

## Haematological traits, religion and rural/urban residence among the Lepchas of Kalimpong subdivision, Darjeeling district, West Bengal (India)

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With 1 figure and 7 tables in the text

**Summary:** As a part of an ongoing multidisciplinary biomedical research programme, initiated by the Indian Statistical Institute in early 1976, entitled „Human Adaptability Programme“, the present study was undertaken among the Lepchas of Kalimpong subdivision, Darjeeling district, West Bengal (India) to enquire at a micro-level into the possible relationship between the major sociocultural factors, viz. religious practices and rural/urban residence, on the one hand, and haematological traits such as haemoglobin level, haematocrit and anaemia, on the other. The results show that while effects of religious practices do not seem to exist on the haematological traits considered, significant effects of rural/urban residence do.

**Zusammenfassung:** Als Teil eines noch laufenden multidisziplinären, biomedizinischen Forschungsprogramms, das zu Beginn des Jahres 1976 unter dem Namen „Human Adaptability Programme“ vom Indian Statistical Institute initiiert worden ist, wurde in dieser Studie an den Lepcha des Bezirks Kalimpong im Darjeeling-Distrikt in West Bengal (Indien) in einem Mikrozensus-Ansatz untersucht, ob zwischen wichtigen soziokulturellen Faktoren wie z. B. „religious practices“ und „rural/urban residence“ einerseits und hämatologischen Parametern wie Hämoglobinspiegel, Hämatokrit und Anämie andererseits Zusammenhänge vorliegen. Es hat sich gezeigt, daß „religious practices“ offenbar keine Effekte auf die hier untersuchten hämatologischen Parameter haben, während dagegen „rural/urban residence“ solche in deutlichem Ausmaß erkennen lassen.

### Introduction

Several studies have indicated that in various populations, sociocultural factors, including economic condition, affect haematological traits, e. g., haemoglobin (Hb) level and haematocrit value (Owen et al. 1974, Page et al. 1977, Devadas et al. 1980, Kaur et al. 1982, Bharati 1983, Roy et al. 1985). This possibly occurs through the operation of a variety of intermediate variables, e. g., nutrition, parasitic infestation, and so on. Moreover, anaemias of various aetiologies are one of the major health problems in most Third World countries, affecting, especially the women (WHO 1980, Royston 1982). A WHO (1968) study observed that nearly 65 % and 85 % of non-pregnant and pregnant women, respectively, from a rural community near Delhi were iron deficient and anaemic. It is suggested that the important factors contributing to iron deficiency in Indian populations could be relatively low

bioavailability of iron in the cereal based diet and chronic blood loss from hook-worm infestation, especially in rural populations (Malville 1991).

Studies concerning the effect of religious practices and rural/urban residence on haematological traits are generally infrequent and such investigations among Indian populations have rarely been attempted. Of the few available studies, Muslim mothers were found to have the highest percentage of anaemia, measured in terms of haemoglobin level, compared to the Harijans and caste Hindus in Andhra Pradesh (Mahadevan et al. 1986), and pre-school children of Rajasthan showed rural/urban differences with respect to haemoglobin level (Gupta et al. 1979).

In view of this, the present study aims to examine, at a micro-level, whether relationships exist between haematological traits, e. g., haemoglobin level, haematocrit and anaemia on the one hand, and (a) religious practices and (b) rural/urban residence, on the other. The Lepchas of Kalimpong subdivision, Darjeeling district, West Bengal were chosen for the study.

## Materials and methods

The Lepchas, one of the tribal populations of the eastern Himalaya, are believed to be the original inhabitants of the Sikkim-Darjeeling area (Gorer 1938, Das 1978). Presently, they are distributed mainly in the Darjeeling district of West Bengal and in the neighbouring State of Sikkim. They are also found in the Himalayan kingdoms of Nepal and Bhutan, albeit in small numbers. The Lepchas, however, call themselves *Rong*, and they have their own language known also as *Rong* which is included in Tibeto-Burman family of languages (Grierson 1927).

