

## Demographic Distribution and Prevalence of ABO and Rhesus Blood Groups in Blood Donors: Study from a Tertiary Care Centre in Southern Region of Andhra Pradesh

B. V. Sai Prasad<sup>1</sup>, Md Khader Faheem<sup>2</sup>, N. V. H. Rajesh Krishna<sup>3</sup>,  
B. H. Poorna Chandra Sekhar<sup>4</sup>, S. Vijayalakshmi<sup>5</sup>, Preethi<sup>6</sup>, A. Venkata Lakshmi<sup>7</sup>, B. Anuradha<sup>8</sup>

<sup>1</sup>Associate Professor, Department of Pathology, S.V. Medical College, Tirupati, India

<sup>2,3,4,5</sup>Assistant Professor, Department of Pathology, S.V. Medical College, Tirupati, India

<sup>6</sup>Internee, Model Blood Bank, S.V.R.R.G.G. Hospital / S.V. Medical College, Tirupati, India

<sup>7</sup>Professor, Department of Pathology, S.V. Medical College, Tirupati, India

<sup>8</sup>Professor & Head, Department of Pathology, S.V. Medical College, Tirupati, India

\*Corresponding Author: Md Khader Faheem

### Abstract

**Introduction:** ABO and Rhesus (Rh) blood grouping and typing are the two main pillars of foundation for appropriate functioning and safe blood banking. The blood groups carry genetic information. Among twenty discovered blood group systems ABO and Rh remain as the most important ones clinically.

**Materials and Methods:** A retrospective study was carried with 43839 blood donors' records. The blood group was determined by forward grouping (cell grouping) and reverse (serum grouping) grouping methods. Gene / allelic frequencies of the variables were calculated.

**Results:** Total number of blood units collected was 43839; from January 2012 to December 2017. The study showed there were 93.37% of male donors and 6.62% of female donors. The percentage of ABO blood groups in descending order in present study is noticed as O>B>A>AB. There were 95.96% of Rh positive and only 4.03% of Rh negative blood units. Allele distribution was calculated for I<sup>A</sup> (p); I<sup>B</sup> (q) and I<sup>O</sup> (r) as 0.0525; 0.2723 and 0.6752 respectively.

**Conclusion:** The most common blood group - 'O' Positive (44.53%) and the least common was 'AB' Negative (0.51%). The data helps in appropriate maintenance of inventory in the blood bank and also helps health care professionals to formulate proper steps to ensure accurate blood transfusion protocol, safe blood transfusion during any sort of health challenges and calamities.

**Key words:** ABO & Rh blood group, allele, blood, donor, gene

Date of Submission: 26-06-2018

Date Of Acceptance: 10-07-2018

### I. Introduction

ABO and Rhesus (Rh) blood grouping and typing is most important mode of evaluation of blood group in an individual. Discovery of ABO blood groups by Karl Landsteiner is an initial breakthrough in field of transfusion medicine which was followed by discovery of Rh antigens[1,2].

The blood groups carry genetic information and the antigens are transmitted hereditarily. A blood group not only plays a major role in safe transfusion but also helps us in understanding genetics, pattern of inheritance and disease susceptibility[3].

Even though there are more than twenty discovered blood group systems. ABO and Rh remain as the most important ones clinically. The frequency of ABO and Rh – D phenotypes has been studied in different populations and groups with extensive statistical analysis. There are also evidences showing that, a different blood group in particular shows association with different diseases[4].

The ABO blood group system is the only system in which antibodies are consistently and predictably present in the serum of normal individuals whose red cells lack antigens. Apart from differences amongst species, differences between the individuals of same species also have been noticed. Rh blood group system is equally important and is a prime essentiality in obstetrics. Hemolytic disease of newborn is one of the gravest diseases which need immediate care, evaluation and management[5].

