of Central and Eastern India. It also emphasises the need for researchers and scholars to recognise and respect the individuality of each community's heritage, enriching our understanding of the diverse and intricate tapestry of indigenous cultures in the region.

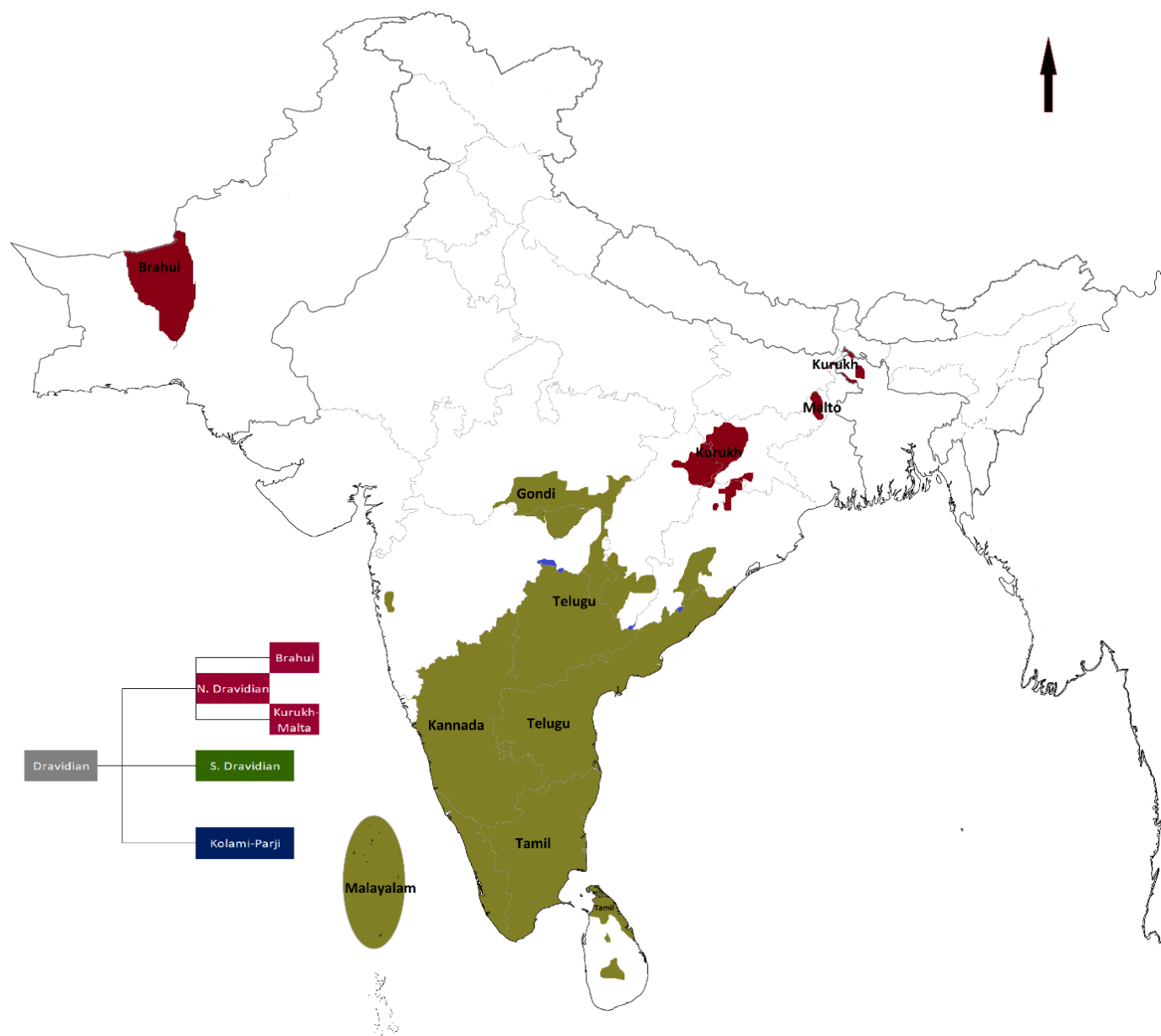


Figure S1 The Dravidian speakers live in South Asia.