In the district of Darjeeling, the major concentration of the Lepchas is found in the Kalimpong subdivision. In fact, more than half of the total Lepcha population resides in the Kalimpong subdivision. In Kalimpong, the Lepchas are found to reside in different locales ranging from remote and backward areas to the vicinity of the urban centres. The Lepchas generally profess two major religions, viz. Buddhism and Christianity. Both Buddhist and Christian Lepchas inhabit villages located in rural as well as urban areas, where they raise vegetables and rear cattle, pigs and chicken. Their dwellings are situated on the hill slopes and generally have pit-type toilets. A very large majority of them practice subsistence agriculture. Nevertheless, some of them work as wage labourers, others depend on handicrafts as the source of their livelihood, while yet others are engaged in service. Unlike the Tibetans or Bhutias, they do not find trade as an interesting source of livelihood.

For the present study, the „urban“ habitat was defined as being constituted of villages located within a distance of about 8 kilometers from Kalimpong town where „urban facilities“ were available reasonably well, while the „rural habitat“ as being constituted of remote villages devoid of such facilities.

Keeping the above definitions in mind, and considering the operational requirement of the feasibility of setting up a laboratory for clinical examinations, the following study villages from urban and rural areas were selected: urban (7 villages) namely, Ngassey, Tashiding, Pashyor, Chhibo, Purbong, Tanek and Mangbol under Kalimpong Khasmahal (Khasmahal is an administrative unit for collection of revenue); and rural (9 villages) namely, Beyong, Tugong, Chhyangdung, Pochok, Pemling, Genjing, Sarioksa, Gitdang and Reyon under Gitdubling and Pemling Khasmahals, located at a distance between 60 and 70 kilometers from Kalimpong town by a jeepable road. The location of the Kalimpong subdivision as well as of the rural-urban habitats covered under this study are shown in Fig. 1.

From each of these rural and urban villages, as many adult Lepcha individuals of both sexes, from both Buddhist and Christian households, were included in the study as could be persuaded. Statistical sampling of households/individuals was not feasible owing to operational difficulties in the field.