The study is formulated in order to secure more number of blood units which are needed and to have sufficient supply of demanding blood group units which in turn helps in reducing hospital deaths due to maternal ill health, accidents and mishaps.

## II. Materials and Methods

A retrospective study was carried out with 43839 blood donors' records. All the donors were between 18-60 years of age. The study subjects have donated blood in Model Blood Bank, S.V.R.R. Government General Hospital, Tirupati and in voluntary blood donation camps organized from January 2012 to December 2017 i.e., for seven years. Each and every donor was thoroughly counseled and examined along with a record of personal data of the individual. The blood group of donated blood was determined by forward grouping (cell grouping) and reverse (serum grouping) grouping methods. Forward grouping was performed with the help of anti sera of ABO and Rh blood groups and reverse grouping was performed by conventional tube method from pilot samples of the donors. Standard operative procedures accepted and authorized by hospital authorities were followed for the procedures. Final blood group was established after both forward and reverse grouping are found out to be the same of a particular sample.

The "O" blood group donors were tested with anti-H Lectin to rule out Bombay blood group. Frequency and percentage of each variable was calculated and 95% confidence intervals were also evaluated using Fisher exact (Clopper – Pearson) for the proportions of each blood group to the total available sample for appropriate definition of normal range.

Hardy Weinberg equilibrium with Ceppilini corrections was used as standard assumption to evaluate gene / allelic frequencies of the variables.

## III. Results

Total number of donors registered was 43839, from January 2012 to December 2017. There was no particular trend in number of blood units collected and groups noticed during the study. The distribution, total collection of blood units with respect to ABO, Rh grouping and typing with 95% confidence intervals is tabulated in **Table no. 1**.

The study revealed that, there were 93.37% of male donors and 6.62% of female donors. There is a gradual increase in female donors from 2012 to 2017; where in during 2017 there were 670 (1.34%) of the total number of donors.

**Table no: 1. Prevalence of ABO blood groups and Rh factor. Year wise collection with 95% confidence limits of individual blood groups.**

| Year  | Rh Positive Blood groups |                          |                          |                        |                          | Rh Negative Blood groups |                       |                       |                       |                        | Grand Total per year   |
|---|--------------------------|--------------------------|--------------------------|------------------------|--------------------------|--------------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|
|   | A positive               | B positive               | O positive               | AB positive            | TOTAL Rh positive        | A negative               | B negative            | O negative            | AB negative           | TOTAL Rh negative      |                        |
| 2012  | 488                      | 2347                     | 3436                     | 532                    | 6803                     | 63                       | 188                   | 144                   | 40                    | 435                    | <b>7238</b>            |
| 2013  | 478                      | 2903                     | 3104                     | 120                    | 6605                     | 18                       | 104                   | 71                    | 12                    | 205                    | <b>6810</b>            |
| 2014  | 388                      | 3123                     | 3344                     | 112                    | 6967                     | 32                       | 121                   | 64                    | 36                    | 253                    | <b>7220</b>            |
| 2015  | 410                      | 2990                     | 3997                     | 290                    | 7687                     | 28                       | 142                   | 51                    | 34                    | 255                    | <b>7942</b>            |
| 2016  | 275                      | 3257                     | 3312                     | 235                    | 7349                     | 64                       | 171                   | 72                    | 48                    | 355                    | <b>7704</b>            |
| 2017  | 742                      | 2998                     | 2331                     | 590                    | 6661                     | 78                       | 67                    | 63                    | 56                    | 264                    | <b>6925</b>            |
| <b>Total</b>  | <b>2781</b><br>(6.34%)   | <b>17888</b><br>(40.80%) | <b>19524</b><br>(44.53%) | <b>1879</b><br>(4.28%) | <b>42072</b><br>(95.96%) | <b>283</b><br>(0.64%)    | <b>793</b><br>(1.80%) | <b>465</b><br>(1.06%) | <b>226</b><br>(0.51%) | <b>1767</b><br>(4.03%) | <b>43839</b><br>(100%) |
| <b>Confidence limits (95%)</b>  | (2.81-12.6)              | (31.26-50.28)            | (35.03-54.28)            | (1.643-9.925)          | (91.48-97.77)            | 0.02531-3.622)           | (0.243-5.446)         | (0.243-5.446)         | (0.0254-3.622)        | (1.644-9.926)          |                        |
| <i>Confidence limits [95% Fisher Exact (Clopper-Pearson)] for the proportions of each blood group to the total available sample (population under study).</i> |                          |                          |                          |                        |                          |                          |                       |                       |                       |                        |                        |