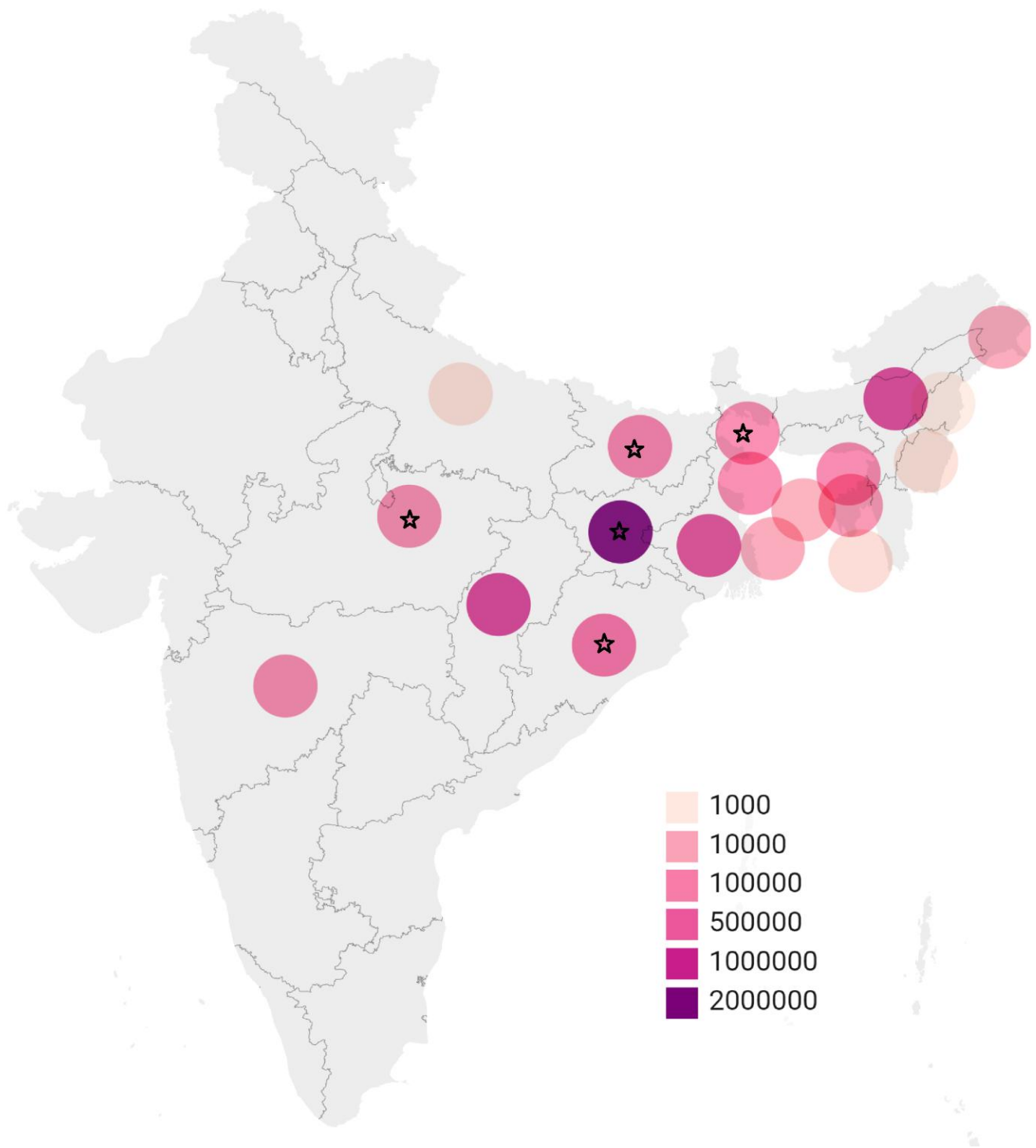


Figure S2 Map showing the distribution of Oraon in South Asia modified from Joshua project. Star shape representing the sampling location of the Oraon.



Figure S3 Livelihood and cultural practices of the Oraon. (A) Offering votive animal figurines below the tree. (B) The man of Oraon tribe showing the rock art site located on the border of Bihar and Jharkhand states. (C) According to them this is the narrative of their migration from the Rohtas region of Bihar state to Chhota Nagpur region of Jharkhand state. A group of family with an old man at the extreme back and the bearer load on the shoulder and head, they are moving along with their animals. (D) The way they trapped the small game for their livelihood. (E) Mud Housing pattern of the Oraon tribe. (F) Protection wall made of forest wood and bushes, for the protection of domesticated animals from the wild animals. (G) Handmade umbrella of wild leaves and grass usually used during rain. (H) The silos for storing grains made of mud mix with dry grass. (I) The way they do their agriculture, bullock cart without wheel.

