



Supplementary Material

Maternal Genetic Diversity and Historical Gene Flow in the Rajput Population of Pakistan Revealed by Mitochondrial DNA Control Region Analysis

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Supplementary Table S1. Haplogroup frequency and regional distribution.

Hap-loggroup	Count (%)	Relative Frequency	Regional associations
U7a	17 (6.05)	High	South Asia, West Eurasia
M5a	16 (5.69)	High	South Asia
U4a	13 (4.63)	High	South Asia, West Eurasia
M30	13 (4.63)	High	South Asia
R5a	11 (3.91)	High	South Asia, West Eurasia
M3a	10 (3.56)	High	South Asia
U2b	10 (3.56)	High	South Asia, West Eurasia
U2e	9 (3.20)	High	South Asia, West Eurasia
U2c	8 (2.85)	Moderate	South Asia, West Eurasia
M3	7 (2.49)	Moderate	South Asia
M4a	7 (2.49)	Moderate	South Asia
U2a	7 (2.49)	Moderate	South Asia, West Eurasia

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Hap-loggroup	Count (%)	Relative Frequency	Regional associations
H2a	6 (2.14)	Moderate	Europe, Near East
M4b	5 (1.78)	Moderate	South Asia
J1b	5 (1.78)	Moderate	Europe, Near East
M33a	5 (1.78)	Moderate	South Asia
T2e	4 (1.42)	Moderate	Europe, Near East
M6a	4 (1.42)	Moderate	South Asia
M65a	4 (1.42)	Moderate	South Asia
M4	4 (1.42)	Moderate	South Asia
M2a	3 (1.07)	Moderate	South Asia
U2	3 (1.07)	Moderate	South Asia, West Eurasia
M18a	3 (1.07)	Moderate	South Asia
M18	3 (1.07)	Moderate	South Asia
W6	3 (1.07)	Moderate	West Eurasia
T1a	3 (1.07)	Moderate	Europe, Near East
M5	3 (1.07)	Moderate	South Asia
T2d	2 (0.71)	Low	Europe, Near East
W3a	2 (0.71)	Low	West Eurasia
M61a	2 (0.71)	Low	South Asia
M30d	2 (0.71)	Low	South Asia
R0a	2 (0.71)	Low	South Asia, West Eurasia
D4b	2 (0.71)	Low	East Asia, Siberia
H3h	2 (0.71)	Low	Europe, Near East
R30a	2 (0.71)	Low	South Asia, West Eurasia

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Hap-loggroup	Count (%)	Relative Frequency	Regional associations
R2	2 (0.71)	Low	South Asia, West Eurasia
N2	2 (0.71)	Low	Near East, Eurasia
W1	2 (0.71)	Low	West Eurasia
M30e	2 (0.71)	Low	South Asia
N	2 (0.71)	Low	Near East, Eurasia
M5b	2 (0.71)	Low	South Asia
R1	2 (0.71)	Low	South Asia, West Eurasia
U7	2 (0.71)	Low	South Asia, West Eurasia
H1e	2 (0.71)	Low	Europe, Near East
N1a	2 (0.71)	Low	Near East, Eurasia
M65b	2 (0.71)	Low	South Asia
W	2 (0.71)	Low	West Eurasia
I1	1 (0.36)	Low	Europe
F1a	1 (0.36)	Low	East Asia, Southeast Asia
D4a	1 (0.36)	Low	East Asia, Siberia
M66	1 (0.36)	Low	South Asia
T2a	1 (0.36)	Low	Europe, Near East
M76	1 (0.36)	Low	South Asia
M60a	1 (0.36)	Low	South Asia
M49	1 (0.36)	Low	South Asia
M7c	1 (0.36)	Low	South Asia
T2i	1 (0.36)	Low	Europe, Near East
HV2	1 (0.36)	Low	Europe, Near East
D4e	1 (0.36)	Low	East Asia, Siberia
M30g	1 (0.36)	Low	South Asia
M18b	1 (0.36)	Low	South Asia
M61	1 (0.36)	Low	South Asia
M66b	1 (0.36)	Low	South Asia
JT	1 (0.36)	Low	Europe, Near East
A	1 (0.36)	Low	East Asia, Siberia, Americas
K1a	1 (0.36)	Low	Europe, Near East
M7b	1 (0.36)	Low	South Asia
B6a	1 (0.36)	Low	East Asia, Southeast Asia, Oceania
M7a	1 (0.36)	Low	South Asia
G3b	1 (0.36)	Low	East Asia, Siberia
I	1 (0.36)	Low	Europe
M5d	1 (0.36)	Low	South Asia
L3e	1 (0.36)	Low	Sub-Saharan Africa
M37e	1 (0.36)	Low	South Asia
M34a	1 (0.36)	Low	South Asia
D4g	1 (0.36)	Low	East Asia, Siberia
F1b	1 (0.36)	Low	East Asia, Southeast Asia
R30b	1 (0.36)	Low	South Asia, West Eurasia
HV2a	1 (0.36)	Low	Europe, Near East
N21	1 (0.36)	Low	Near East, Eurasia

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Hap-loggroup	Count (%)	Relative Frequency	Regional associations
S	1 (0.36)	Low	Oceania
W3b	1(0.36)	Low	West Eurasia
H14a	1 (0.36)	Low	Europe, Near East
N11a	1 (0.36)	Low	Near East, Eurasia
M3c	1 (0.36)	Low	South Asia
M30f	1 (0.36)	Low	South Asia
H32	1 (0.36)	Low	Europe, Near East
M31a	1 (0.36)	Low	South Asia
H11a	1 (0.36)	Low	Europe, Near East
M1	1 (0.36)	Low	South Asia
X2c	1 (0.36)	Low	West Eurasia, Near East, North America
D4t	1 (0.36)	Low	East Asia, Siberia
R7b	1 (0.36)	Low	South Asia, West Eurasia
T2c	1 (0.36)	Low	Europe, Near East
B2a	1 (0.36)	Low	East Asia, Southeast Asia, Oceania
HV19	1(0.36)	Low	Europe, Near East
W1h	1 (0.36)	Low	West Eurasia
P2	1 (0.36)	Low	Oceania
H1	1 (0.36)	Low	Europe, Near East

Methods Note: Haplogroup frequencies were calculated from 281 mtDNA control-region sequences using

Supplementary Table S2. Global control-region mtDNA diversity indices (Forensic Datasets) compared to the Rajput population.

Region	Population / Dataset	n	HD ($\approx$ GD)	RMP
South Asia	Rajput (Punjab, Pakistan)	281	0.996 $\pm$ 0.002	0.0042
South Asia	Indian Gujar	80	0.992	0.0065
South Asia	Sri Lanka (Sinhalese)	102	0.993	0.0069
Europe	Netherlands	680	0.9963	0.0037
Europe	Germany	615	0.995	0.0040
Europe	Italy	327	0.997	0.0039
East Asia	Japan	188	0.9986	0.0095
East Asia	China – Henan Han	208	0.9991	0.0061
Southeast Asia	Thailand	213	0.9960	0.0087
West Asia	Iran	150	0.992	0.0058
West Asia	Saudi Arabia	230	0.994	0.0050
Africa (West)	Ghana (Akan)	191	0.987	0.0130
Africa (East)	Sudan (HVRI)	185		0.0207
North Africa	Egypt	130	0.991	0.0091
Oceania	Papua New Guinea	96	0.984	0.017

(Mabuchi et al., 2007; Chaitanya et al., 2016; Xu et al., 2020; Bodner et al., 2022).