The percentage of ABO blood groups in descending order in present study is noticed as O>B>A>AB. ABO & Rh grouping of collected blood units is tabulated in **Table no. 2**.

The distribution of ABO Rh positive blood groups observed was as follows – O positive (44.53%); B positive (40.80%); A positive (6.34%); AB positive (4.28%); which accounts for 95.96% of Rh positive blood units. The distribution of ABO Rh negative blood groups was as follows – B negative (1.80%); O negative (1.06%); A negative – (0.64%); and AB negative (0.51%); which accounts for only 4.03% of Rh negative blood units. The data with respect to ABO, Rh group of blood and gender distribution is tabulated in **Table no. 3**.

The gene frequencies of ABO and Rh blood group are calculated using Hardy Weinberg equation and the respective frequencies and outcome are depicted in **Table no. 4 & 5**.

**Table no: 2. ABO & Rh group wise distribution of blood units**

| ABO Blood Group    | Rh Positive (%)    | Rh Negative (%) | Total ABO (%) | (%)          |
|--------------------|--------------------|-----------------|---------------|--------------|
| 'A'                | 2781 (90.76)       | 283 (9.23)      | 3064 (100)    | <b>6.98</b>  |
| 'B'                | 17888 (95.75)      | 793 (4.24)      | 18681 (100)   | <b>42.61</b> |
| 'O'                | 19524 (97.67)      | 465 (2.32)      | 19989 (100)   | <b>45.59</b> |
| 'AB'               | 1879 (89.26)       | 226 (10.73)     | 2105 (100)    | <b>4.80</b>  |
| 'D' (Rh positive)  | 42072 (95.96)      | -               | -             | <b>95.96</b> |
| 'd' (Rh negative)  | -                  | 1767 (4.03)     | -             | <b>4.03</b>  |
| <b>Grand Total</b> | <b>43839 (100)</b> |                 |               | <b>100</b>   |

**Table no: 3. Gender wise distribution of ABO & Rh blood groups**

| Blood group                     | Male (%)               |                      | Female (%)               |                    | Total (%)          |                    |
|---------------------------------|------------------------|----------------------|--------------------------|--------------------|--------------------|--------------------|
| <b>Rh Positive Blood groups</b> |                        |                      |                          |                    |                    |                    |
| <b>A Positive</b>               | 2321 (5.29)            |                      | 460 (3.87)               |                    | 2781 (6.34)        |                    |
| <b>B Positive</b>               | 16524 (37.69)          |                      | 1364 (3.11)              |                    | 17888 (40.80)      |                    |
| <b>O Positive</b>               | 18821 (42.93)          |                      | 703 (1.60)               |                    | 19524 (44.53)      |                    |
| <b>AB Positive</b>              | 1700 (3.87)            |                      | 179 (0.40)               |                    | 1879 (4.28)        |                    |
| <b>Total Rh Positive</b>        | 39366 (89.37)          |                      | 2706 (6.17)              |                    | 42072 (95.96)      |                    |
| <b>Rh Negative Blood groups</b> |                        |                      |                          |                    |                    |                    |
| <b>A Negative</b>               | 251 (0.57)             |                      | 32 (0.07)                |                    | 283 (0.64)         |                    |
| <b>B Negative</b>               | 721 (1.64)             |                      | 72 (0.16)                |                    | 793 (1.80)         |                    |
| <b>O Negative</b>               | 396 (0.90)             |                      | 69 (0.15)                |                    | 465 (1.06)         |                    |
| <b>AB Negative</b>              | 199 (0.45)             |                      | 27 (0.06)                |                    | 226 (0.51)         |                    |
| <b>Total Rh Negative</b>        | 1567 (3.57)            |                      | 200 (0.45)               |                    | 1767 (4.03)        |                    |
|                                 | <b>Total no. Males</b> | <b>40933 (93.37)</b> | <b>Total no. Females</b> | <b>2906 (6.62)</b> | <b>Grand Total</b> | <b>43839 (100)</b> |