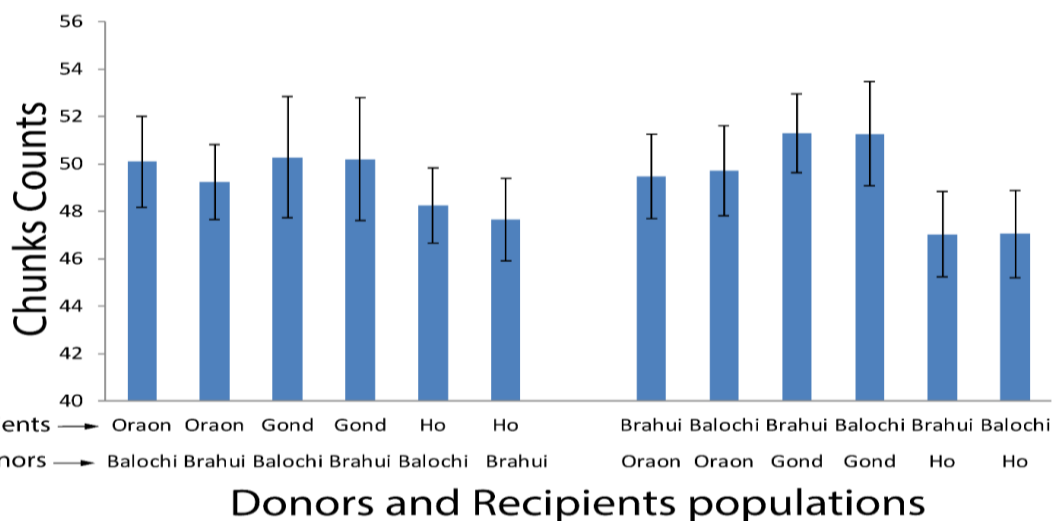


Figure S8 Donor Chunks count plot showing Oraon, Gond, Ho as a donor as well as a recipient with respect to the Brahui and their closest neighbours.

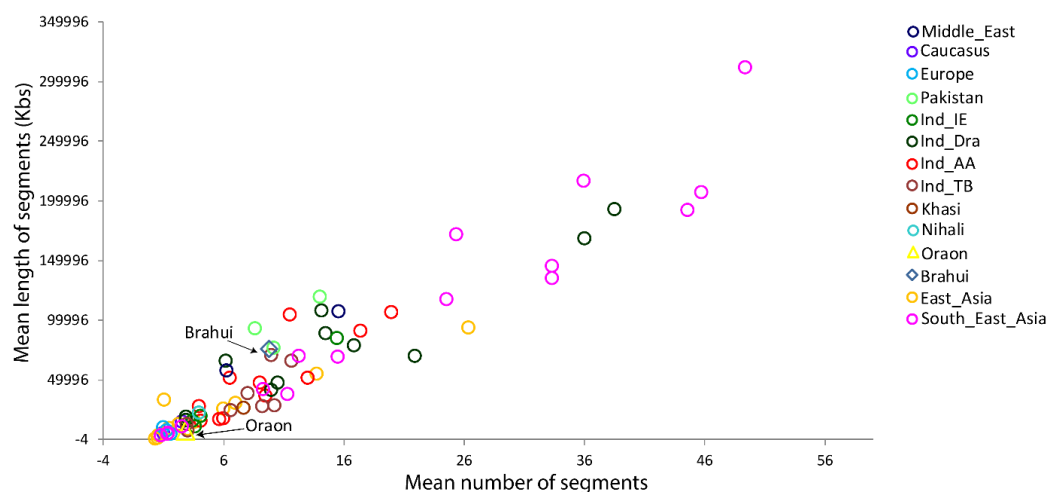


Figure S9 Scatterplot showing Runs of homozygosity (RoH) of the Eurasian populations.

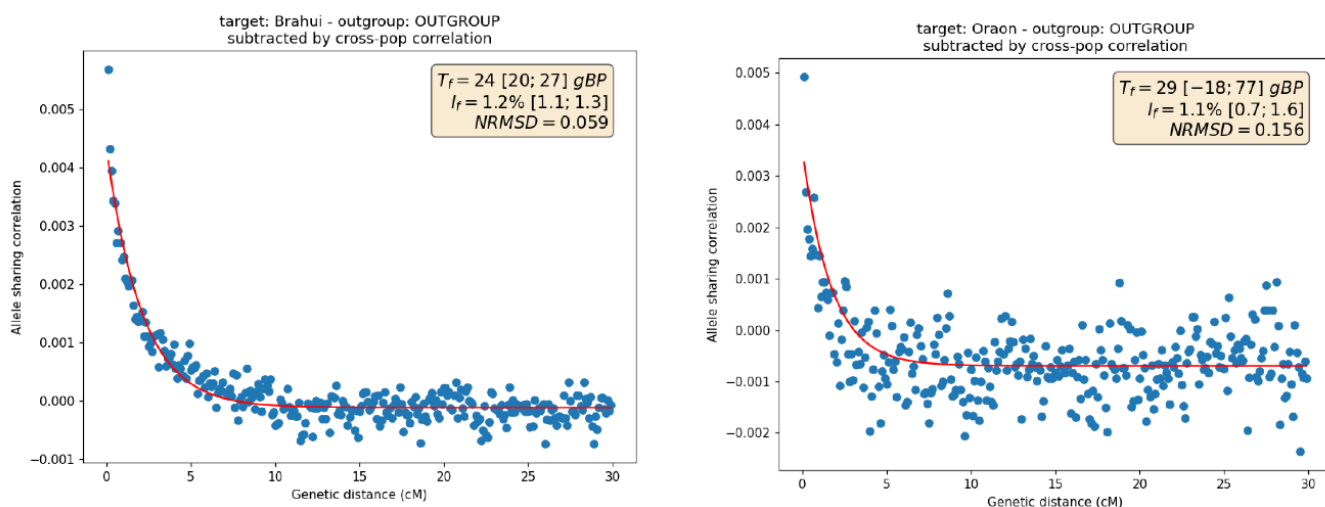


Figure S10 Decay curves for Brahui and Oraon population. The legend shows the mean and 95% confidence interval for the founder age (T_f) in generations before present (gBP) and the founder intensity (I_f), and the NRMSD.

