

Biological Traits and Their Associations with Diseases: A Review of Studies from Indian Region.

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ABSTRACT In the present paper an attempt has been made to compile studies on the association of diseases with the biological traits reported from the Indian region.

Extensive data are available now on the association between various genetical (blood groups systems, HLA system, enzyme systems, serum proteins, tasting ability etc.) morphological (dermatoglyphics) and behavioural traits and diseases.

The results of the association studies between various genetic traits and diseases have been reviewed and compiled by Vogel and Helmbold (1972) and Mourant et al. (1978). Schaumann and Alter (1976) have reviewed and synthesized the existing literature on delineating associations of dermatoglyphics with various diseases. Although the biological significance of these associations in many cases is still quite unclear, one can conclude from such studies that these traits seem to play some role regarding the susceptibility or the resistance to certain diseases. In the present work a comprehensive compilation of the studies reported on the association of genetical, morphological and behavioural traits with diseases from the Indian region (Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) has been attempted. From India, the population genetics research is placed in a comparatively speaking better position, and thus explains, why most of the material in this paper pertains to India.

The studies on various biological traits and their associations with diseases reported from India have been placed with 25 states and 7 Union Territories (U.T.) after Bhasin (1988).

I. North India, II. West India, III. East India, IV. Central India, V. South India, and VI. Islands. Himalayan Region may be divided into three divisions, i.e., A) Western Himalaya, B) Central Himalaya, and C) Eastern Himalaya as follows:

I. North India:

(A) *Western Himalaya* (S. No. 1-2)

(1) Jammu and Kashmir, (2) Himachal Pradesh, (3) Punjab, (4) Chandigarh (U.T.), (5) Haryana, (6) Delhi (U.T.) and (7) Uttar Pradesh

(B) *Central Himalaya* (S. No. 7, Eight Districts of Uttar Pradesh)

[(i) Almora, (ii) Chamoli, (iii) Dehra Dun, (iv) Garhwal (Pauri), (v) Naini Tal, (vi) Pithoragarh, (vii) Tehri Garhwal, and (viii) Uttarkashi] and 8. Rajasthan

II. West India:

(1) Gujarat, (2) Maharashtra, (3) Goa*, (4) Daman and Diu* (U.T.), and (5) Dadra and Nagar Haveli (U.T.).

III. East India:

(C) *Eastern Himalaya* (S.No. 1 to 8 and Darjeeling District of West Bengal)

(1) Arunachal Pradesh, (2) Assam, (3) Nagaland, (4) Manipur, (5) Mizoram, (6) Tripura, (7) Meghalaya, (8) Sikkim, (9) West Bengal, (10) Bihar, and (11) Orissa.

IV. Central India:

(1) Madhya Pradesh

V. South India:

(1) Karnataka, (2) Andhra Pradesh, (3) Tamil Nadu, (4) Kerala, and (5) Pondicherry (U.T.)

VI. Island:

(1) Lakshadweep (U.T.) and (2) Andaman and Nicobar Islands (U.T.).

The studies which have been reported from India and cannot be categorised into any State and / or Union Territory and from other Countries have been placed under the 'Others' heading.

* The State of Goa and Union Territory of Daman and Diu have been listed under Goa, Daman and Diu.

Table 1: Biological traits and their associations with diseases

S. No.	Place	Category/ Diseases	Remarks	Authors
INDIA				
1. NORTH INDIA				
A. WESTERN HIMALAYA (S. No. 1, 2)				
1.	Jammu and Kashmir Srinagar	Skin Diseases: Skin Diseases	Blood Group Systems: Subjects with blood group A are more prone to the various skin diseases and this susceptibility decreased in that order with groups AB, O and B. <i>Urticaria</i> , <i>alopecia areata</i> , <i>pyoderma fungal infection</i> <i>acne vulgaris</i> and <i>zoster</i> were significantly common in group A people while infective eczema, erythema multiforme, contact dermatitis, psoriasis and vitiligo in group AB subjects.	Hagini et al., 1975
2.	Himachal Pradesh Shimla	Skin Diseases: Psoriasis	Blood Group Systems: A significant preponderance of O group in psoriasis patients as compared to controls.	Lal et al., 1972
3.	Punjab Patiala	Neoplasms: Breast Cancer	Dermatoglyphics (Finger and Palmar): The dermatoglyphics features characteristic of breast cancer observed are: decreased number of arches on finger-balls, increase in line-C aberrations, increase in the number of axial tri-radii, enlargement of angle atd, decrease in the number of patterns in the IVth inter-digital area of the palm, and greater incidence of the triple radial base crease as compared to controls.	Bhardwaj et al., 1978
	Patiala	Neoplasms: Breast Cancer	Serum Protein Systems: Results on haptoglobin show a preponderance of products of gene Hp ¹ in patients as compared to controls. No variation is observed at the transferrin locus in either sample. Significant differences have been found between patients and controls due to the deflection of alloalbuminaemia in breast cancer patients.	Kaur et al., 1984
	Patiala	Neoplasms: Breast Carcinoma	Serum Protein Systems: No significant differences are seen in the mean immunoglobulin levels in patients with malignant and benign diseases when compared with normal controls and with each other.	Kaur et al., 1986
	Patiala	Neoplasms: Cancer of the Gastro- intestinal Tract	Blood Group Systems: No significant preponderance or susceptibility of a person with a particular blood group to a particular cancer has been detected. However, a fairly gross preponderance of cancer stomach has been detected in patients with blood group O. In cancer liver blood group O patients have been more frequently encountered.	Rai et al., 1972
	Patiala	Infectious Diseases: Pulmonary Tuberculosis	Blood Group Systems: Blood groups A and B distributions in the patients and control do not differ significantly.	Sidhu et al., 1974
	Patiala	Respiratory Diseases: Bronchial Asthma	Finger Dermatoglyphics: No statistically significant differences are observed in pattern subtypes in various digits between normal and patients. Though, susceptibility of asthma to individuals with whorl type	Bhatnagar et al., 1983