#### IV. Discussion

The present study regarding distribution of blood groups helps us to ensure and follow safe blood transfusion and protocol respectively. This also plays an essential role in human evolution, genetic research etc[6,7]. There is a quite good evidence that, individuals with particular blood groups are associated with selective diseases like diabetes mellitus, duodenal ulcer, Rh and ABO incompatibility of new born etc.,[2]. In present study male donors are at an upper hand compared to female donors which was also seen in studies carried out by Giri P A et al[8], Patel Piyush et al[9], Teklu Zerihun et al[10], Soonam John[11] and many other research workers. The current study confirms that, "O" groups is most common ABO in our local demographic area and it was a similar finding in studies performed by various researchers in southern part of India (O<B<A<AB). But, the distribution of blood groups in various other zones is different and follows different trends. The findings of various researchers in comparison with present study are tabulated in **Table no. 6**.

**Table no: 4. ABO & Rh Allele frequency distribution**

| ABO & Rh (D) allele | Designated alphabet | Nomenclature   | Allele frequency |
|---------------------|---------------------|----------------|------------------|
| 'A' allele          | (p)                 | I <sup>A</sup> | <b>0.0525</b>    |
| 'B' allele          | (q)                 | I <sup>B</sup> | <b>0.2723</b>    |
| 'O' allele          | (r)                 | I <sup>O</sup> | <b>0.6752</b>    |
| 'D' allele          | (v)                 | I <sup>D</sup> | <b>0.7993</b>    |
| 'd' allele          | (u)                 | I <sup>d</sup> | <b>0.2007</b>    |

**Table no: 5. Comparison of observed and expected phenotype frequency among blood donors (with calculations and formulae)**

| Blood group system | Phenotype  | Observed frequency | Genotype |        | Expected frequency |        |
|--------------------|------------|--------------------|----------|--------|--------------------|--------|
| ABO                | A          | 0.0698             | AA       | $p^2$  | 0.0027             | 0.0735 |
|                    |            |                    | AO       | $2pr$  | 0.0708             |        |
|                    | B          | 0.4261             | BB       | $q^2$  | 0.0741             | 0.4418 |
|                    |            |                    | BO       | $2qr$  | 0.3677             |        |
|                    | O          | 0.4559             | OO       | $r^2$  | 0.4558             | 0.4558 |
| AB                 | 0.0480     | AB                 | $2pq$    | 0.0285 | 0.0285             |        |
| Rh                 | D positive | 0.9596             | DD       | $v^2$  | 0.6388             | 0.9596 |
|                    |            |                    | Dd       | $2uv$  | 0.3208             |        |
|                    | d negative | 0.0403             | dd       | $u^2$  | 0.0402             | 0.0402 |

The study revealed that 95.96% of blood donors are Rh positive for D-antigen. Only 4.03% showed Rh negativity. Rh D positivity is found in the range of 92% to 98% across India in different studies[15]. In present study gene frequencies were calculated for  $I^A$  (p);  $I^B$  (q) and  $I^O$  (r) as 0.0525; 0.2723 and 0.6752 respectively. We compared our findings with other studies carried out by Sidhu (2003)[26]; Agarwal et al [27] (2014); Suresh et al [14] (2015) and Raja K.A [19] (2016). The findings correlated with all above studies and are tabulated in **Table no. 7**.