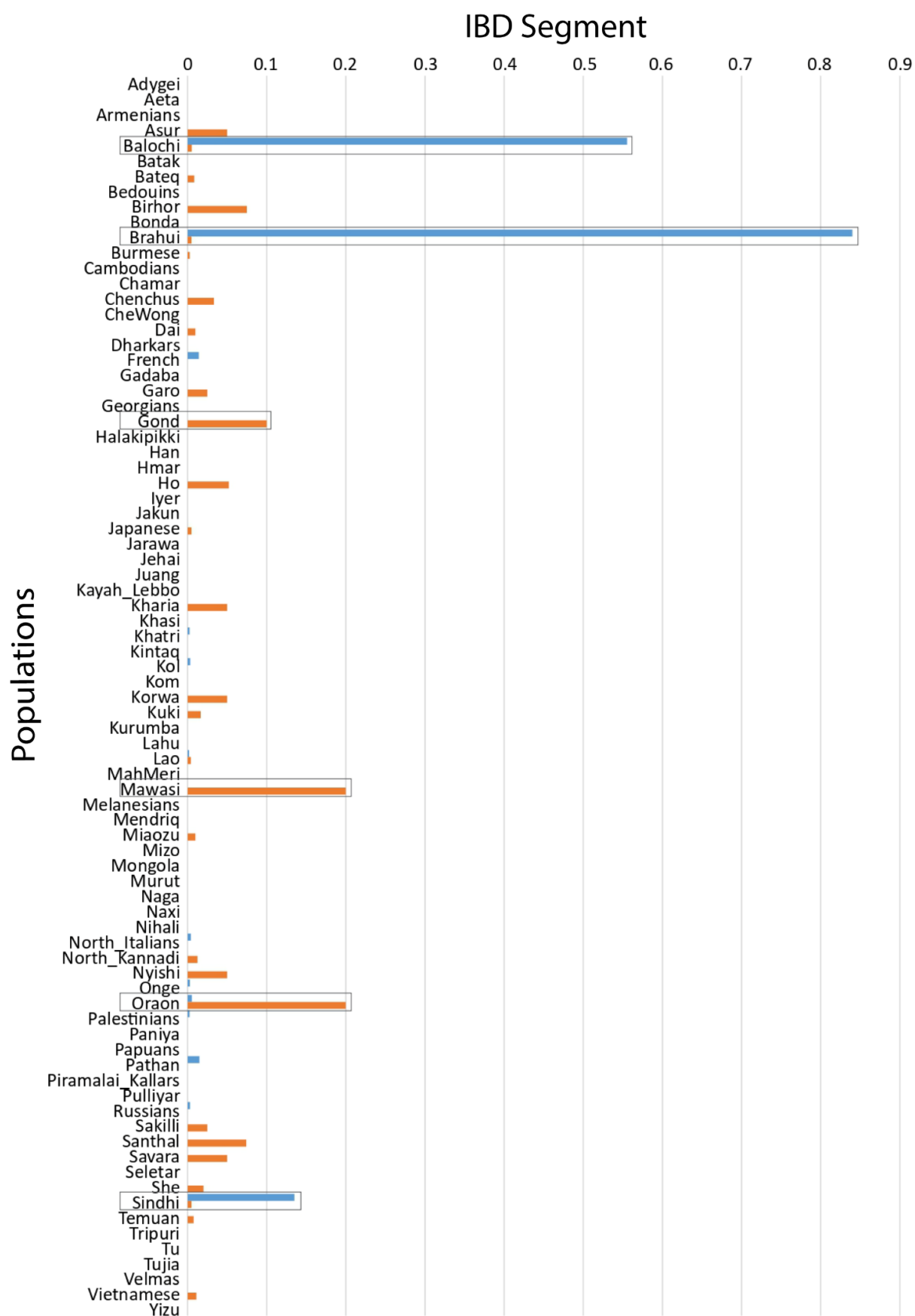
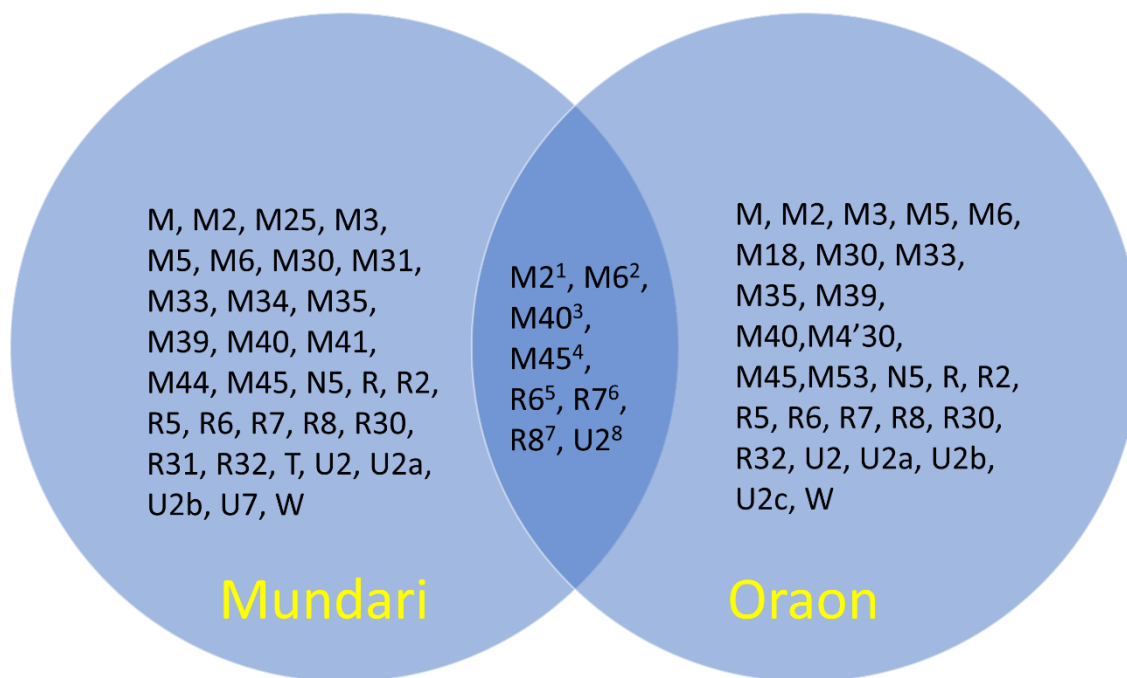


