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# Rh Antigen and Phenotype Frequency in Kalba Region, UAE

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**Objective: To evaluate the frequency of Rh-phenotypes and the most probable genotype in Kalba region, UAE.**

**Design: Random Prospective cohort study.**

**Setting: Kalba hospital.**

**Method: The study was conducted on 661 blood samples from both sexes and in different age groups who were randomly selected. ABO and Rh phenotype reactivity was determined by using tube method according to the manufacturer's instruction. The Rh antigens studied were D, C, c, E and e.**

**Result: The most frequently occurring antigen was found to be e 643 (97.3%), followed by D 602 (91.1%), C 484 (73.2%), c 470 (71%) and E 139 (21%).**

**The Rh genotypes present in decreasing order of frequency as follows:**
**$R^1r$ 204 (30.9%), $R^1R^1$ 186 (28%), $R^1R^2$ 76 (11.5%), $R^0R^0$ 72 (10.9%), rr 48 (7.3%), $R^2r$ 44 (6.7%), $R^2R^2$ 12 (1.8%), $r'r$ 8 (1.2%), $r'r'$ 4 (0.6%), $R^zR^2$ 4 (0.6%), $R^zR^z$ 1 (0.1%), $r'r''$ 1(0.1%), $r''r''$ 1 (0.1%).**

**Conclusion: The study shows that the most frequent Rh antigen in Kalba region is e antigen. Thirteen Rh phenotypic groups of various frequencies were recorded. Knowledge of blood group phenotype distribution is very important for blood banks and transfusion service policies.**

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The ABO system was recognized by Karl Landsteiner in 1901 and remains the most important in transfusion medicine. Thirty years later and in cooperation with Alexander S Wiener, the rhesus (Rh) group was discovered[1]. The Rh blood group is the most diverse of the human blood, consisting of at least 45 independent antigens making it the most complex RBC antigen system[2]. The antigens are located on two Rhesus proteins -RhD and RhCE- and are produced by difference in their protein sequence[3]. Their expression is controlled by two closely linked genes on chromosome one, gene codes for D and for CcEe[4].

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Three methods of Rh nomenclature were described. Fisher and Race proposed that the Rh antigens were controlled by three closely linked genes giving rise to eight gene complex or haplotypes: CDe, cDe cDE, CDE, cde, Cde, cdE and CdE. At about the same time, Wiener proposed that there was only one Rh gene, controlling a number of blood factors, equivalent to C, c, D, E, e[5]. Rosenfield proposed a system of nomenclature based on serologic observation. Symbols were not intended to convey genetic information, merely to facilitate communication of phenotypic data. Each antigen is given a number, generally in the order of its discovery or its assignment to the Rh system[6]. The antigen $Rh^1$ is D in Fisher-Race terminology and it corresponds with the blood factor $Rh^0$ according to Wiener[7].

Knowledge of Rh phenotypes in given population is relevant for better planning and management of blood bank; the main goal is to find compatible blood for patients needing multiple blood transfusions[8].

The aim of this study is to evaluate the frequency of Rh-phenotype in Kalba region, UAE.

## METHOD

The study was performed on 661 blood samples from both sexes and different age groups who were randomly selected. The study population consisted only of UAE nationality.

**Serology:** Two ml of venous blood was collected from each subject into EDTA tubes. The blood samples were typed by tube method using ABO and Rh (D) typing Antisera Seraclone, Biotec Lab, Germany. All D negatives results were confirmed microscopically. Albumin and AHG test were used as control and for weak D confirmation. RBCs were phenotype for C, c, E and e antigens according to standard serologic protocols (tube method) using monoclonal antisera from DiaMed-Switzerland[6].

## RESULT

Three hundred twenty samples (48.4%) were group O, 159 (24%) group A, 151 (22.8%) group B and 31 (4.7%) group AB. One weak D antigen was encountered in this study out of 661 samples tested, which was consider as Rh D (+), thus the incidence of weak D detected was found to be 0.1% of total individuals and 1.7% among Rh negative individuals, see table 1.