### V. Conclusion

There is heterogeneity of blood groups around the world in different parts. The might be due to various genetic and environmental factors. A large population based study of a particular geographic area will help in deriving the essential steps to ensure safe and efficient transfusion protocol. The studies also help to ascertain optimum inventory management and selection of appropriate donors as per the needs of the blood bank without wasting surplus blood units. The knowledge of blood groups also helps in clinical trials and studies; forensic related issues etc. These sorts of studies are really essential to curtail deaths due to excessive blood loss, maternal and child health related problems – thus, opening an access to safe and sufficient supply of blood.

**Table no: 6. Comparison of prevalence and distribution of ABO and Rh blood groups in different regions of India and with different countries**

| Geographic Area | Location / Place<br>(Author, Year of study) | ABO Group |       |       |       | Rhesus Group |          |
|-----------------|---|-----------|-------|-------|-------|--------------|----------|
|                 |   | A         | B     | O     | AB    | Pos. (+)     | Neg. (-) |
| Southern India  | Tirupati (Present study, 2017)              | 6.98      | 42.61 | 45.59 | 4.80  | 95.96        | 4.03     |
|                 | Bengaluru (Periyavan A et al 2010) [12]     | 23.8      | 30.0  | 39.8  | 6.4   | 94.2         | 5.8      |
|                 | Shimoga (Girish CJ et al, 2011) [13]        | 24.3      | 29.4  | 39.1  | 7.1   | 94.9         | 5.1      |
|                 | Tirupati (Suresh et al, 2015) [14]          | 21.1      | 40.8  | 30.5  | 7.6   | 91.4         | 8.6      |
| Northern India  | Lucknow (Chandra et al, 2012) [15]          | 21.7      | 39.8  | 39.1  | 9.3   | 95.7         | 4.3      |
|                 | Amritsar (Kaur H et al, 2013) [16]          | 18.0      | 38.1  | 34.3  | 9.6   | 91.3         | 8.7      |
|                 | Uttarakhand (ParulGarg et al, 2014) [17]    | 28.7      | 32.0  | 28.7  | 10.5  | 94.5         | 5.5      |
| Central India   | Bhopal (Rajesh et al, 2015) [4]             | 22.52     | 35.92 | 30.99 | 10.55 | 95.42        | 4.57     |
| Eastern India   | Durgapur (Nag et al, 2013) [18]             | 23.90     | 33.60 | 34.80 | 7.70  | 94.70        | 5.30     |
| Western India   | Surat (Raja KA et al, 2016) [19]            | 24.35     | 34.43 | 32.26 | 8.94  | 95.12        | 4.87     |
|                 | Gandhinagar (Rupali et al, 2017) [20]       | 25.19     | 35.65 | 29.11 | 10.05 | 94.9         | 5.1      |
| International   | Nepal (Pramanik et al, 2000) [21]           | 34.00     | 29.50 | 32.50 | 4.00  | 96.70        | 3.30     |
|                 | Saudi Arabia (Bashwari et al, 2001) [22]    | 24.00     | 17.00 | 52.00 | 7.00  | 93.00        | 7.00     |
|                 | USA (Frances TF, 2002) [23]                 | 41.00     | 9.00  | 46.00 | 4.00  | 85.00        | 15.00    |
|                 | Pakistan (Rahman M et al, 2004) [24]        | 28.70     | 32.40 | 30.50 | 8.40  | 93.00        | 7.00     |
|                 | Britain (Firkin F et al, 2008) [25]         | 42.00     | 8.00  | 47.00 | 3.00  | 83.00        | 17.00    |