Figure S11 Average probabilities for individuals from Brahui (blue) and Oraon (orange) populations to share at least one IBD segment >5cM with individuals from 81 selected populations included in this study. Five populations with higher than 10% sharing probabilities are outlined.



¹169+C-189-223-256-274-311-319-320
²188-223-231-269-362
³179-223-289-294-319-356-463
⁴189-223-300
⁵93-129-266-318-320-362
⁶260-261-319-362
⁷r-CRS
⁸51-189-325

Figure S12 Venn diagram represents the mitochondrial DNA haplogroup sharing of Oraon and Munda populations.

Table S1 mtDNA HVS-I, related coding marker, sample ids, haplogroup affiliation, and geographical location details.

State	S. No.	HVS-I (-16000)	Coding Region	Haplogroup
BIHAR	A276	93-129-266-318-320-362	12705-12285	R6
BIHAR	A277	93-129-223	489-1888-10400	M5
BIHAR	A283	168-206C-223	1811-12308	U2a
BIHAR	A284	223-231-356-362	489-10400	M6
BIHAR	A285	51-154-206C-230-311	1811-12308	U2a
BIHAR	A288	223-256-311-362	489-10400-12007	M4
BIHAR	A289	174-223-311-362	489-10400-12007	M4
BIHAR	A290	223	195A-489-10400	M30
BIHAR	A291	223-274-319-362	447G-489-10400	M2
BIHAR	A292	129-189-284-304	10754-12705	R5
BIHAR	A304	223-231-356-362	489-10400	M6
BIHAR	A305	223	195A-489-10400	M30
BIHAR	A306	183C-223-232-270-519	195A-489-10400	M30
BIHAR	A307	111-182C-183C-189-223-261-311	8701-9545	N5
JHARKHAND	A401	129-223-291-519	489-1888-10400	M5
JHARKHAND	A402	179-223-289-294-319-356-463	489-8925-10400	M40
JHARKHAND	A403	75-260-261-319-362	12705-13105	R7
JHARKHAND	A404	178-223-288-519	489-2361-10400	M33
JHARKHAND	A405	169+C-189-223-256-274-311-319-320	447G-489-10400	M2