S. No.	Place	Category/ Diseases	Remarks	Authors
	Patiala	<i>Diseases of Digestive System: Cirrhosis</i>	pleiotropic hands and resistance of this disease in individuals with loop type pleiotropic type have been observed. <i>Finger Dermatoglyphics:</i> Presence of ulnar loops on fingers, distal shifting of axial triradii and occurrence of double forms with increase in atd angle and absence of 'C' triradii are observed in patients.	Kumar et al., 1983
	Patiala	<i>Infectious Diseases: Tuberculosis</i>	<i>Palmar Dermatoglyphics:</i> The differences between patients and controls are non-significant in all the termination of lines as well as occurrence of patterns in the five palmar areas except in line A endings. Patients show deviation from the control group in relation to the bilaterality of main line index. The patients differ from controls both bilaterally as well as homolaterally except the left hand which shows non-significant differences in relation to the termination of line C.	Singal et al., 1983
	Patiala	<i>Diseases of Thyroid Gland: Goitre</i>	<i>Serum Protein Systems:</i> Albumin is monomorphic in all the cases. Ceruloplasmin is both qualitatively and quantitatively normal in all patients. Patients have a greater incidence of ahaptoglobinaemia.	Gupta et al., 1981
	Patiala	<i>Respiratory Diseases: Asthma and Chronic Bronchitis</i>	<i>Blood Group Systems:</i> Three sets of blood groups viz., A:O, B:O and A+AB: B+O are taken into consideration for comparing patients with the control group. The chi-square value obtained for the last set (A+AB:B+O) is highly significant suggesting some degree of involvement of blood groups in these diseases.	Schajpal et al., 1978
	Patiala	<i>Respiratory Diseases: Respiratory Disease</i>	<i>Serum Protein Systems:</i> In patients there is a case of Hp Johnson and 3 cases of ahaptoglobinaemia. No transferrin or albumin variant has been found.	Schajpal et al., 1978
		<i>Haematological Diseases: Haematological Diseases</i>	<i>Haemoglobin Variants:</i> Presence of haemoglobin D-trait is not associated with any haematological disorder.	Saha & Banerjee, 1965
	Amritsar	<i>Respiratory Diseases: Pulmonary Tuberculosis</i>	<i>Blood Group Systems:</i> Types AB and B individuals have more pulmonary tuberculosis disease than the other two types. In Rh-D blood group system the results show non-significant association of disease with Rh-D types.	Marok & Bhanwer, 1989
4. Chandigarh (U.T.)		<i>Miscellaneous Diseases: Acute Anterior Uveitis</i>	<i>HLA (Histocompatibility) System:</i> Significantly high incidence of HLA-B27 is found in the patients as compared to the controls.	Sengupta et al., 1979
		<i>Congenital Malformations: Congenital Heart Disease</i>	<i>Blood Group Systems:</i> There is preponderance of groups O and A in congenital heart disease, which however is not significant. There is an increased incidence of the Rh negative group amongst these patients which is highly significant.	Sidana et al., 1970 Sidana et al., 1970
		<i>Congenital Malformations: Spina Bifida Cystica</i>	<i>Blood Group Systems:</i> There is preponderance of groups O and A in the patients as compared to the control. This difference, however, is not significant. Similarly, the difference in Rh blood groups is insignificant.	Sidana et al., 1970

S. No.	Place	Category/ Diseases	Remarks	Authors
		Congenital Malformations: Other Congenital Anomalies	Blood Group Systems: A preponderance of blood group A is observed in anorectal and tracheoesophageal anomalies, preponderance of blood group O in congenital megacolon, preponderance of blood group B in hypospadias and AB in club foot, haemangioma and congenital megacolon. These groups are not subjected to statistical analysis.	Sidana et al., 1970
		Diabetic Diseases: Diabetes Mellitus	Blood Group Systems: Statistically significant increase of group O among patients in general and in male patients in particular.	Jolly et al., 1969
		Neoplasms: Malignant Diseases	Finger Dermoglyphics: An increased frequency of whorls and arches and decreased frequency of loops in the patients with malignant diseases (head, neck and miscellaneous groups) and the preponderance of arches observed in carcinoma cervix group. Various indices have shown significant differences.	Chauhan et al., 1983
		Mental Disorders: Unipolar and Bipolar Affective Disorders	Blood Group Systems: The statistically significant associations between unipolar affective disorder and phenotype A and bipolar affective disorder and phenotype O have been found. Serum Protein Systems: There is an increase of homozygotes Hp 2-2 and decrease of heterozygotes Hp 2-1 in bipolar affective disorder.	Balgir, 1986
5. Haryana				
6. Delhi (U.T.)				
		Respiratory Diseases: Asthma	Blood Group Systems: A highly significant increase in the incidence of asthma in the persons of blood group B. In genotype NN minor statistically significant difference between the asthmatic patients and controls is found. There is quite significant association of asthma with R.R ₁ (CCDee) genotype.	Anand, 1964a
		Diabetic Diseases: Diabetes	Blood Group Systems: Though the relative incidence is found to be higher in blood groups O and B, the difference is not statistically significant.	Lamba et al., 1974
		Diabetic Diseases: Diabetes Mellitus (insulin-dependent)	HLA (Histocompatibility) System: The frequency of HLA-DR 3 is significantly increased in the patients as compared with the controls. HLA-DR 2 shows a significant negative association, but DR 4 has no relationship with this disease.	Bhatia et al., 1985
		Congenital Anomalies: 21-Hydroxylase Congenital adrenal Hyperplasia	HLA (Histocompatibility) System: One patient with HLA A3 antigen is identified.	Mathews et al., 1983
		Infectious Diseases: Leprosy	HLA (Histocompatibility) System: At the first locus, the difference in frequencies of HLA _A antigens between normal subjects and patients with lepromatous leprosy is not found to be statistically significant. Although the frequency of HL-A8 at the second locus apparently seemed to be increased and that of HL-A9 at the first locus is found to be decreased in patients with non-lepromatous leprosy as compared with the normal controls.	Dasgupta et al., 1975

S. No.	Place	Category/ Diseases	Remarks	Authors
		Eye Diseases: Retinitis Pigmentosa	Dermatoglyphics (Finger and Palmar): Retinitis pigmentosa group differs from the control group mainly for a-b ridge counts and for the positions of axial triradii. Besides these, differences for some palmar patterns and atd angles are also observed. However, for the total finger ridge counts and fingertip patterns, there are no significant differences.	Deshmukh et al., 1983
		Diseases of Digestive System: Childhood Cirrhosis	Serum Protein Systems: In patients, the incidence of the C ₂ gene is increased compared to the normal population.	Sahai et al., 1986
		Diseases of Circulatory System: Systemic lupus erythematosus	Finger Dermatoglyphics: In the patients, there is no deviation from the pattern exhibited in the control group.	Sahai et al., 1986
		Infectious Diseases: Malaria	Blood Group Systems: Group A is found more frequently in malaria cases than in the controls and vice versa for group O.	Gupta & Rai Chowdhuri, 1980
		Respiratory Diseases: Pulmonary Tuberculosis	Blood Group Systems: The proportion of patients having blood group O is considerably lower as compared to the controls. HLA (Histocompatibility) System: No significant deviation is observed in the HLA-A, -B and -C locus antigens. With HLA-DR typing, there is a marginal increase in DR 2 and a concurrent significant decrease in DR w6 in the patient group.	Singh et al., 1983
		Heart Diseases: Rheumatic Heart Disease	HLA (Histocompatibility) System: A significant increase in the frequency of antigens A28 and BW35 and a significant decrease in the frequency of B13 are observed in patients. A high frequency of DR3 is observed in the patient group as compared to the normal controls.	Rao et al., 1982
		Rheumatic Diseases: Seronegative Spondarthritides	HLA (Histocompatibility) System: HLA B27 is present in more than 90 per cent of the cases with seronegative spondarthritides.	Malaviya et al., 1979
		Diseases of Digestive System: Peptic Ulcer	Blood Group Systems: Proportion of group O cases in the control population is found to be significantly less than the proportion in the peptic ulcer group. Statistically significant, higher percentage of non-secretors in all the blood groups in peptic ulcer cases than in control group.	Dutta & Dutta, 1973
		Infectious Diseases: Pulmonary Tuberculosis	Blood Group Systems: The frequency of blood group B and Rh negative is appreciably high as compared to the normal individuals. A very high frequency of gene N obtained among the affected individuals, differs significantly on comparison with normal population.	Kshatriya & Kapoor, 1991
7.	Uttar Pradesh			
		B. CENTRAL HIMALAYA (S. No. 7, Eight Districts of Uttar Pradesh)*		
	Kanpur	Neoplasms: Cancer Cervix	Blood Group Systems: Relative incidence of cancer cervix in group AB females is high as compared to inci-	Tyagi et al., 1967