**Table no: 7. ABO & Rhesus gene frequency distribution in different research studies**

| Author<br>(year of study)     | Calculated ABO & Rhesus gene frequencies |        |        |        |        |
|-------------------------------|--|--------|--------|--------|--------|
|                               | $I^A$                                    | $I^B$  | $I^O$  | $I^D$  | $I^d$  |
| Present study (2017)          | 0.0525                                   | 0.2723 | 0.6752 | 0.7993 | 0.2007 |
| Sidhu S et al (2003) [26]     | 0.171                                    | 0.27   | 0.559  | 0.836  | 0.164  |
| AmitAgarwal et al (2014) [27] | 0.1653                                   | 0.2254 | 0.6093 | 0.7679 | 0.2321 |
| Suresh et al (2015) [14]      | 0.1398                                   | 0.2148 | 0.6454 | 0.7321 | 0.2679 |
| Raja KA et al (2016) [19]     | 0.1844                                   | 0.2477 | 0.5679 | 0.7794 | 0.2206 |

## References

- [1]. Hemalatha R, Bhagya V. Frequency and Distribution of Blood Groups Among Medical Students in Davanagere. *J Pub Health Med Res* 2015;3:1-4.
- [2]. Chandrika R, Jayaprakash S. Frequency of ABO and rhesus (D) blood groups in Dakshina kannada district of Karnataka-a study from rural tertiary care teaching Hospital in south India. Nitte University
- [3]. *Journal of Health Science*. 2014;3:57-60.
- [4]. Deshpande R.H., Wadde S.K. Distribution of Blood Groups in Blood Donors in Blood Banks of Latur. *Sch. J. App. Med. Sci.*, 2013;1(4):276-9
- [5]. Rajesh Kumar Chaurasia, Puja Sharma, Vivek Vikram Bharosey, Amit Haritwal, Shweeta Rana,G.K. Sawke, Shalaka Avasare, Nilima Sawke. A study of distribution of ABO and Rh Blood groups system among blood donors at a tertiary care hospital. *J of Evolution of Med and Dent Sci*. 2015;4(18):3138-42.
- [6]. Lo YM, Hjelm NM, Fidler C, Sargent IL, Murphy MF, et al. Prenatal diagnosis of fetal RhD status by molecular analysis of maternal plasma. *N Engl J Med*. 1998;339: 1734-8
- [7]. Shazia H, Samreen S. Distribution of ABO and Rhesus Blood Groups in Kashmir Valley. *International Journal of Science and Research*. 2014;3:233-5.
- [8]. Smita M, Dibyajyoti S (2014) Distribution and Prevalence of ABO and Rh Phenotype blood groups in Eastern India. *J Pharm Biomed Sci*. 2014;2230:712-5.
- [9]. Giri PA, Yadav S, Parhar GS, Phalke DB. Frequency of ABO and Rhesus Blood Groups: A study from a rural tertiary care teaching hospital in India. *Int J Biol Med Res*.2011; 2(4):988-90.
- [10]. Patel PA, Patel SP, Shah JV, Oza HV. Frequency and distribution of blood groups in blood donors in western Ahmedabad – a hospital based study. *National J. Med. Res*.2012; 2(2):207-10.
- [11]. Teklu Zerihun, Shiferaw Bekele. Pattern of ABO and Rhesus Blood groups distribution of five years survey in Jimma town Blood Bank, South West Ethiopia. *J Health Edu Res Dev*. 2016;4(3): 177.
- [12]. Soonam John. Prevalence of ABO and Rhesus Blood groups in Blood Donors: A study from a tertiary care centre in South Kerala. *Int J of Contemporary Med Res*. 2017; 4(11):2314-6.
- [13]. Periyavan A, Sangeetha S K, Marimuthu P, Manjunath BK, Seema DM. Distribution of ABO and Rhesus-D, groups in and around Bangalore. *Asian J Transfus Sci*. 2010;4 (1):41.