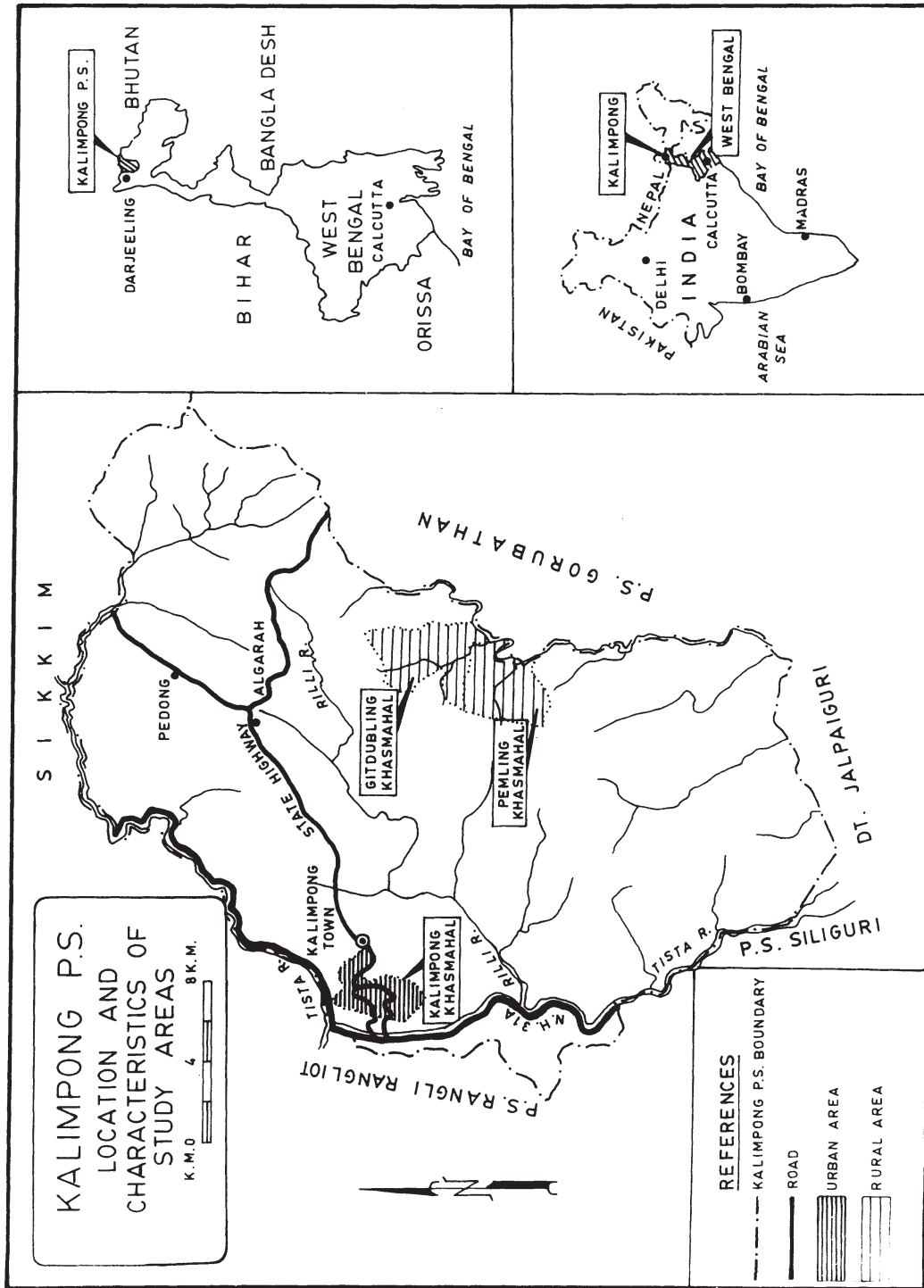


Fig. 1. Map showing study areas.

Table 1. Sample size of study groups by sex.

Study group	Sample size		
	Male	Female	Total
Urban Buddhist	28	46	74
Urban Christian	68	73	141
Rural Buddhist	125	122	247
Rural Christian	102	98	200
Total	323	339	662

Blood specimens were obtained by finger pricking from 662 Lepcha adults (aged 20 years and above) of both sexes. The sample sizes by study group and sex are set out in Table 1.

The oxyhaemoglobin level was estimated immediately after collecting the blood specimens using a Sahli's haemoglobinometer. The haematocrit value was measured by collecting blood in heparinised microcapillaries (length 75 mm, internal diameter 1 mm) and spinning them down, shortly after collection in a haematocrit centrifuge. The anaemic status of the subjects was determined by classifying them into anaemics and non-anaemics, and mild, moderate and severe anaemics, following WHO (1968) and DeMaeyer (1989) cut-off points for haemoglobin concentration.

## Results

The basic statistics pertaining to Hb level and haematocrit value of the four study groups, by sex, are presented in Table 2. The table shows that with respect to Hb level, Urban Buddhists have lower mean values compared to Urban Christians in both sexes, while Rural Buddhists have higher value compared to Rural Christians in case of males but it is reverse in case of females. However, with respect to haematocrit, though Urban Buddhists have lower value compared to Urban Christians in case of males, the trend is reverse in case of females. While in case of males, Rural Buddhists have higher value compared to Rural Christians, the opposite is true for the females.

Table 2, furthermore, reveals that in respect of both Hb level and haematocrit, Urban Buddhists and Urban Christians have lower mean values compared to Rural Buddhists and Rural Christians, respectively in both sexes.

The distribution of Hb level and haematocrit values for males and females are discernibly negatively skewed and leptokurtic. Log transformation did not help reduce skewness/kurtosis. We, therefore, rely on robustness results to validate efficacy of ANOVA to these non-normal distributions. Since the objective of the present study is to examine the possible effects of two major sociocultural factors viz. religious practices and rural/urban residence, on the haematological traits, under consideration, two-way ANOVA was performed for the Hb level and haematocrit separately for males and females. The results of the two-way ANOVA are presented in Table 3. This analysis revealed that for both the sexes the effect of rural/urban residence but not of religious practices was significant in case of Hb level. Contrary to expectation, with respect to haematocrit, neither the effect of religious practices nor that of rural/urban residence was significant. Moreover,

Table 2. Basic statistics pertaining to haematological traits.