* Almora, Chamoli, Dehra Dun, Garhwal (Pauri), Naini Tal, Pithoragarh, Tehri Garhwal, Uttarkashi

S. No.	Place	Category/ Diseases	Remarks	Authors
	Agra	Neoplasms: Oral Cancer	dence in group O females. This value is statistically significant. Blood Group Systems: In patients with oral cancer statistically insignificant increase in group A or O individuals is observed. Though, a highly significant incidence of blood groups O and A is found amongst patients with cancer of buccal mucosa as compared to controls.	Mital & Gupta, 1969
	Lucknow	Diseases of the Blood: Anaemia, Microcyte Hypochromic Group	Blood Group Systems: The frequency of blood group O in this type of anaemia is found high in comparison to control group. There is no significant change in the frequencies of other groups.	Nath et al., 1963
	Lucknow	Diseases of Digestive System: Chronic Cholecystitis	Blood Group Systems: No association of any blood group (ABO) could be demonstrated.	
	Lucknow	Diseases of Digestive System: Cirrhosis of Liver	Blood Group Systems: The blood group A in this disease is higher than that in the general population. It is associated with a decrease in the frequencies of groups O and B.	Nath et al., 1963
	Lucknow	Diabetic Diseases: Diabetes Mellitus	Blood Group Systems: There is a high frequency of A among diabetic subjects as compared to its frequency in the general population. There is a corresponding reduction in the frequencies of groups B and O and no significant change in the frequency of AB group.	Nath et al., 1963
	Lucknow	Genito-Urinary Diseases: Enlarged Prostate	Blood Group Systems: There are no specific frequency differences in the distribution of ABO blood groups in patients as compared to control group.	Nath et al., 1963
	Lucknow	Genito-Urinary Diseases: Fibroid Uterus	Blood Group Systems: The frequency of group B is higher in patient as compared to its incidence in the general population. There is no such change in the other groups.	Nath et al., 1963
	Lucknow	Diseases of Circulatory System: Hypertension	Blood Group Systems: B group is found to be predominant among hypertensive as against control. There is a corresponding reduction in the frequency of A blood group.	Nath et al., 1963
	Lucknow	Diseases of the Blood: Normocytic Hypochromic Anaemia	Blood Group Systems: No association of any blood group with disease.	Nath et al., 1963
	Lucknow	Diseases of Digestive System: Peptic Ulcer	Blood Group Systems: The frequency of O group is found higher among patients as against its frequency in the control group. There is no significant departure from normal for the blood groups B and AB.	Nath et al., 1963
	Lucknow	Infectious Diseases: Pulmonary Tuberculosis	Blood Group Systems: No association of blood groups (ABO and Rh) is observed.	Nath et al., 1963
	Lucknow	Diseases of the Blood: Tropical Eosinophilia	Blood Group Systems: The frequency of blood groups A and AB is high in patients. Groups B and O show a very low frequency.	Nath et al., 1963
	Varanasi	Infectious Diseases: Leprosy	Blood Group Systems: No relation between ABO blood groups and susceptibility to disease is observed.	Singh & Ojha, 1967
	Kanpur	Infectious Diseases: Leprosy	Blood Group Systems: There is no positive relationship between incidence of leprosy and blood groups, however,	Saxena et al., 1973

<i>S. No.</i>	<i>Place</i>	<i>Category/ Diseases</i>	<i>Remarks</i>	<i>Authors</i>
			once the disease has appeared it is felt that blood group O individuals are prone to tuberculoid type while blood group B individuals are prone to development of lepromatous lesions. The findings are statistically significant.	
	Kanpur	<i>Infectious Diseases: Pulmonary Tuberculosis</i>	<i>Blood Group Systems:</i> The distribution of blood groups in patients is similar to that found in control cases, except in the productive type of disease in which blood group AB predominates.	Navani & Narang, 1962
		<i>Genito-Urinary Diseases: Renal Lithiasis</i>	<i>Blood Group Systems:</i> A significant association of renal lithiasis with blood group A is observed.	Anand, 1964b
		<i>Rheumatic Diseases: Rheumatic Fever</i>	<i>Blood Group Systems:</i> The frequency differences of blood groups A, B and O in the patients and controls are found to be insignificant, while significantly larger number of patients are found to have blood group AB.	Ahmad et al., 1978
	Varanasi	<i>Diseases of the Skin: Vitiligo</i>	<i>Blood Group Systems:</i> A statistically significant increase in the proportion of secretors in vitiligo as compared to the normal controls is observed.	Sehgal & Dube, 1967
	Varanasi	<i>Diseases of the Skin: Vitiligo</i>	<i>Blood Group Systems:</i> There is a statistically significant excess of patients with blood groups B and A and less in patients with blood group O.	Sehgal & Dube, 1968
	Varanasi	<i>Diseases of the Skin: Vitiligo</i>	<i>Blood Group Systems:</i> A significant relationship of vitiligo with blood group AB is observed.	Singh & Shanker, 1966
		<i>Diseases of the Skin: Vitiligo</i>	<i>Blood Group Systems:</i> Blood group B has been found to occur more frequently in patients.	Srivastava & Shukla, 1965
	Kanpur	<i>Infectious Diseases: Osteo-articular Tuberculosis</i>	<i>Blood Group Systems:</i> B group appears to be more prone to osteo-articular tuberculosis as compared to other groups.	Nand & Yadav, 1964
	Kanpur	<i>Malignant Diseases: Malignant Diseases</i>	<i>Blood Group Systems:</i> Statistically, it is found that persons belonging to AB group are more susceptible to malignancy. Increased frequency of group A is noticed in cases of cancer of penis and stomach. Excess of B and O is noticed in cases of breast cancer. No significant result is observed in case of oral cancer.	Tyagi et al., 1965
8.	Rajasthan			
	Udaipur	<i>Diseases of Digestive System: Duodenal Ulcer</i>	<i>Blood Group Systems:</i> There is statistically significant association between blood group and peptic ulcer with preponderance in group O.	Sharma et al., 1969
		<i>Neoplasms: Cancer of Cervix Uteri</i>	<i>Blood Group Systems:</i> The patients show a strikingly high incidence in blood group A and the difference is highly significant statistically.	Gupta, 1968
	Jaipur	<i>Infectious Diseases: Pulmonary Tuberculosis</i>	<i>Blood Group Systems:</i> There is a significantly higher incidence of group AB among the patients than in the controls.	Jain, 1970
	North India			
	Patiala & Chandigarh	<i>Respiratory Diseases: Asthma</i>	<i>Blood Group Systems:</i> Results reveal non-significant differences between patients and controls as far as ABO and Rh blood groups are concerned. However, MN blood groups reveal significant differences between two series- the homozygous type MM being resistant and heterozygous type MN being susceptible to asthma.	Dhiman et al., 1990

