

The ABO Blood Group Frequency Distribution of Kuala Lumpur based on a Blood Donor Sample

by *Gnanasothie Duraisamy* and *R.D. Amarasingham*

Blood Transfusion Unit,
General Hospital,
Kuala Lumpur.

Department of Chemistry
Penang.

Introduction

THE ABO BLOOD GROUP frequencies of the non-aboriginal population of Western Malaysia has been studied by Simmons et al¹ (1950), Schebesta² (1952) and Poon Wai Lum and Amarasingham³ (1968). The studies in all these cases have been on small numbers. The ABO group frequencies of the population of Singapore has been more thoroughly studied by Allen et al⁴ (1947), Gibson-Hill⁵ (1953) and Yeoh⁶ (1960) and in 1962 K.T. Chan⁷ (1962) published data on a large-scale survey of blood donors in Singapore. The population of Western Malaysia is composed mainly of Malays, Chinese and Indians. The ethnic background of the non-aboriginal population of Western Malaysia is similar to that of Singapore. It is expected that the ABO blood group distribution among the various races in Western Malaysia would be similar to that of Singapore.

Aim

The purpose of this study is to establish the ABO group frequencies among Malays, Chinese and Indians of Kuala Lumpur, the capital of Western Malaysia, using a large sample of normal healthy people. The results would be useful in the study into the possible association of various diseases to blood groups in the different races living here and also in evaluating the value of blood group evidence in crimes where blood grouping results are involved.

Procedure

(a) Materials and Methods

The records of the Blood Transfusion Unit, General Hospital, Kuala Lumpur were examined and all blood donors registered between May 1961 and August 1970 were taken as the sample in the present series. The donors may be regarded as normal adults for the reasons given below.

(b) Acceptance of Donors

A blood donor is accepted by the Blood Transfusion Unit on the following criteria:—

- (i) Donors must be between 18 and 60 years of age.
- (ii) Donor's weight must be more than 100 lbs.
- (iii) Donors should have no recent history of having malaria, jaundice or other serious illness.
- (iv) Their haemoglobin level must be over 85%.
- (v) Prior to the donation, the doctor assesses the donor to make sure that he is physically fit to donate blood.

(c) Determination of Blood Group

The blood is separated into cells and serum and both these entities are used to determine the blood group. The cells are tested against commercially prepared Anti-A and Anti-B sera, and the blood group result is cross-checked by testing the serum against standard A cells and B cells on a tile.

TABLE Ia
Year by year distribution of ABO blood groups among the three major locally domiciled ethnic groups in Kuala Lumpur.

YEAR	M A L A Y S								
	Total No. of Groupings Done	ABSOLUTE NUMBERS				PERCENTAGES			
		O	A	B	AB	O	A	B	AB
1961 (May-Dec.)	1,113	510	250	284	69	45.8	22.5	25.5	6.2
1962	1,496	640	375	395	86	42.8	25.1	26.4	5.7
1963	1,340	534	308	396	102	39.85	23.0	29.55	7.6
1964	1,483	636	353	377	117	42.9	23.8	25.4	7.9
1965	1,476	685	332	376	83	46.4	22.5	25.5	5.6
1966	1,217	509	300	343	65	41.8	24.65	28.2	5.35
1967	1,582	776	372	345	89	49.1	23.5	21.8	5.6
1968	1,624	754	399	366	105	46.4	24.6	22.5	6.5
1969	1,765	751	460	453	101	42.55	26.05	25.7	5.7
1970 (Jan.-Aug.)	1,460	655	360	361	84	44.85	24.65	24.7	5.8

YEAR	C H I N E S E								
	Total No. of Groupings Done	ABSOLUTE NUMBERS				PERCENTAGES			
		O	A	B	AB	O	A	B	AB
1961 (May-Dec.)	714	349	171	164	30	48.9	23.95	22.95	4.2
1962	998	472	234	232	60	47.3	23.45	23.25	6.0
1963	1,005	461	262	241	41	45.8	26.1	24.0	4.1
1964	935	457	231	209	38	48.8	24.7	22.4	4.1
1965	871	429	209	202	31	49.25	24.0	23.2	3.55
1966	619	295	148	153	23	47.7	23.9	24.7	3.7
1967	697	326	182	163	26	46.8	26.1	23.4	3.7
1968	620	297	156	143	24	47.9	25.15	23.05	3.9
1969	713	325	184	171	33	45.6	25.8	24.0	4.6
1970 (Jan.-Aug.)	414	196	102	94	22	47.4	24.6	22.7	5.3

Criteria for Ethnic Division

The ethnic group chosen for study are the major race groups residing in Kuala Lumpur (Western Malaysia) and the criteria for ethnic sub-division adopted in the present survey is as follows:—

(1) Malays: All Malays of Western Malaysia.

