

---

## Rh-Chromosome Frequencies in Pakistan

Nargis Parveen,\* M.B.,B.S.,  
M.Phil. Physiology,  
Postgraduate Medical Institute,  
Peshawar, Pakistan.

### Summary

*A total of 3000 individuals were studied for Rh sub-groups. Most of the subjects were students from different colleges in Lahore. It was found that the commonest genotype was CDe/CDe in this area amongst the Rh+ve individuals and the genotype cde/cde was maximum amongst the Rh-ve cases.*

*The commonest antigen was 'D' with a frequency of 0.7379; 'd' had a frequency of 0.2620. Antigen 'C' was having a frequency of 0.5946 and antigen 'c' was 0.4054. Antigen 'E' was having a frequency of 0.4229 and 'e' was 0.5771.*

### Introduction

This paper shows the results of testing 3000 samples of blood from Lahore area with the Rh antibodies: anti-D, Anti-C, anti-E, anti-c and anti-e.

The discovery of the six elementary Rh-antigens and their mutual relationship resulted from a study by Fisher<sup>1</sup> in 1943. The three pairs of allelomorphous antigens were called C and c, D and d, E and e. A chromosome could carry any combination of the 3 pairs e.g. CDe, cde, CdE, CDE and so on. Since each individual has 2 sets of chromosomes so he has 2 sets of Rh-chromosomes as well, therefore, his genotype may be any combination e.g. CDe/cde, CDE/cDe, CDE/cdE and so on<sup>2</sup>. Twenty one different genotypes were determined in this study and from the results gene frequency for the different Rh-antigens was determined by the Square root method first introduced by Mourant in 1976.

---

\* Associate Professor of Physiology, Postgraduate Medical Institute, Lady Reading Hospital, Peshawar.

---

## Material and Methods

The blood samples were obtained from different educational institutions in the city of Lahore. The total number of individuals studied were 3000. For determination of Rh factors, 5 antisera were used i.e. anti-D, anti-C, anti-E, anti-c and anti-e from Biotest Diagnostics Germany and the method adopted was that of Dacie and Lewis (1975).

### Method

2-3% suspension was made from the patient's cells and was washed three times in normal saline. Then two sets of tubes were taken. To each set one drop of the anti serum against each antigen was placed at the bottom of the small tubes and two drops of the suspension was placed higher up. The red cells were then shaken down into the serum and mixed with the serum. The tubes were then settled conveniently into metal racks and put in a water bath at 37°C for 1 1/2 to 2 hours. After this period on one set of tubes Coomb's test was performed, while the second set was treated with 30% bovine albumin and the results compared in the following manner:

	<i>D</i>	<i>C</i>	<i>E</i>	<i>c</i>	<i>e</i>
<i>ALBUMIN</i>	+	+	-	-	+
<i>COOMB'S</i>	+	+	-	+	+
<i>FINAL RESULT</i>	+	+	-	+	+

*Cc Dee*

### Results

Blood samples were collected from 3000 individuals belonging to different colleges in Lahore and the following results were determined:-

Table-I shows the different genotypes that were detected in this study.

Table-II shows the Rh-chromosome frequencies calculated by square root method of Mourant (1976).

Table-III shows the frequency of the six elementary antigens.

## DIFFERENT GENOTYPES DETECTED IN THE STUDY

TABLE - I

Rh +			Rh -		
GENOTYPE	NUMBER OBSERVED	% age	GENOTYPE	NUMBER OBSERVED	% age
CDe/CDe	1009	36.1	cde/cde	148	71.84
CDe/Cde					
cDe/cDe	154	5.5	Cde/cde	37	17.9
cDe/cde					
CDe/cDe	653	21.76	cdE/cdE	10	4.85
CDc/cde					
CDE/cDe	696	23.2	cdE/cde	5	2.43
CDE/cde					
cDE/cDe	157	5.6	Cde/cde	6	3.00
cDE/cde					
cDE/cde	19	0.7			
CDE/cde					
CDE/cDE	58	2.1			
CDE/cdE					
CDE/CDE	48	1.7			
CDE/CdE					
TOTAL	2794	100	TOTAL	206	100