S. No.	Place	Category/ Diseases	Remarks	Authors
	Dehra Dun & Delhi	<i>Diseases of the Blood:</i>	<i>Blood Group Systems:</i> A statistically significant high percentage of blood groups A and B has been observed in the patients.	Anand, 1961
	Chandigarh & New Delhi	<i>Eosinophilia</i> <i>Heart Diseases:</i> Fallot's Tetralogy	<i>Dermatoglyphics (Finger and Palmar):</i> (i) Pattern type with two <i>triradii</i> appears relatively more frequent in patients particularly on digits 3 and 5. (ii) <i>Singular</i> pattern type (arches and tented arches) are much less frequent in patients than in controls. (iii) The relative frequency of radial loops registers a marked increase in patients particularly on digit 2. (iv) There is a definite tendency for increased mean ridge count in patients as compared with the mean ridge count in controls.	Bulusu et al., 1983
	Patiala, Ludhiana, Jullundur, Amritsar & Delhi	<i>Eye Diseases:</i> Blindness	<i>Palmar Dermatoglyphics:</i> High frequency of whorls, high values of Furuhashi's index and pattern intensity index, incidence of pleiotropic and monomorphic hands and genotypes for thinner epidermis and lesser radial and ulnar cushioning are observed in congenital blinds.	Jindal & Bansal, 1983
II. WEST INDIA				
9. Gujarat				
	Surat District	<i>Infectious Diseases:</i> Malaria	<i>Blood Group Systems:</i> The blood group A antigen is more frequent in patients than in controls. P-positive individuals are less frequent in patients than in controls. <i>Serum Protein Systems:</i> Hp 1-1 individuals are obviously more frequent among patients than controls.	Singh et al., 1986
	Baroda	<i>Infectious Diseases:</i> Leprosy	<i>Blood Group Systems:</i> The ABO blood group distribution of leprosy patients does not differ significantly from that of the general population.	Verma & Dongre, 1965
	Surat	<i>Infectious Diseases:</i> Leprosy	<i>Blood Group Systems:</i> In lepromatous leprosy B group is affected less in the sample than in control and the difference is highly significant. No significant differences have been observed among other groups.	Shah et al., 1972
	Baroda District	<i>Infectious Diseases:</i> Tuberculoid Leprosy	<i>Blood Group Systems:</i> The distribution of blood groups (ABO) in the patients and controls does not differ significantly, suggesting that there is no association between the blood groups and incidence of tuberculoid leprosy.	Verma & Acharya, 1966
10. Maharashtra				
	Bombay	<i>Spondylitic Diseases:</i> Ankylosing Spondylitis <i>Neoplasms:</i> Cancer Breast <i>Neoplasms:</i> Cancer Cervix <i>Neoplasms:</i> Cancer Hypopharynx	<i>HLA (Histocompatibility) System:</i> A high degree of association of B27 with ankylosing spondylitis has been observed. <i>Blood Group Systems:</i> No significant differences in the ABO blood group distribution in the patients have been observed compared to that of the control. <i>Blood Group Systems:</i> There are no differences in the ABO distribution between the patients and the controls. <i>Blood Group Systems:</i> The percentage distribution of ABO blood groups in the disease group compared to that in the control shows significant differences and the relative incidence among B persons, compared to that of A and O group persons is also significantly higher.	Bale et al., 1980 Jayant, 1971 Jayant, 1971 Jayant, 1971

S. No.	Place	Category Diseases	Remarks	Authors
		<i>Neoplasms: Cancer of Cavity</i>	<i>Blood Group Systems:</i> The ABO distribution in patients as compared to that in the controls shows insignificant differences.	Jayant, 1971
		<i>Neoplasms: Cancer Oropharynx</i>	<i>Blood Group Systems:</i> No significant differences have been observed in the distribution of ABO blood groups in patients and controls.	Jayant, 1971
	Aurangabad	<i>Diabetic Diseases: Diabetes Mellitus</i>	<i>Dermatoglyphics (Finger and Palmar):</i> In diabetics significant variations are observed in the following dermatoglyphic traits: (1) Whorls on finger tips are increased (2) Ulnar loop frequency is decreased. (3) Frequency of Sydney line is increased. (4) Frequency of single radial base crease (SRBC) is increased. (5) C-ulnar frequency is decreased. (6) Frequency of arches is increased in females. (7) Radial loops are decreased in males.	Sant et al., 1979
	Nagpur	<i>Infectious Diseases: Leprosy</i>	<i>Enzyme Systems:</i> There is significant association between leprosy and erythrocyte G-6-PD.	Kher & Grover, 1969
	Bombay	<i>Diseases of the Skin: Multiple Sclerosis</i>	<i>HLA (Histocompatibility) System:</i> In patients, HLA-B12 antigen is present in excess in comparison with normal controls.	Wadia et al., 1980
	Bombay	<i>Diseases of Digestive System: Peptic Ulceration</i>	<i>Blood Group Systems:</i> No statistically significant increase in the incidence of peptic ulcer in any particular blood group (ABO) has been observed.	Joshi et al., 1958
		<i>Mental Disorders: Schizophrenia</i>	<i>Dermatoglyphics:</i> 48.85 per cent schizophrenic males show ridge-dissociation as compared to 4.50 per cent in normal males, while 28.21 per cent schizophrenic females show ridge-dissociation as compared to normal females.	Vaidya et al., 1981
	Bombay	<i>Infectious Diseases: Smallpox</i>	<i>Blood Group Systems:</i> Though no adequate control data are available for comparison, analyses of the findings show no statistically significant association between severity of smallpox and ABO blood groups. A similar negative association is found between fatal and non-fatal cases of smallpox.	Sukumaran et al., 1966
	Wardha District	<i>Infectious Diseases: Sporadic Tuberculoid Leprosy</i>	<i>HLA (Histocompatibility) System:</i> No significant differences in HLA haplotype-frequencies between patients and controls are detected.	van Eden et al., 1981
	Bombay	<i>Infectious Diseases: Tetanus</i>	<i>Blood Group Systems:</i> The distribution of ABO and Rh (D) groups among the tetanus patients are not significantly different from the frequencies in normal population. <i>HLA (Histocompatibility) System:</i> There is no significant difference in the frequency of any of the HLA antigens between the normal controls and the tetanus patients.	Bale et al., 1980
		<i>Infectious Diseases: Tuberculosis</i>	<i>Blood Group Systems:</i> Group A shows highest frequency in the case of tuberculosis.	Bhosale & Kulkarni, 1971
		<i>Diabetic Diseases: Diabetes</i>	<i>Blood Group Systems:</i> In diabetic patients, blood group O shows highest frequency.	Bhosale & Kulkarni, 1971
	Bombay	<i>Diseases of Digestive System: Neonatal Jaundice</i>	<i>Serum Protein Systems:</i> The incidence of Hp O-O is lower in icteric infants as compared to normals. Further analysis on the basis of mother-child haptoglobin combination shows significantly increased number of Hp 2-1 type icteric infants to Hp 2-1 type mothers.	Gupta et al., 1975

