Red-cell enzyme study among some migrant tribal populations in the Andaman Islands

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With 4 tables in the text

Summary: 11 red-cell enzyme systems have been studied among the three tribal populations Oraon, Munda and Kharia, who migrated from Chotanagpur area, particularly, Ranchi district, in Bihar, India, towards the end of the last century and the beginning of this century, and subsequently settled in the Andaman Islands. Of these enzyme systems six were invariant in these three populations. In respect of Ac. phos. both the Oraon and Kharia have lost genetic equilibrium, and the genetic equilibrium is disturbed for EsD among the Munda. Some possible reasons for such genetic disequilibrium in these populations are suggested.

Zusammenfassung: 11 Blutenzymsysteme werden an den Stammesbevölkerungen der Oraon, Munda und Kharia untersucht, die aus dem Gebiet von Chotanagpur (Ranchi-Distrikt) in Bihar/Indien um die Jahrhundertwende und später auf die Andamanen gewandert sind. Von diesen Enzymsystemen waren in den drei Bevölkerungen 6 invariant. Im SEP-System haben sowohl die Oraon als auch die Kharia das genetische Gleichgewicht verloren, und im EsD-System findet sich eine Störung des Gleichgewichts bei den Munda. Es werden Denkmöglichkeiten für das genetische Ungleichgewicht in diesen Bevölkerungen erörtert.

Introduction

Towards the end of the last century, and in the beginning of the present century, the British administrators in India brought to the Andaman Islands some tribal people from Chotanagpur area, particularly the Ranchi district in Bihar, to work as forest labourers. They were sent there mostly through Christian missionaries (VIDYARTHI, 1971). Subsequently, some of those tribals permanently settled in the Andaman and Nicobar Islands.

So far no genetical work seems to have been undertaken among these Chotanagpur tribes. The results of some red-cell enzyme studies among the Oraon, Munda and Kharia are reported here. The present data will be compared with the existing data available on these three tribes in the mainland.

Materials and methods

Blood samples were collected by finger-prick on filter paper strips as described by SAHA & KIRK (1973) from unrelated individuals of three migrant tribes, the Oraon, Munda and Kharia in the Andaman Islands.

Altogether 11 red-cell enzyme systems, viz. PGM_1, PGM_2, Oxidase, EsD, Ac. phos., 6-PGD, LDH, MDH, ICD, CAI and CAII, were typed by starch gel electrophoresis, essentially following the methods described by HARRIS & HOPKINSON (1976).

Results and discussion

The distributions of the phenotype frequencies of the 11 red-cell enzyme systems are given in Tables 1 and 2 for variant and invariant systems, respectively.

Table 1. Phenotype frequencies of some red-cell enzyme systems.

	Oraon		Munda		Kharia	
System	No.	%	No.	%	No.	%
PGM_1						
1 - 1	60	46.51	30	44.78	30	37.50
2 - 1	54	41.86	31	46.27	39	48.75
2 - 2	15	11.63	6	8.95	11	13.75
Total	129	100.00	67	100.00	80	100.00
EsD						
1 - 1	51	39.53	26	38.81	19	23.75
2 - 1	63	48.83	21	31.34	40	50.00
2 - 2	15	11.63	20	29.85	21	26.25
Total	129	99.99	67	100.00	80	100.00
Ac. Phos.						
A	9	6.98	5	7.46	5	6.25
AB	18	13.95	16	23.88	14	17.50
B	102	79.07	46	68.66	61	76.25
Total	129	100.00	67	100.00	80	100.00
6-PGD						
AA	126	97.67	65	97.01	78	97.50
AC	3	2.33	2	2.99	2	2.50
Total	129	100.00	67	100.00	80	100.00
LDH						
Normal	129	100.00	67	100.00	79	98.75
Calcutta-1	-	-	-	-	1	1.25
Total	129	100.00	67	100.00	80	100.00

Table 1 shows that the phenotypic frequencies for PGM_1, EsD, Ac. phos. and 6-PGD are more or less similar in all these three populations. But in the case of LDH, both the Oraon and Munda are invariant, whereas the Kharia possess the LDH^{Cal-1} allele. About 2.24 % of the Oraon (MUKHERJEE et al., 1975) and 1.55 % of the Munda (MUKHERJEE et al., 1973) in the mainland possess the LDH^{Cal-1} allele. In a recent review ROYCHOUDHURY (1975) shows that LDH^{Cal-1} is present in almost all populations in India.