(2) Chinese: All Chinese from any part of China.

(3) Indians: Northern and Southern Indians, Pakistanis and Ceylonese.

Results

In all, a total of 29,040 blood groups were available for analysis, comprising 14,556 Malays, 7,586

ABO BLOOD GROUP FREQUENCY

TABLE Ia

YEAR	INDIANS								
	Total No. of Groupings Done	ABSOLUTE NUMBERS				PERCENTAGES			
		O	A	B	AB	O	A	B	AB
1961 (May–Dec.)	549	220	127	168	34	40.1	23.1	30.6	6.2
1962	793	327	153	257	56	41.2	19.3	32.4	7.1
1963	637	255	139	193	50	40.0	21.8	30.3	7.9
1964	709	306	147	204	52	43.2	20.7	28.8	7.3
1965	701	296	141	224	40	42.2	20.1	32.0	5.7
1966	593	242	146	156	49	40.8	24.6	26.3	8.3
1967	838	369	184	237	48	44.0	22.0	28.3	5.7
1968	807	374	156	229	48	46.35	19.3	28.4	5.95
1969	752	357	144	210	41	47.5	19.15	27.9	5.45
1970 (Jan.–Aug.)	519	227	113	152	27	43.7	21.8	29.3	5.2

TABLE Ib

The distribution of ABO blood groups among the three major locally domiciled ethnic groups in Kuala Lumpur. (1961 to 1970)

Ethnic Origin	Total No. of groupings done	Absolute Numbers				Percentages			
		O	A	B	AB	O	A	B	AB
Malays	14,556	6450	3509	3696	901	44.3	24.1	25.4	6.2
Chinese	7,586	3607	1879	1772	328	47.5	24.7	23.3	4.3
Indians	6,898	2973	1450	2030	445	43.1	21.0	29.4	6.4

TABLE II

Gene frequencies of the three Major Ethnic groups in Kuala Lumpur

Ethnic Group	p	q	r
Malays	16.21	16.98	66.82
Chinese	16.04	15.21	68.76
Indians	14.51	19.60	65.89

Chinese and 6,898 Indians. The results are summarised in Tables 1a and 1b which gives the absolute numbers in each ethnic and blood group and the corresponding percentages.

The ethnic distribution of the donor sample is

compared to the ethnic distribution of the general population of Kuala Lumpur in Table VI. From it, it will be seen that the majority of donors are Malays, although they form the lowest percentage of the population of the Kuala Lumpur district. It has been

TABLE III
The ABO group and Gene frequencies of Malays in this series compared with other investigations in Singapore and Malaysia.

Series	Place	Population	Authors	Numbers	Percentages				p	q	t
					O	A	B	AB			
1.	Kuala Lumpur	Malays	Present Series 1970	14,556	44.3	24.1	25.4	6.2	16.21	16.98	66.82
2.	West Malaysia West Malaysia	Malays	Poon Wai Lum & R.D. Amarasingham 1967	616	36.86	25.16	31.98	6.0	17.837	22.027	60.136
3.	Singapore	Malays	K.T. Chan, 1961	5461	38.42	20.07	29.23	7.29	17.70	20.26	62.04
4.	Perak	Malays	Schebesta, 1952	44	30.09	20.45	43.18	2.27	—	—	—
5.	Singapore	Malays	Gibson-Hill, 1953	42	40.48	16.67	40.48	2.38	—	—	—
6.	Singapore	Malays	Allen & MacGregor 1947	1963	40.45	26.54	25.67	7.34	18.65	18.11	63.24

noted that the reason for this is that they are the ones who come forward to donate more willingly. They also form the majority of large donor groups such as the Police, Army and the Dusun Tua Youth Camp. The percentage of Chinese donors is very small compared to the population percentage.

The gene frequencies were calculated by the formulae of Fisher's method which were published by Dobson and Ikin in 1966 and Roberts in 1948. The results are summarised in Table II.