S. No.	Place	Category/ Diseases	Remarks	Authors
	Bombay	<i>Infectious Diseases: Smallpox</i>	<i>Blood Group Systems:</i> Though no adequate control data are available for comparison analyses of the findings shows no statistically significant association between severity of smallpox and ABO blood groups.	Sukumaran et al., 1966
	Bombay	<i>Infectious Diseases: Pulmonary Tuberculosis</i>	<i>Blood Group Systems:</i> There are no statistically significant differences between the ABO frequencies in the test and the control series. There is no evidence of any association between the blood groups and site of lesion.	Shenoy & Daftary, 1962
		<i>Infectious Diseases: Pulmonary Tuberculosis</i>	<i>Blood Group Systems:</i> No definite conclusion could be arrived at regarding the susceptibility or resistance of one ABO blood group over another or of the same group in different castes.	Kothare, 1959
	Sitapur	<i>Eye Diseases: Primary Glaucoma</i>	<i>Blood Group Systems:</i> Primary glaucoma is very common in blood groups A and B, less common in groups O and AB. It is also noted that the incidence of this disease is high in non-secretors rather than in secretors.	Garg & Pahwa, 1965
		<i>Infectious Diseases: Tuberculosis</i>	<i>Blood Group Systems:</i> Group A shows highest frequency, (36 percent) in case of tuberculosis.	Bhosale & Kulkarni, 1971
		<i>Diabetic Diseases: Diabetes</i>	<i>Blood Group Systems:</i> In case of diabetic patients blood group O shows highest frequency.	Bhosale & Kulkarni, 1971
11.	Goa, Daman and Diu			
12.	Dadra and Nagar Haveli (U.T.)			
III. EAST INDIA				
C. EASTERN HIMALAYA (S. No. 13 to 20 and Darjeeling District of West Bengal)				
13.	Arunachal Pradesh			
14.	Assam			
15.	Nagaland			
16.	Manipur			
17.	Mizoram			
18.	Tripura			
19.	Meghalaya			
20.	Sikkim			
21.	West Bengal			
	Calcutta	<i>Diabetic Diseases: Diabetes Mellitus</i>	<i>Dermatoglyphics (Finger and Palmar):</i> Diabetic males show slightly increased frequency of whorls as compared to that of the control group, but in the cases of other pattern types control group shows higher frequencies than those of diabetic males. Female diabetic group shows slightly higher frequency of loops (both the ulnar and radial) than that of the control counterparts. These differences are found to be statistically significant. The mean total finger ridge count (TFRC) of the diabetic males is found to be significantly higher than the control group; the female diabetic patients show the higher ridge count than the controls but the difference is statistically non-significant. C-main line types of the diabetic males shows significantly higher occurrence of proximal type than their control counterparts.	Banerjee et al., 1985
	Calcutta	<i>Infectious Diseases: Diarrhoea</i>	<i>Blood Group Systems:</i> Statistically significant difference is found in blood group O when comparison is	Sircar et al., 1981

S. No.	Place	Category/ Diseases	Remarks	Authors
		and Cholera	made between control and cholera groups. No significant association is however noticed between <i>V. parahaemolyticus</i> induced diarrhoea and ABO blood groups.	
		<i>Infectious Diseases: Leprosy</i>	<i>Blood Group Systems:</i> Blood group A is somewhat more frequent in lepromatous cases. However, the deviation is insignificant statistically.	Vogel & Chakravarti, 1966b
	Bankura & Calcutta	<i>Infectious Diseases: Leprosy</i>	<i>Blood Group Systems:</i> A significantly high frequency of O and low frequency of B blood group is found among the patients than in controls.	Ghosh & Mukherjee, 1970
	Bankura & Calcutta	<i>Lepromatous</i>		
		<i>Infectious Diseases: Leprosy</i>	<i>Blood Group Systems:</i> When the blood groups of tuberculoïd leprosy cases are compared with those of controls, no significant differences are observed in respect of ABO system.	Ghosh & Mukherjee, 1970
		<i>Tuberculoïd</i>		
	Bankura & Purulia	<i>Infectious Diseases: Leprosy</i>	<i>Blood Group Systems:</i> Significantly higher frequency of groups A and AB as compared to B and O in leprosy patients.	Vogel et al., 1971b
	Calcutta	<i>Mental Disorders: Schizophrenia</i>	<i>Palmar Dermatoglyphics:</i> Both male and female schizophrenics and normals show no marked differences in the incidence of true patterns in the various configurational areas.	Kannakar & Malhotra, 1983
	Bankura & Purulia Districts	<i>Infectious Diseases: Leprosy</i>	<i>Serum Protein Systems:</i> No associations are found concerning the haptoglobins and transferrins. Though Gc 2-1 as well as Gc 2-2 phenotypes are significantly much more frequent in healthy individuals as compared to those suffering from leprosy, in which Gc 1-1 phenotype shows an obvious higher incidence.	Walter et al., 1972
	Bankura & Purulia Districts	<i>Infectious Diseases: Leprosy</i>	<i>Serum Protein Systems:</i> There seems to be no association between leprosy and Inv types.	Vogel et al., 1971a
	Calcutta	<i>Diabetic Diseases: Diabetes Mellitus</i>	<i>Dermatoglyphics (Finger and Palmar):</i> There is an overall increase in the incidence of ulnar loops among the patients than in the controls. High frequency of distal axial triradii (t") and patterns (loops) in 2 and 3 interdigital areas in palms of the diabetic patients as compared to the controls, are observed. Low incidence of simian crease and of single flexion crease on V digit among patients and the controls is observed. Both hypothenar and thenar areas show more patterns in the patients than controls. Absence of main line C is strikingly more among patients than controls. Patterns on the hypothenar and thenar areas of per person as well as the patterns on I and III interdigital areas show significant differences.	Chakravarti, 1966
	Calcutta	<i>Diseases of Digestive System: Peptic Ulcer</i>	<i>Blood Group Systems:</i> There is statistically no significant difference in the ABO blood group frequencies between peptic ulcer patients and controls.	Ghosh et al., 1957
	Burdwan District	<i>Infectious Diseases: Smallpox</i>	<i>Blood Group Systems:</i> A strong and statistically significant difference in incidence between the patients and the control samples: groups A and AB are much more frequently affected than groups B and O.	Chakravarti et al., 1966
	Calcutta	<i>Diseases of the Skin: Vitiligo</i>	<i>Blood Group Systems:</i> No significant relationship between vitiligo and ABO blood groups. It does not also suggest any possible influence of group specific substances over the incidence and genesis of vitiligo.	Dutta et al., 1969