JHARKHAND	A406	223-227-231-356-362-519	489-10400	M6
JHARKHAND	A407	223	195A-489-10400	M30
JHARKHAND	A408	144A-223-265-362-519	489-1888-10400	M5
JHARKHAND	A409	104-183C-189-223-234-244	489-10400	M
JHARKHAND	A410	169+C-189-223-256-274-311-319-320	447G-489-10400	M2
JHARKHAND	A412	179-223-289-294-319-356-463	489-8925-10400	M40
JHARKHAND	A413	223-318T-325-519	489-10400-12007-12498	M18
JHARKHAND	A414	92-145-185-239-325-519	3816-12705	R32
JHARKHAND	A416	223-227-231-356-362-519	489-10400	M6
JHARKHAND	A418	129-182C-183C-189-223-274-319	447G-489-10400	M2
JHARKHAND	A419	92-145-185-239-325-519	3816-12705	R32
JHARKHAND	A420	223-292-297-519	189-195-204-207-709-8701-15884	W
JHARKHAND	A421	189-223-300-519	489-4734-10400	M45
JHARKHAND	A422	390-519	195-9449-12705	R8
JHARKHAND	A423	188-223-231-269-362-519	489-10400	M6
JHARKHAND	A424	188-223-231-269-362-519	489-10400	M6
JHARKHAND	A425	189-223-300-519	489-4734-10400	M45
JHARKHAND	A426	223-329-340-350-519	489-10400	M
JHARKHAND	A427	223-231-356-362-519	489-10400	M6
JHARKHAND	A428	179-223-289-294-319-356-463	489-8925-10400	M40
JHARKHAND	A429	129-223-235-291-519	489-1888-10400	M5
JHARKHAND	A431	93-129-266-318-320-362	12705-12285	R6
JHARKHAND	A432	129-223-235-291-519	489-1888-10400	M5
JHARKHAND	A433	179-223-289-294-319-356-463	489-8925-10400	M40
JHARKHAND	A434	223-272-325	489-8679-10400	M39
JHARKHAND	A435	185-519	12705	R
JHARKHAND	A436	93-179-223-294-319-356-463	489-8925-10400	M40
JHARKHAND	A437	145-185-239-325-519	3816-12705	R32
JHARKHAND	A438	93-129-266-318-320-362	12705-12285	R6
JHARKHAND	A439	129-223-519	489-1888-10400	M5
JHARKHAND	A440	129-223-519	489-1888-10400	M5
JHARKHAND	A441	129-182C-183C-189-223-274-319	447G-489-10400	M2
JHARKHAND	A442	189-223-300-519	489-4734-10400	M45
JHARKHAND	A443	189-223-300-519	489-4734-10400	M45
JHARKHAND	A444	189-223-300-519	489-4734-10400	M45
JHARKHAND	A445	223-234	195A-489-10400	M30
JHARKHAND	A446	179-223-289-294-319-356	489-8925-10400	M40
JHARKHAND	A447	223-231-269-362-519	489-10400	M6
JHARKHAND	A448	126-223-311-519	482-489-10400	M3
JHARKHAND	A449	169-172-223-241-278-519	489-2361-10400	M33
JHARKHAND	A450	185-189-223-270-274-319-352-519	447G-489-10400	M2
JHARKHAND	A451	189-223-278-293C-519	489-10400-12561	M35
JHARKHAND	A452	129-223-291-304-519	489-1888-10400	M5
JHARKHAND	A453	51-206C-230-304-311-456-519	1811-12308	U2a
JHARKHAND	A454	51-168-355-519	1811-12308	U2b
JHARKHAND	A455	169-172-223-241-278-519	489-2361-10400	M33
JHARKHAND	A457	189-223-300-519	489-4734-10400	M45
JHARKHAND	A458	179-223-289-294-319-356-463	489-8925-10400	M40
JHARKHAND	A459	179-223-289-294-319-354-356-463	489-8925-10400	M40
JHARKHAND	A460	169+C-189-223-256-274-311-319-320	447G-489-10400	M2
JHARKHAND	A461	169+C-189-223-256-274-311-319-320	447G-489-10400	M2
JHARKHAND	A462	85-129-223-274-362-519	489-1888-10400	M5
JHARKHAND	A463	169+C-189-223-256-274-311-319-320	447G-489-10400	M2
JHARKHAND	A464	189-223-300-519	489-4734-10400	M45
JHARKHAND	A465	51-206C-220C	1811-12308	U2a

JHARKHAND	A466	179-223-289-294-319-356-463	489-8925-10400	M40
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JHARKHAND	A468	189-223-300-519	489-4734-10400	M45
JHARKHAND	A469	223	195A-489-10400	M30
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JHARKHAND	A471	179-223-289-294-319-356-463	489-8925-10400	M40
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JHARKHAND	A473	CRS	195-9449-12705	R8
JHARKHAND	A474	75-260-261-319-362-390	12705-13105	R7
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ODISHA	ORIOR035	260-261-311-319-362	12705-13105	R7
ODISHA	ORIOR036	51-93A-154-206C-230-311	1811-12308	U2a
ODISHA	ORIOR037	260-261-311-319-362	12705-13105	R7
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ODISHA	ORIOR046	168A-179-223-289-294-319-356-463	489-8925-10400	M40
ODISHA	ORIOR047	93-223-362	195A-489-10400	M30
ODISHA	ORIOR048	86-129-223-243-265C	489-1888-10400	M5
ODISHA	ORIOR049	104-223-234-243-244	489-10400	M