Study group	Hb (g/dl) level						Haematocrit (%)					
	Male			Female			Male			Female		
	N	$\bar{x}$	SD	N	$\bar{x}$	SD	N	$\bar{x}$	SD	N	$\bar{x}$	SD
Urban Buddhist	28	12.19	2.76	46	10.74	1.87	28	40.29	6.53	45	36.62	5.01
Urban Christian	68	12.53	2.47	73	10.81	1.67	68	40.87	5.86	73	36.37	4.02
Rural Buddhist	124	13.50	2.15	122	11.55	2.01	125	42.02	4.58	122	37.22	4.72
Rural Christian	102	13.37	2.27	98	11.72	2.33	102	41.52	5.52	98	37.54	5.36

religious practices  $\times$  rural/urban residence interaction effect was not found to be significant for Hb level and haematocrit in either sex. Age related changes among adults were not discernible since scatter diagrams of Hb level values by age and of haematocrit values by age did not indicate, by visual examination, any age trends (the diagrams are not presented here).

Table 4 shows the percentage distribution of anaemia, as determined clinically, in the study groups, by sex. It is evident from the table that there are higher percentages of anaemic females compared to anaemic males in all the study groups, as expected. It is also revealed that while Urban Buddhists have lower percentage of anaemics compared to Urban Christians in both the sexes, Rural Buddhists have lower percentage of anaemics compared to Rural Christians in case of males and the reverse trend occurs in case of females. Moreover, percentages of both anaemic males and females are higher among Urban Buddhists and Urban Christians compared to Rural Buddhists and Rural Christians, respectively.

In order to compare the four study groups, with respect to anaemic status, contingency Chi<sup>2</sup> test ( $2 \times 4$  contingency table in this case) was performed separately for males and females. This analysis revealed that significant differences exist among the four study groups, with respect to anaemic status for both the sexes. Further-

Table 3. Two-way Analysis of Variance: haematological traits.

Trait	sex	Rural/urban residence	F-ratio Religious practices	Rural/urban residence $\times$ religious practices interaction	Error
		df = 1	df = 1	df = 1	df
HB (g/dl) level	Male	12.637*	0.121	0.604	318
	Female	13.401*	0.261	0.045	335
Haematocrit (%)	Male	2.900	0.003	0.597	319
	Female	2.485	0.004	0.258	334

\* Significant at 5 % level

Table 4. Anaemic status of study groups by sex.

Study group	Anaemic		Non-anaemic		Total	
	Male	Female	Male	Female	Male	Female
	Hb (g/dl) < 13	Hb (g/dl) < 12	Hb (g/dl) ≥ 13	Hb (g/dl) ≥ 12		
Urban Buddhist	No. 15 % 53.27	33 71.74	13 46.43	13 28.26	28 100.00	46 100.00
Urban Christian	No. 37 % 54.41	55 75.34	31 45.59	18 24.66	68 100.00	73 100.00
Rural Buddhist	No. 33 % 26.61	57 46.72	91 73.39	65 53.28	124 100.00	122 100.00
Rural Christian	No. 34 % 33.33	34 34.69	68 66.67	64 65.31	102 100.00	98 100.00

Table 5. Test of significance: anaemic status

Significance of difference among/between	Chi <sup>2</sup> value		df
	Male	Female	
Urban Buddhist, Urban Christian, Rural Buddhist and Rural Christian	18.61**	36.21**	3
Urban Buddhist and Urban Christian	0.02	0.05	1
Rural Buddhist and Rural Christian	0.91	2.76	1
Urban Buddhist and Rural Buddhist	6.49*	7.43**	1
Urban Christian and Rural Christian	6.61*	26.09**	1

\* Significant at 5 % level

\*\* Significant at 1 % level

more, among both males and females, significant differences exist with respect to anaemic status between Urban Buddhists and Rural Buddhists as well as between Urban Christians and Rural Christians (Table 5).