S. No.	Place	Category/ Diseases	Remarks	Authors
	Calcutta	<i>Infectious Diseases: Shigellosis</i>	<i>Blood Group Systems:</i> A significant association ($P < 0.01$) of blood group B is observed with shigellosis cases in comparison with controls.	Sinha et al., 1991
		<i>Diseases of the Blood: Cooley's Anaemia</i>	<i>Blood Group Systems:</i> High incidence of Rh (D) negative in Cooley's anaemia is observed.	Das Gupta et al., 1955
	Calcutta	<i>Infectious Diseases: Smallpox</i>	<i>Blood Group Systems:</i> Though no association between ABO blood groups and smallpox is observed, the chance of death in cases of severe infection is to be least in persons belonging to A blood group.	Bhattacharya et al., 1965
22.	Bihar			
	Patna	<i>Heart Diseases: Ischaemic Heart Disease</i>	<i>Blood Group Systems:</i> Significant difference has been observed due to an excess of group A or deficiency of groups B, O and AB in patients as compared to that in the controls.	Srivastava et al., 1966
	Ranchi	<i>Mental Disorders: Schizophrenia and Manic Depressive Psychosis</i>	<i>Blood Group Systems:</i> None of the different mental illnesses show any significant association with ABO or Rh blood groups. <i>Finger Dermatoglyphics:</i> Significantly higher incidence of which is observed on the fingers of the patients, most of whom are schizophrenic as compared to the controls.	Chakravarti et al., 1980
	Ranchi	<i>Diseases of Digestive System: Peptic Ulcer</i>	<i>Blood Group Systems:</i> Group O individuals are having higher risk to develop ulcer. There is a significantly higher proportion of non-secretors among the peptic ulcer patients than in controls. There appears to be no difference among the patients and controls belonging to O blood groups in respect of secretors and non-secretors.	Chakravarti & Chakravarti, 1979
		<i>Rheumatic Diseases: Rheumatic Diseases</i>	<i>Blood Group Systems:</i> The increased susceptibility in persons of blood group A and a relative resistance to rheumatic diseases in persons of blood group O is observed.	Sinha et al., 1971
23.	Orissa			
	Berhampur, Ganjam District	<i>Genito-Urinary Diseases: Benign enlargement of Prostate</i>	<i>Blood Group Systems:</i> The incidence of blood group B is definitely at a higher level among the patients.	Nayak, 1971
	Berhampur, Ganjam District	<i>Neoplasms: Carcinoma Stomach</i>	<i>Blood Group Systems:</i> There is preponderance of blood group A in carcinoma stomach patients.	Nayak, 1971
	Berhampur, Ganjam District	<i>Diseases of Digestive System: Peptic Ulcer</i>	<i>Blood Group Systems:</i> The number of peptic ulcer patients having blood group O has been found to be maximum.	Nayak, 1971
	Berhampur, Ganjam District	<i>Infectious Diseases: Tuberculosis</i>	<i>Blood Group Systems:</i> There is a preponderance of blood groups O and B in tuberculosis as compared to other blood groups.	Nayak, 1971
	East India			
	West Bengal and Bihar	<i>Infectious Diseases: Smallpox</i>	<i>Blood Group Systems:</i> Relative incidence of smallpox is shown to be much higher in suffering patients of groups A and AB, when compared with the controls.	Vogel & Chakravarti, 1960

IV. CENTRAL INDIA

24. Madhya Pradesh

S. No.	Place	Category/ Diseases	Remarks	Authors
	Bhopal	Neoplasms: Cancer (Oral Cavity, Face, Neck and Chest)	Blood Group Systems: Cancer lip shows preponderance of O, cancer chest shows preponderance of B, cancer tongue and tonsils show preponderance of B and AB while O group pre-dominate in cancer jaw.	Ghooi et al., 1970
	Bhopal	Neoplasms: Cancer (Gastro-intestinal Tract)	Blood Group Systems: Cancer oesophagus is found more common in B and AB groups. Cancer of stomach is observed common in B and A groups. Cancer colon is common in group B, cancer rectum in O while anal cancer does not show association for any particular blood group. Cancer liver and pancreas are more common in B group.	Ghooi et al., 1970
	Bhopal	Neoplasms: Cancer (Genito-urinary Tract)	Blood Group Systems: Bladder cancer has been found common in groups O and B. In carcinoma prostate group B is predominated. Cancer cervix is far more common in A and B groups and least common in O. B and A groups predominated in cancer penis. Cancer breast is found to be more common in B and A, respectively.	Ghooi et al., 1970
	Bhopal	Neoplasms: Cancer Sarcomas and Miscellaneous Groups	Blood Group Systems: Leukaemias are commoner in AB, B groups; the lymphatic tumors are frequent in A and B groups; while sarcomas are frequent in B groups.	Ghooi et al., 1970
	Gwalior	Neoplasms: Cancer Breast	Blood Group Systems: There is a preponderance of group B individuals in control series but there is a significant relationship of the disease to group O.	Majupuria et al., 1966
		Diseases of Digestive System: Duodenal Ulcer and Bleeding	Blood Group Systems: No group O preponderance is found among the duodenal ulcer patients taken as a whole but a definite group O preponderance is found among the ulcer patients who have bled.	Mitra, 1971
	Rourkela	Infectious Diseases: Filariasis	Blood Group Systems: No association has been found between the blood groups (A ₁ A ₂ BO, Duffy, Kell and Rhesus) and filariasis.	Anand, 1965
	Tekampur	Infectious Diseases: Infective Viral Conjunctivitis	Blood Group Systems: Among the control group B is the commonest blood group followed by O, but the frequency of infective viral conjunctivitis is highest in group A and next in B. These differences are significant.	Agarwal et al., 1975
	Gwalior	Skin Diseases: Chronic Eczema	Blood Group Systems: There is slight predominance of group B in chronic eczema cases.	Gupta & Gupta, 1966
	Gwalior	Skin Diseases: Psoriasis	Blood Group Systems: There is significant predominance of group O in patients.	Gupta & Gupta, 1966
	Gwalior	Skin Diseases: Vitiligo	Blood Group Systems: There is highly significant predominance of group AB in vitiligo cases though increase in O group frequency is also noted.	Gupta & Gupta, 1966
		Skin Diseases: Acne Vulgaris	Blood Group Systems: A significant association between blood group A and the incidence of acne vulgaris has been observed.	Gupta et al., 1966
		Genito-Urinary Diseases: Azoospermia	Blood Group Systems: The predominance of group O in azoospermia cases is observed.	Gupta & Gupta, 1965
	Gwalior	Infectious Diseases: Pulmonary Tuberculosis	Blood Group Systems: It is found that frequency of group A is slightly higher in pulmonary tuberculosis.	Gupta & Gupta, 1966