ODISHA	ORIOR050	93-129-266-318-320-362	12705-12285	R6
ODISHA	ORIOR051	189-223-275-438	489-10400	M
ODISHA	ORIOR052	51-189-223-243-316-399	489-10400	M53
ODISHA	ORIOR054	93-223-362	195A-489-10400	M30
ODISHA	ORIOR055	223-318T-325-519	489-10400-12007-12498	M18
ODISHA	ORIOR056	189-223-300-519	489-4734-10400	M45
ODISHA	ORIOR057	51-169-234-278-300	1811-12308	U2c
ODISHA	ORIOR058	51-169-234-278-300	1811-12308	U2c
ODISHA	ORIOR060	51-189-223-316-355A-399	489-10400	M53
ODISHA	ORIOR061	189-223-300	489-4734-10400	M45
ODISHA	ORIOR062	51-169-234-278	1811-12308	U2c
ODISHA	ORIOR063	189-223-311	489-10400-12007	M4
ODISHA	ORIOR064	129-223-291	489-1888-10400	M5
ODISHA	ORIOR065	51-189-223-316-355A-399	489-10400	M53
ODISHA	ORIOR066	189-223-300-519	489-4734-10400	M45
ODISHA	ORIOR067	168A-179-223-289-294-319-356-463	489-8925-10400	M40
ODISHA	ORIOR068	48-93-129-223-234	489-10400-12007	M4

Table S2 Y-chromosomal haplogroup markers details.

Population group	North Munda	South Munda	Oraon (India)	Oraon (Bangladesh)
n (total)	286	246	91	43
C-M216	0.014	0.004	--	--
F-M89	0.056	0.077	0.022	0.07
H-M69	0.143	0.089	0.571	0.512
J2-M172	0.056	0.024	--	0.047
O2-M95	0.654	0.76	0.319	0.326
P-M45	0.01	0.016	0.011	0.023
R1-M173	0.049	0.028	0.044	0.023
R2-M124	0.017	--	0.033	--
Reference	[4]	[4]	[5]	Present Study

Table S3 Population list included in the present study from different regions.

Region	Populations	No. of Individuals	Labeling in Figures	Language	Country collected in	References
Africa	Yorubas	20	Africa	Niger-Congo	Nigeria	[6]
Africa	Bantus	18	Africa	Niger-Congo	South Africa	[6]
Africa	Mandenkas	20	Africa	Niger-Congo	Senegal	[6]
Caucasus	Adygei	17	Caucasus	Northwest Caucasian	Russia	[6]
Caucasus	Armenians	16	Caucasus	Indo-European	Armenia	[7]
Caucasus	Georgians	20	Caucasus	Kartvelian	Georgia	[8]
East_Asia	Dai	10	East_Asia	Daic	China	[6]
East_Asia	Han	20	East_Asia	Trans-Himalayan	China	[6]
East_Asia	Japanese	20	East_Asia	Japonic	Japan	[6]
East_Asia	Lahu	8	East_Asia	Trans-Himalayan	China	[6]
East_Asia	Miaozu	10	East_Asia	Hmong-Mien	China	[6]
East_Asia	Mongola	10	East_Asia	Mongolic	China	[6]
East_Asia	Naxi	7	East_Asia	Trans-Himalayan	China	[6]
East_Asia	She	10	East_Asia	Hmong-Mien	China	[6]
East_Asia	Tu	10	East_Asia	Mongolic	China	[6]
East_Asia	Tujia	10	East_Asia	Trans-Himalayan	China	[6]
East_Asia	Yizo	10	East_Asia	Trans-Himalayan	China	[6]