Table 6 presents the degrees of anaemia in the study groups by sex. The table reveals that among the anaemics of both sexes, the percentage of mildly anaemic individuals is the highest, that of the severely anaemic individuals is the lowest and percentage of moderately anaemic individuals remains in between, in case of all the study groups. A similar trend relating to the degree of anaemia has also been observed by Panter-Brick et al. (1992) among the rural Nepalese populations of Salme, Central Nepal. Table 6 also shows that Urban Buddhists and Urban Christians have higher percentages of moderately anaemics and lower percentages of mildly anaemics compared to Rural Buddhists and Rural Christians, respectively.



Table 6. Degree of anaemia.

Study group	Mild anaemia		Moderate anaemia		Severe anaemia		Total	
	Hb 10.1-13 (g/dl)	Hb 10.1-12 (g/dl)	Hb 7.1-10.0 (g/dl)		Hb $\leq$ 7.0		Male	Female
	Male	Female	Male	Female	Male	Female		
Urban Buddhist	No. 10	18	5	13	1	3	16	34
	% 62.50	52.94	31.25	38.24	6.25	8.82	100.00	100.00
Urban Buddhist	No. 26	37	12	17	1	3	39	57
	% 66.67	64.91	30.77	29.82	2.56	5.26	100.00	100.00
Rural Buddhist	No. 28	37	10	20	1	5	39	62
	% 71.80	59.68	25.64	32.26	2.56	8.06	100.00	100.00
Rural Christian	No. 26	17	10	17	1	5	37	39
	% 70.27	43.59	27.03	43.59	2.70	12.82	100.00	100.00

## Discussion

The data presented above indicate that the haematological traits studied do not respond similarly to the two sociocultural factors, viz. religious practices and rural/urban residence. While a statistically significant effect of religious practices does not seem to exist on Hb level and haematocrit value in either sex, that of rural/urban residence appears to exist on Hb level. However, with respect to haematocrit, rural/urban differences, though not significant, show a pattern similar to that observed for Hb level. That is, rural groups have higher values compared to urban ones for both the religious groups. In case of anaemic status too, significant rural/urban differences exist, but religious differences are not found to be significant.

Non-significant Buddhist-Christian differences, irrespective of the area of residence, on the one hand, and significant rural/urban differences, irrespective of religious practices, on the other, with respect to haematological traits (especially Hb level and anaemia) may suggest that the traits under consideration are not apparently sensitive to the microcultural factors associated with religious practices but they may be sensitive to those associated with rural/urban residence, in the study population.

Comprehensive explanations for the observed pattern of Buddhist-Christian as well as rural-urban variations in respect of traits under study cannot readily be given but some possible clues can be provided, in terms of dietary practices and nutrient (iron) intakes among the study groups. It was observed that among the various food items, green leafy vegetables, one of the rich sources of iron, are consumed by much higher percentage of rural households compared to urban ones, irrespective of religious practices. Interestingly again, average iron intake (per consumption unit at the household level) was found to be higher among the rural groups compared to urban ones (Table 7). These observations may help to explain the findings that rural

Table 7. Consumption of green leafy vegetables and iron intake.

Study group	Percent of households consumed green leafy vegetables	Average iron intake (mg)* per consumption unit
Urban Buddhist (n = 21)	52.38	36.18
Urban Christian (n = 24)	62.50	36.58
Rural Buddhist (n = 48)	81.25	47.03
Rural Christian (n = 42)	85.71	41.95

\* iron intake was estimated by household using food tables in Indian Council of Medical Research, 1981.

groups, irrespective of religious practices show higher values of Hb level and lower percentages of anaemics compared to urban groups. Similarly, Buddhist-Christian differences, irrespective of area of residence, with respect to consumption of green leafy vegetables and average iron intake were not found to be marked which might have contributed to lack of marked Buddhist-Christian differences in respect of haematological traits and anaemia.

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