S. No.	Place	Category/ Diseases	Remarks	Authors
	Gwalior	<i>Infectious Diseases:</i> Leprosy <i>Neoplasms:</i> Cancer Cervix	<i>Blood Group Systems:</i> Significantly higher frequency of group AB is found in leprosy. <i>Blood Group Systems:</i> There is a definite relation between blood group A and cancer cervix.	Gupta & Gupta, 1966 Majumuria & Gupta, 1966
V. SOUTH INDIA				
25.	Karnataka Bangalore	<i>Mental Disorders:</i> Manic Depressive Psychosis	<i>Finger Dermatoglyphics:</i> The pattern of ulnar loops is significantly less in female patients than among controls, and whorls are often seen in patients than among controls.	Naryanan & Mallikarjunaiah, 1983
26.	Andhra Pradesh Hyderabad	<i>Neoplasms:</i> Carcinoma of Cervix	<i>Dermatoglyphics (Finger and Palmar):</i> The significant differences are: the frequency of whorls on the finger tips is increased, there is a decrease in the frequency of patterns in the thenar/I area and an increase in interdigital areas III and IV, and the d-t ridge count as well as the Δ angle decrease.	Reddy et al., 1977
	Hyderabad	<i>Neoplasms:</i> Carcinoma of Cervix	<i>Blood Group Systems:</i> Differences in the frequencies of ABO blood groups between the patients and the controls are not significant. However, the frequency of group O is higher and group B lower in the patients than in the controls.	Reddy et al., 1980
	Hyderabad	<i>Infectious Diseases:</i> Chicken Pox	<i>Blood Group Systems:</i> The comparison of blood group frequencies in patients show statistically significant values, group A subjects having a somewhat higher risk than subjects of group B or O.	Chakravarti & Chakravarti, 1977
	Hyderabad	<i>Diabetic Diseases:</i> Diabetes Mellitus	<i>Finger Dermatoglyphics:</i> A significant increase in total finger ridge count in male patients and in patients representing both sexes. A considerable increase in the t-d ridge count in male and female patients which become significant in the pooled data.	Iqbal et al., 1978
	Hyderabad	<i>Diseases of Circulatory System:</i> Hypertension	<i>Serum Protein Systems:</i> Compared to controls, patients with Hp 2-2 phenotypes show a significantly increased risk for essential hypertension and hypertension associated with ischaemic heart disease. There is a significant decrease in the mean levels of serum haptoglobins in hypertension as compared to controls.	Prabha et al., 1987
	Hyderabad	<i>Rheumatic Diseases:</i> Rheumatic Heart Disease	<i>Finger Dermatoglyphics:</i> The parameters which are significantly different from the controls are: (1) reduced frequency of arches on the finger tips in males and increased frequency of whorls in females; (2) increased frequency of patterns in the III interdigital area in males; (3) decreased d-t ridge count in females, and (4) higher incidence of multiple axial triradii in females.	Annapurana et al., 1978
	Hyderabad	<i>Miscellaneous Diseases:</i> Rheumatic and Congenital Heart Disease	<i>Serum Protein Systems:</i> The distribution of frequencies of rheumatic heart disease patients in each of the Hp types is about the same as the expected values but that in the congenital heart disease differed significantly where the frequency in the Hp 2-1 type is lower and the frequencies in the Hp 1-1 as well as Hp 2-2 types are higher than the expected values.	Ahuja et al., 1980

S. No.	Place	Category/ Diseases	Remarks	Authors
	Hyderabad	<i>Diseases of Circulatory System: Rheumatic and Congenital Heart Disease</i>	<i>Phenylthiocarbamide Tasting System:</i> No association is found between PTC taste sensitivity and rheumatic or congenital heart diseases. <i>Morphological and Behavioural Traits:</i> Earlobing is associated with both types of heart diseases (an increase in free ear lobes), where as handedness is associated with congenital heart disease (an increase in left handedness). There is no association between hand clasping and this disease.	Vishnupriya et al., 1978
	Hyderabad	<i>Diseases of Circulatory System: Rheumatic and Congenital Heart Disease</i>	<i>Serum Protein Systems:</i> The frequency distribution of haptoglobin phenotypes is within the expected range in rheumatic heart disease, but differed significantly in congenital heart disease. In latter case, the frequency of Hp 2-1 type is lower and the frequencies of Hp 1-1 and Hp 2-2 types are higher than the expected values.	Ahuja et al., 1980
	Hyderabad	<i>Heart Diseases: Rheumatic Heart Disease Congenital Diseases: Congenital Heart Disease Diabetic Diseases: Diabetes Mellitus Neoplasms: Carcinoma of Cervix Diseases of the Skin: Vitiligo</i>	<i>Finger Dermatoglyphics:</i> There is a reduction in mean t-d ridge count in the female patients of all the categories as compared to the controls, the difference being significant except in pulmonary stenosis. <i>Blood Group Systems:</i> The relative risk of O is significantly reduced in patients in comparison with blood donors but not with local population.	Ahuja et al., 1984
	Hyderabad	<i>Diabetic Diseases: Diabetes Mellitus</i>	<i>Dermatoglyphics (Finger and Palmar):</i> There is an increase in the number of whorls, and an increase in total finger ridge count as well as ridge counts on the II, III and IV digits in the right hand of the male patients. On the palms there is an increase in c-d and a-d ridge counts, on the right hands of the male patients. Significant differences from the controls for all the traits are observed.	Ahuja et al., 1983
	Hyderabad	<i>Eye Diseases: Retinal Detachments</i>	<i>Serum Protein Systems:</i> No incidence of an abnormal haemoglobin is observed while high incidence of Hp 2-2 shows a significant deviation from controls.	Padma et al., 1980
	Visakhapatnam	<i>Diabetic Diseases: Diabetes Mellitus</i>	<i>Blood Group Systems:</i> No significant difference between diabetic and control is observed with regard to ABO and MN blood groups. However, an excess of O blood group is observed among the diabetics. The incidence of Rh- blood group is very low among both the patients and controls.	Busi & Chakravarti, 1973
		<i>Eye Diseases: Blindness</i>	<i>Dermatoglyphics (Finger and Palmar):</i> Significant differences in parameters namely, radial loops, interdigital/ hypothenar patterns, main line index between controls and patients are noted.	Fatima et al., 1983