The formula is given below:—

$$p = \frac{t-s}{v} \quad q = \frac{u-s}{v} \quad \text{and} \quad r = \frac{s}{v}$$

$$\text{where } s = \sqrt{\frac{O}{O+A}}$$

$$t = \sqrt{\frac{O}{O+B}}$$

$$u = \sqrt{\frac{O}{O+A+B}}$$

$$\text{and } v = t + u - s$$

in which O, A, and B are the actual number of cases in Groups O, A and B in the sample.

Discussion

- (a) The year-to-year variation was found to be slight in the distribution within each group.
- (b) The three ethnic groups were found to have different frequency distribution. The Chinese have a relatively high group O frequency with about the same A and B group frequencies. In the case of the Indians, there was a significantly large distribution of Group B over Group A, 29.4% against 21.0%. In the case of the Malays the difference of Group B over Group A was a much smaller amount, a difference of 1.3%.
- (c) Tables III to V give a comparison of the ABO group frequencies found in the survey compared with the investigation of other workers on similar ethnic groups in Western Malaysia and Singapore. The results indicate that there is not much variation between the Chinese and Indian ethnic groups living in these territories. The frequency distribution of the Malays show differences particularly with the B group where the percentage was found to be 25.4%, which is rather lower than that of the Poon Wai Lum and R.D. Amarasingham series and the K.T. Chan series which were 31.98 and 29.25% respectively. It is, however, very similar to that found by Allen and Macgregor which was 25.67%.

Summary

The ABO group distribution among the main race

ABO BLOOD GROUP FREQUENCY

TABLE IV
The ABO and Gene frequencies of Chinese in this series compared with other investigations in Singapore and Malaysia.

Series	Place	Population	Authors	Numbers	Percentages				p	q	r
					O	A	B	AB			
1.	Kuala Lumpur W. Malaysia West Malaysia	Overseas Chinese Overseas Chinese	Present Series 1970 Poon Wai Lum & R.D. Amarasingham 1967	7,586	47.5	24.7	23.3	4.3	16.04	15.21	68.76
2.				940	45.85	23.29	25.54	5.32	15.409	16.776	67.755
3.	Singapore	Overseas Chinese	K. T. Chan, 1961	15,262	43.53	25.99	24.99	5.48	17.363	16.741	65.896
4.	Singapore	Overseas Chinese	Allen & MacGregor, 1947	624	43.11	24.04	27.72	3.13	15.87	18.09	66.04
5.	Malaya	South Chinese	Simmons et al, 1950	250	46.4	25.2	20.8	7.6	16.5	13.9	68.1
6.	Singapore	Overseas Chinese	Yeoh, 1960	1,000	44.30	25.5	26.5	3.70	16.79	17.39	65.82

TABLE V
The ABO group and Gene frequencies of Indians in this series compared with other investigations in Singapore and Malaysia.

Series	Place	Population	Authors	Numbers	Percentages				p	q	r
					O	A	B	AB			
1.	Kuala Lumpur W. Malaysia	Indians, Pakistanis & Ceylonese	Present Series 1970	6,898	43.1	21.0	29.4	6.4	14.51	19.60	65.89
2.	West Malaysia	-do -	Poon Wai Lum & R.D. Amarasingham 1967	826	34.87	22.03	35.84	7.26	16.308	24.931	58.761
3.	Singapore	-do -	K. T. Chan, 1961	5,000	39.02	21.02	33.60	6.36	14.983	22.700	62.317
4.	Singapore	Northern Indians	Allen & MacGregor 1947	1,478	34.30	24.97	32.61	8.12	18.22	23.04	58.74
5.	Singapore	Southern Indians	Allen & MacGregor 1947	389	31.88	76.73	34.45	6.94	18.70	23.62	57.68

TABLE VI
Distribution of Donor samples and population in the District of Kuala Lumpur
among the three major locally domiciled Ethnic groups.
(Adjusted to the criterion for ethnic division adopted in the study)

Ethnic Group	Population*		Donor Sample	
	Number	Percentage	Number	Percentage
Malays	124,815	16.79	14,506	50.13
Chinese	493,765	66.42	7,586	26.12
Indians	124,815	16.79	6,898	23.75

*Estimated population for year 1968 — information from Department of Statistics, Malaysia.

in Kuala Lumpur, West Malaysia, has been determined using a large sample from data collected from the Blood Transfusion Unit of the Kuala Lumpur General Hospital.

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