Europe	French	20	Europe	Indo-European/Italic	France	[6]
Europe	North_Italians	12	Europe	Indo-European/Italic	Italy	[6]
Europe	Russians	17	Europe	Indo-European/Slavic	Russia	[7]
Middle East	Bedouins	20	Middle East	Afro-Asiatic	Israel	[6]
Middle East	Palestinians	20	Middle East	Afro-Asiatic	Israel	[6]
Oceania	Melanesians	10	PNG		Papua New Guinea	[6]
Oceania	Papuans	17	PNG		Papua New Guinea	[6]
South East Asia	Aeta	15	SEA	Austronesian	Philippines	[9]
South East Asia	Bateq	12	SEA	Austroasiatic/Mon-Khmer/Aslian	Malaysia	[10]
South East Asia	Burmese	35	SEA	Trans-Himalayan/Lolo-Burmese/Burmish	Myanmar	[4]
South East Asia	Cambodians	10	SEA	Austroasiatic/Mon-Khmer	Cambodia	[6]
South East Asia	CheWong	11	SEA	Austroasiatic/Mon-Khmer/Aslian	Malaysia	[10]
South East Asia	Jakun	11	SEA	Austronesian	Malaysia	[10]
South East Asia	Jehai	22	SEA	Austroasiatic/Mon-Khmer/Aslian	Malaysia	[10]
South East Asia	Kayah_Lebbo	16	SEA	Austronesian	Indonesia	[11]
South East Asia	Kintaq	15	SEA	Austroasiatic/Mon-Khmer/Aslian	Malaysia	[10]
South East Asia	Lao	24	SEA	Daic	Laos	[12]
South East Asia	MahMeri	24	SEA	Austroasiatic/Mon-Khmer/Aslian	Malaysia	[10]
South East Asia	Mendriq	13	SEA	Austroasiatic/Mon-Khmer/Aslian	Malaysia	[6]
South East Asia	Murut	17	SEA	Austronesian	Brunei	[13]
South East Asia	Seletar	23	SEA	Austronesian	Malaysia	[10]
South East Asia	Temuan	13	SEA	Austronesian	Malaysia	[10]
South East Asia	Vietnamese	18	SEA	Austroasiatic/Mon-Khmer	Vietnam	[13]
South Asia	Jarawa	19	Jarawa	Andamanese	India	[14]
South Asia	Onge	17	Onge	Andamanese	India	[14]
South Asia	Brahui	20	Brahui	Dravidian/North	Pakistan	[6]
South Asia	Nihali	2	Nihali	Linguistic isolate	India	[15]
South Asia	Oraon	6	Oraon	Dravidian/North	India	[16]
South Asia	Oraon	10	Oraon	Dravidian/North	Bangladesh	Present Study
South Asia	Balochi	20	Pakistan	Indo-European/Indo-Iranian/Iranian/Western	Pakistan	[6]
South Asia	Pathan	20	Pakistan	Indo-European/Indo-Iranian/Iranian/Eastern	Pakistan	[6]
South Asia	Sindhi	20	Pakistan	Indo-European/Indo-Iranian/Indo-Aryan	Pakistan	[6]
South Asia	Asur	2	IND_AA	Austroasiatic/Munda/North	India	[4]
South Asia	Birhor	16	IND_AA	Austroasiatic/Munda/North	India	[14]
South Asia	Bonda	4	IND_AA	Austroasiatic/Munda/South	India	[4]

South Asia	Gadaba	1	IND_AA	Austroasiatic/Munda/South	India	[4]
South Asia	Ho	23	IND_AA	Austroasiatic/Munda/North	India	[4]
South Asia	Juang	2	IND_AA	Austroasiatic/Munda/South	India	[4]
South Asia	Kharia	2	IND_AA	Austroasiatic/Munda/South	India	[4]
South Asia	Korwa	18	IND_AA	Austroasiatic/Munda/North	India	[14]
South Asia	Mawasi	1	IND_AA	Austroasiatic/Munda/North	India	[15]
South Asia	Santhal	31	IND_AA	Austroasiatic/Munda/North	India	[12]
South Asia	Savara	2	IND_AA	Austroasiatic/Munda/South	India	[4]
South Asia	Chenchus	4	IND_DRA	Dravidian	India	[15]
South Asia	Gond	12	IND_DRA	Dravidian	India	[14]
South Asia	Halakipikki	3	IND_DRA	Dravidian	India	[15]
South Asia	Iyer	20	IND_DRA	Dravidian	India	[14]
South Asia	Kurumba	4	IND_DRA	Dravidian	India	[15]
South Asia	North_Kannadi	8	IND_DRA	Dravidian	India	[8]
South Asia	Paniya	22	IND_DRA	Dravidian	India	[14]
South Asia	Piramalai_Kallars	8	IND_DRA	Dravidian	India	[15]
South Asia	Pulliyar	5	IND_DRA	Dravidian	India	[15]
South Asia	Sakilli	4	IND_DRA	Dravidian	India	[8]
South Asia	Velmas	10	IND_DRA	Dravidian	India	[15]
South Asia	Chamar	10	IND_IE	Indo-European/Indo-Iranian	India	[15]
South Asia	Dharkars	9	IND_IE	Ind- European/Indo-Iranian	India	[15]
South Asia	Khatri	19	IND_IE	Indo-European/Indo-Iranian	India	[14]
South Asia	Kol	16	IND_IE	Indo-European/Indo-Iranian	India	[15]
South Asia	Garo	4	IND_TB	Trans-Himalayan	India	[4]
South Asia	Hmar	4	IND_TB	Trans-Himalayan	India	[12]
South Asia	Kom	2	IND_TB	Trans-Himalayan	India	[12]
South Asia	Kuki	6	IND_TB	Trans-Himalayan	India	[12]
South Asia	Mizo	5	IND_TB	Trans-Himalayan	India	[12]
South Asia	Naga	5	IND_TB	Trans-Himalayan	India	[15]
South Asia	Nyishi	4	IND_TB	Trans-Himalayan	India	[12]
South Asia	Tripuri	19	IND_TB	Trans-Himalayan	India	[14]
South Asia	Khasi	3	Khasi	Austroasiatic/Mon-Khmer	India	[4]

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