S. No.	Place	Category/ Diseases	Remarks	Authors
	Hyderabad	Ear Diseases: Partial Deafness	Dermatoglyphics (Finger and Palmar): The frequency of ulnar loops is significantly lower in the affected children than in controls. There is no difference in the frequency of patterns on hypothenar, thenar/I, II, III and IV interdigital ridges in the partially deaf children when compared with controls and also in case of modal lines of C and D and simian crease. But there is an increase, though not significant, in the TFR, a-b, b-d ridge counts in the affected children as compared with the controls.	Sujatha et al., 1983
	Tirupati	Infectious Diseases: Bronchial Asthma	Blood Group Systems: There is an occurrence of statistically significant higher frequency of group O among the bronchial asthma patients in comparison with the control group.	Ramachandraiah et al., 1984
	Masulipatnam	Infectious Diseases: Pulmonary Tuberculosis	Blood Group Systems: No significant association has been found between the diseased persons and ABO blood groups. However, an excess of B group individuals is observed in the tuberculosis patients.	Ramachandraiah et al., 1984
	Kottala, Tirupati	Diseases of Digestive System: Jaundice	Blood Group Systems: No definite relationship between the occurrence of jaundice and ABO phenotypes is found.	Ramachandraiah et al., 1978
	Kottala, Tirupati	Infectious Diseases: Filariasis	Blood Group Systems: No definite relationship is found between the occurrence of filariasis and ABO blood groups.	Ramachandraiah et al., 1978
	Kottala, Tirupati	Diabetic Diseases: Diabetes Mellitus	Blood Group Systems: A possible relationship is found to exist between the occurrence of diabetes mellitus and ABO phenotypes. The diabetic patients tend to show an excess of A phenotypes among them.	Ramachandraiah et al., 1978
		Infectious Diseases: Filariasis	Blood Group Systems: The distributions of ABO blood groups are not different between the patients and the control group.	Subramanyam & Ramachandraiah, 1978
	Hyderabad	Eye Diseases: Eye Diseases	Phenylthiocarbamide Tasting System: The incidence of nontasters for PTC is significantly high in cases with congenital cataract, ophthalmic retinal detachment and convergent and divergent squint as compared to controls. Blood Group Systems: Blood group A individuals show significantly high risk for zonular cataract, corneal dystrophy and convergent squint; group B individuals for zonular cataract and group O individuals for nuclear cataract, myopia and convergent squint. There is a high preponderance of non-secretors in zonular cataract and primary glaucoma cases when compared with controls. Serum Protein Systems: A strong association is found between Hp 2-2 and retinal detachments especially those with vitreous degenerations. In general, when compared to controls, the frequency of Hp 2-2 is relatively low in nuclear, zonular, cortical and senile cataracts, while it is high in rest of the diseases.	Padma & Murty, 1983
27. Tamil Nadu	Madras	Infectious Diseases: Leprosy	Blood Group Systems: No significant difference is observed in the frequencies of ABO genes.	Prasad & Ali, 1966

S. No.	Place	Category/ Diseases	Remarks	Authors
	South Arcot District	<i>Infectious Diseases: Filariasis</i>	<i>Blood Group Systems:</i> An excess of B and a deficiency of AB is observed among the filarial patients. Only males show clearly significant risks. The Rh (D) blood groups reveal no association with filariasis.	Srikumari Srisailapathy et al., 1990
	Nilgiri Hills	<i>Miscellaneous Diseases: Acanthiasis, Catarract, Corneal Ulcer, Tuberculosis, Diabetes and Bronchial Asthma</i>	<i>Blood Group Systems:</i> Considering the proportions of all the diseases together occurring in the Badaga patients it is found that 47.65 per cent of them belonged to O group as compared to 31.25 per cent of normals (an excess of 16.4 per cent). But in Toda patients blood groups other than O show higher prevalence as compared to the controls.	Reddy et al., 1978
28.	Kerala Ernakulam	<i>Infectious Diseases: Filariasis</i>	<i>Blood Group Systems:</i> No statistically significant differences have been observed in the frequency of ABO blood groups between patients and controls.	Nair et al., 1959
29.	Pondicherry (U.T.)			
	VI. ISLANDS			
30.	Lakshadweep (U.T.)			
31.	Andaman and Nicobar Islands (U.T.)			
	VII. OTHERS			
	Durban, South Africa	<i>Neoplasms: Cancer</i>	<i>HLA (Histocompatibility) System:</i> There is an increase in the frequency of the HLA antigens A 11 and Bw 52 in patients with malignancies. Heterozygosity at B locus is significantly increased in patients with cancer of the breast. The Aw 24, B17 haplotype is also associated with breast cancer.	Hammond et al., 1979
	Singapore	<i>Diabetic Diseases: Diabetes Mellitus</i>	<i>Blood Group, Enzyme and Haemoglobin Systems:</i> A positive association with a higher incidence of G6PD deficiency in diabetics is observed in Indian patients. There is no significant difference in the frequencies of ABO blood groups and haemoglobin types between the patients and controls.	Saha, 1979
	Singapore	<i>Diseases of Circulatory System: Myocardial Infarction</i>	<i>Blood Group, Enzyme and Haemoglobin Systems:</i> There is no significant difference in the distribution of the genetic markers (ABO, Rh, Le ^a , Xg ^a , G6PD and Hb) between patients and controls (Indians).	Saha et al., 1973
	Poona & Delhi	<i>Mental Disorders: Psychiatric Diseases</i>	<i>Blood Group Systems:</i> There is higher proportion of cases with blood group O among the psychiatric cases than among the control group.	Singh, 1969
	Singapore	<i>Respiratory Diseases: Pulmonary Tuberculosis</i>	<i>Blood Group Systems:</i> No significant differences in the frequency distribution of ABO and Rh blood groups in patients as compared with controls are detected in Indians.	Saha & Banerjee, 1968
	Singapore	<i>Infectious Diseases: Pulmonary Tuberculosis</i>	<i>Haemoglobin (Hb) Variants:</i> There is no significant difference between the prevalence of abnormal haemoglobin in Indian patients as compared to normals.	Saha, 1970
	Singapore	<i>Infectious Diseases: Syphilis</i>	<i>Blood Group Systems:</i> There is a low frequency of O group as compared to B group in syphilis in Indian patients, but the difference is not significant. <i>Haemoglobin (Hb) Variants:</i> The prevalence of abnormal haemoglobins is less frequent amongst syphilitics than the normal controls, but the association is not significant.	Saha & Banerjee, 1971

S. No.	Place	Category/ Diseases	Remarks	Authors
	Delhi & Maharashtra	Infectious Diseases: Leprosy	Blood Group Systems: The frequency of blood group A is high in leprosy patients as compared to controls and also the frequency of group AB is low among patients and this difference is statistically significant.	Ghei & Vaidya, 1976a
	Delhi & Maharashtra	Infectious Diseases: Leprosy	Blood Group Systems: Frequency of blood group M is found to be high in patients as compared to the controls. It is also noticed that frequency of heterozygote MN decreased in patients as compared to controls.	Ghei & Vaidya, 1976b
	NEPAL BHUTAN SRI LANKA PAKISTAN BANGLADESH			
		Infectious Diseases: Cholera	Blood Group Systems: There is a significant relationship between disease severity and O blood group.	Glass et al., 1985
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