Table 2 shows that these three populations are invariant for PGM_2, Oxidase, MDH, ICD, CAI and CAII. It may be noted that all these systems are invariant in other Indian populations so far studied except that the Chamar of Delhi are

Table 2. Number of individuals tested for invariant systems.

Population	PGM_2	MDH	Oxidase	ICD	CA I	CA II
	1-1	1-1	1-1	1-1	1-1	1-1
Oraon	129	129	129	129	129	129
Munda	67	67	63	67	66	67
Kharia	80	80	76	80	74	80

Table 3. Distribution of gene frequencies for some red-cell enzyme systems.

Population	PGM_1		EsD		Ac. Phos.		6-PGD	
	PGM_1^1	PGM_1^2	EsD^1	EsD^2	p^a	p^b	PGD^A	PGD^C
Oraon	0.6744	0.3256	0.6395	0.3605	0.1396	0.8605	0.9883	0.0117
Munda	0.6792	0.3209	0.5448	0.4552	0.1940	0.8060	0.9850	0.0150
Kharia	0.6188	0.3813	0.4875	0.5125	0.1500	0.8500	0.9875	0.0125

Table 4. χ^2-values at 1 d. f.

Systems	Populations		
	Oraon	Munda	Kharia
PGM_1	0.2815	0.2546	0.0885
EsD^1	0.4518	9.0764*	0.0000
Ac. Phos.	22.6655*	3.7504	7.8739*
6-PGD	0.0201	0.0202	0.0105

* Significant at 5 % level.

not invariant for MDH (Das et al., 1974), the Muslim of Madhya Pradesh (Roberts et al., 1974) and some nontribals of Andhra (Santachiara-Benercetti et al., 1972) for PGM_2, Parsi of Bombay (Ghosh, 1977) for CAI, and Parsi and Marathi of Bombay (Ghosh, 1977) for CAII. The MDH system is invariant among the Oraon of Ranchi district (Mukherjee et al., 1975).

The gene frequencies for PGM_1, EsD, Ac. phos. and 6-PGD in these three populations have been given in Table 3. Among the Oraon of Ranchi district the frequencies of the alleles PGM_1^1 and PGM_1^2 are 0.684 and 0.316, respectively (Mukherjee et al., 1975). But such data on the Munda and Kharia of the mainland are not available. For the other three systems, i. e., EsD, Ac. phos. and 6-PGD no data exist for these three groups on the mainland. However, in PGM_1, Ac. phos. and 6-PGD, there is no significant difference between these groups in the Andaman Islands (for PGM_1, $\chi^2 = 2.2357$, d. f. = 4, $P>.05$; for Ac. phos., $\chi^2 = 3.2219$, d. f. = 4, $P>.05$; for 6-PGD, $\chi^2 = 0.0776$, d. f. = 2, $P>.05$). In the case of EsD these three populations differ significantly ($\chi^2 = 16.793$, d. f. = 4, $P<.05$). Taking all these four systems together there is no significant difference among the migrant tribal populations in the Andaman Islands ($\chi^2 = 22.3282$, d. f. = 14. $P>.05$).

Due to the paucity of data on red-cell enzyme systems for those three tribes on the mainland we have very limited opportunity to assess the changes, if any, which might have occurred in the genetic characteristics of these populations. However, the $LDH^{Cal\text{-}1}$ gene is present among the Oraon and Munda of Ranchi district, but it is absent among these two groups in the Andaman Islands. This may be due to sampling fluctuation or due to the fact that it is lost through selection. Table 4 shows the χ^2 values for PGM_1, EsD, Ac. phos. and 6-PGD in tests of HARDY-WEINBERG equilibrium in the three populations. In respect of Ac. phos., both the Oraon and Kharia have lost genetic equilibrium, whereas among the Munda this equilibrium is disturbed for EsD. The present data do not permit detection of the cause of the genetic disequilibrium in these populations, but the following possibilities may be indicated: (a) sampling error, (b) non-random migration from mainland, (c) close-mating in each of these populations, (d) admixture with other populations after migration. However, nothing could be said conclusively until further investigation into the genetic components and demographic parameters of these populations as well as their parental groups on the mainland will be done.

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