---

**RH-CHROMOSOME FREQUENCIES CALCULATED BY  
SQUARE ROOT METHOD OF MOURANT (1976)**

TABLE-II

CHROMOSOME		FREQUENCIES
CDE	R2	.1499
CDe	R1	.4437
Cde	R	.0129
cDE	R2	.0795
cDe	R6	.0919
cdE	R"	.0201
cde	r	.2331

**FREQUENCY OF SIX ELEMENTARY ANTIGENS**

TABLE-III

Rh FACTOR	GENE FREQUENCY
D	0.7379
d	0.2620
C	0.5946
c	0.4054
E	0.4229
e	0.5771

---

**Discussion**

In this study the commonest genotype amongst Rh+ve observed cases was CDe/CDe (33.6%). Next common Rh + ve genotype was CDE/cDe (23.3%).

Out of the Rh-ve cases the commonest genotype observed was cde/cde and the rarest group of Rh-chromosomes was found to be CdE/cde (0.2%). Regarding the Rh-antigen frequencies the antigen 'D' was having a frequency of 0.7379 and 'd' was found to be 0.2620. Gen. 'C' was 0.5946 and 'c' was 0.4054. 'E' was found to have a frequency of 0.4229 and antigen 'e' was 0.5771.

This study shows that the chromosome CDe/CDe is maximally distributed in our community and such is the case almost throughout the world as shown by different studies. Nizehuis in 1964 and Woodd Walker in 1976 showed similar figures in Iran and Afghanistan respectively<sup>2</sup>. Similar studies in Northern India i.e. Assam and Bihar by Miki et al (1960)<sup>4</sup> and Kumar et al (1969) showed maximum frequency of CDE/CDe in these areas.

A study in Uttar Pardesh by Tiwari and Bihar<sup>5</sup> in 1968 showed CDE/CDe to be the commonest genotype.

In all the above mentioned studies the commonest Rh-negative genotype observed was cde/cde, with the exception of a few countries like U.S.S.R. where common Rh-ve genotype observed was Cde/cde<sup>6</sup>. Regarding the antigen frequency as calculated by the method of Mourant (1976), the commonest antigens observed in our community were antigen 'D', antigen 'C' and antigen 'e' and this shows similarity with the study done by Miki et al in 1960 and Kumar et al in 1969. Our figures show some similarity with figures from Saudi Arabia, Marangian, 1957, and Japan, Massatashi, 1966<sup>2</sup>. There is wide variation in figures from England as shown by Simmons et al, 1966<sup>2</sup>.

---

**Acknowledgement**

I am indebted to Dr. Nusrat Waqar, Professor Physiology, King Edward Medical College, Lahore for supervising my work. I am very grateful to Dr. Abdul Hayee, Associate Professor of Haematology, King Edward Medical College, Lahore and Dr. Tasleem Akhtar, Director, Pakistan Medical Research Council, Peshawar for their constructive criticism and guidance.

I am also thankful to Mr. Akbar Khan for his secretarial help.

**References**

1. Race, R.R., and Sanger, R., (1975); Blood groups in Man. Black-well Scientific Publication.
2. Mourant, Kopec, Kazimier, (1976); The distribution of Human blood groups and other polymorphisms.
3. Nijen Huis, L.E., (1964); Blood group frequencies in Iran. Vox San., 9: 723-40.
4. Miki, T., Tanaker., (1960); Rh-phenotypes in Khasis of Assam. Proc. Japan Acad., 36: 229-33.
5. Tiwari, S.C. and Bihar, M.K., (1968); The Blood groups of the Brahmins and Rajputs of Garhwal. Hum. Biol., 40: 386-95.
6. Verbitsky, M. Sh., Aunenkov, (1972), Distribution of genetic iso antigens of Blood group systems among the population of Abkhazian Svanetis. Vep. Anthrop, 40; 123-33.
7. Maranj. G., Ikin, Euizabeth W., Mourant, A.E. and Lehmann, H., (1966); The blood groups and hamolohins of the Saudi Arabians. Hum. Biol. 38: 394-420.