**Table 1: Prevalence of ABO and Rh (D) Phenotype**

| Phenotype | Number & Percentage |
|---|---|
| **ABO phenotype** | |
| A | 159 (24) |
| B | 151 (22.8) |
| AB | 31 (4.7) |
| O | 320 (48.4) |
| **Total** | **661 (100)** |
| **Rh (D) phenotype** | |
| Rh (+ve) | 601 (91) |

| | |
|---|---|
| Rh (-ve) | 59 (8.9) |
| Weak D (+) | 1 (0.1) |
| **Total** | **661 (100)** |

Table 2 shows the frequency of the five Rh antigens in the population. The antigens were found as follows: e 643 (97.3%), D 602 (91.1%), C 484 (73.2%), c 470 (71%) and E 139 (21%). One weak D antigen was encountered in this study.

**Table 2: Frequency Distribution of Rh Antigens**

| Antigen | Number & Percentage |
|---|---|
| D* | 602 (91.1%) |
| C | 484 (73.2%) |
| c | 470 (71%) |
| E | 139 (21%) |
| e | 643 (97.3%) |

*One is weak D positive consider Rh (D) positive

The Rh phenotype frequencies are shown in table 3. Thirteen phenotypes were found: CcDee 204 (30. 9%). CCDEE, CcdEe and ccdEE were rare phenotypes in the population. Of 59 subjects that were D-negative, 48 were ccdee phenotype.

**Table 3: Number and Percentage of Most Probable Rh Phenotypes and Genotypes**

| Phenotypes | Probable genotype | Frequency (%) |
|---|---|---|
| CcDee | $R^1r$ | 204 (30.9%) |
| CCDee | $R^1R^1$ | 186 (28.1%) |
| CcDEe | $R^1R^2$ | 76 (11.5%) |
| ccDee | $R^0R^0$ | 72 (10.9%) |
| ccdee | rr | 48 (7.3%) |
| ccDEe | $R^2r$ | 44 (6.7%) |
| ccDEE | $R^2R^2$ | 12 (1.8%) |
| Ccdee | $r'r$ | 8 (1.2%) |
| CCdee | $r'r'$ | 4 (0.6%) |
| CcDEE | $R^zR^2$ | 4 (0.6%) |
| CCDEE | $R^zR^z$ | 1 (0.1%) |
| CcdEe | $r'r''$ | 1 (0.1%) |
| ccdEE | $r''r''$ | 1 (0.1%) |

## DISCUSSION

Rh D positive (91%) in this study was similar to some neighboring countries, Kurds/Iraq (91.7%), Saudi Arabia (91.2%), a marked difference from those of Caucasian (85%) and Indians (94.2%); therefore, the number of cases of hemolytic disease of the newborn (HDN) are expected to be much lower[9-12]. Only one case of weak D antigen was detected. The overall incidence of weak D was found 0.1% and 1.7% among Rh-negative individuals. A study in Indian showed that the incidence of weak D is 0.12% among Rh-negative individuals[13].

The result of this study was similar to those obtained from Nigeria except for C, c and D; in that study, it was revealed that D was 95%, C 17.7%, c 99.8%, e 98.7% and E 20.5%[14]. In a study by Thakral et al from India, e antigens was 98.3%, D, C 84.7%, c 52.8% and E 17.9% among blood donors[15].

In this study, it was found that the most common probable Rh-genotypes present in decreasing order of frequency were $R^1r$, $R^1R^1$, $R^1R^2$, $R^0R^0$, rr, $R^2r$, $R^2R^2$, $r'r$, $r'r'$, $R^zR^2$, $R^zR^z$, $r'r''$, $r''r$ similar results were obtained from Saudi Arabia and Jordan[8,16].

Among 59 Rh D negative subjects, ccdee (rr) was the commonest phenotype (48 out of 59). A study by Kurexijiang et al, in Khotan, showed that among 106 Rh D negative individuals all the phenotypes were ce except one that was cEe[17].

## CONCLUSION

**The Rh negative was found to be 8.9%. The most frequently occurring antigens were e (97.3%), D (91.1%), C (73.2%), c (71%) and E (21%).**

**Rh genotypes present in decreasing order of frequency were $R^1r$, $R^1R^1$, $R^1R^2$,$R^0R^0$, rr, $R^2r$, $R^2R^2$, $r'r$, $r'r'$, $R^zR^2$, $R^zR^z$, $r'r''$ and $r''r$.**

**Further studies using complex antibodies and direct DNA analysis are recommended.**

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**Competing interest**: None **Sponsorship**: None

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