- [14]. Girish CJ, Chandrashekhar TN, Ramesh Babu K, Kantikar SM. ABO and Rhesus blood group distribution among Malnad region blood donors. *Research and Reviews in Biomedicine and Biotechnology (RRBB)*.2011;2(3):25-30.
- [15]. B.Suresh, K.V.Sreedhar Babu, P.Chandra Mouli, R.Arun, D.S.Jothibai. Distribution of ABO and rhesus (D) blood group antigens among blood donors at a tertiary care teaching hospital blood bank in south India. *J Clin Sci Res* 2015; 4:129-35.
- [16]. Chandra T, Gupta A. Frequency of ABO and rhesus blood groups in blood donors. *Asian J Transfus Sci*. 2012;6:52-3.
- [17]. Kaur H, Khanna A, Manjari M, Khanna M. Prevalence of ABO blood groups and rhesus (Rh) factor in the population residing in and around Amritsar, Punjab (a 4-year study from June 2007 to June 2011). *Asian J Transfus Sci*. 2013;7(2):159.
- [18]. Parul G, Saloni U, Sanjay SC, Uman H, Ishwer T. Prevalence of ABO and Rhesus Blood Groups in blood donors: A study from a tertiary care teaching hospital of Kumaon region of Uttarakhand. *Journal of clinical and diagnostic research*.2014;8(12):16-9.
- [19]. Nag I, Das SS. ABO and Rhesus blood groups in potential blood donors at Durgapur Steel city of the district of Burdwan, West Bengal. *Asian J. Transfus Sci*. 2012;6(1): 54-5.
- [20]. Kruti A. Raja, Gopi H. Dobariya, Chirag A. Unagar, Amrishi N. Pandya, Nitendra N. Patel, Sangita J. Wadhvani. Frequency and distribution of ABO and Rh blood groups among blood donors in tertiary care hospital of South Gujarat, India. *Int J Res Med Sci*. 2016; 4(12):5377-81.
- [21]. Rupali Patil, Vandana Patel, Minesh B. Gandhi. Frequency and distribution fo ABO and Rh Blood group antigens in healthy blood donors at the blood bank of a tertiary care hospital in Gandhinagar, Gujarat, India. *Indian Journal of Pathology and Oncology*. 2017; 4(4):586-90.
- [22]. Pramanik, T. & S. Pramanik.: Distribution of ABO and Rh blood groups in Nepalese medical students: a report. *East Mediter. Health J*. 2000; 1:156-8.
- [23]. Bashwari LA, Al Mulhim AA, Ahmad MS, Ahmed MA. Frequency of ABO blood groups in Eastern region of Saudi Arabia. *Saudi Med J*. 2001; 22:1008-12.
- [24]. Frances TF: Blood groups (ABO groups). In: *Common Laboratory and Diagnostic Tests*. 3rd Edition, Philadelphia: Lippincott, 2002; p.19-5.
- [25]. Rahman M and Lodhi Y. Frequency of ABO and Rhesus blood groups in blood donors in Punjab. *Pak J Med Sci*. 2004; 20:315-8.
- [26]. Firkin F., Chesterman C, Penington D, & Rush B.: *De Gruchy's Clinical haematology in medical Practice*. Blackwell Science Publisher, 5th Edition, 2008; Pp-475.
- [27]. Sidhu S. Distribution of the ABO blood groups and Rh(D) factor among the scheduled caste population of Punjab. *Anthropol*. 2003;5(3):203-4.
- [28]. Agrawal A, Tiwari AK, Mehta N, Bhattacharya P, Wankhede R, Tulsiani S, et al. ABO and Rh (D) group distribution and gene frequency; the first multicentric study in India. *Asian J Transfus Sci*. 2014;8(2):121-5.

Md Khader Faheem " Demographic Distribution and Prevalence of ABO and Rhesus Blood Groups in Blood Donors: Study from a Tertiary Care Centre in Southern Region of Andhra Pradesh." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 17, no. 7, 2018, pp 01-05.