

Statistical evaluation related to blood donation worldwide

Evaluación estadística relacionada con la donación de sangre a nivel mundial

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Abstract

Objective: to present statistics related to human blood donation worldwide. **Methods:** the study is exploratory, descriptive, comparative, and unidimensional in nature. Information was gathered from the World Health Organization, World Population Review, and Statistical sources. Multivariate cluster analysis was used to analyze the information. **Results:** germany has the highest blood donation rate, followed by Denmark. It is generally observed that European countries have a stronger culture of donation, while countries in Africa and some in Asia have the lowest statistics related to the topic. **Conclusions:** It is essential to encourage education programs related to the importance of blood donation in nations, ensuring good communication to break down some barriers among potential donors.

Keywords: altruism, donation, statistics, blood, solidarity

Resumen

Objetivo: dar a conocer las estadísticas relacionadas con la donación de sangre humana a nivel mundial. **Métodos:** El estudio es de tipo descriptivo comparativo exploratorio de carácter unidimensional. La información fue recopilada de la Organización Mundial de la Salud, World Population Review and Statistical. Para el análisis de la información se empleó la técnica multivariada de clúster. **Resultados:** Alemania presenta la mayor tasa de donación de sangre, seguido de Dinamarca. En general se aprecia que en los países de Europa existe mayor cultura de donación, mientras en naciones ubicadas en África y algunos países de Asia, se dan las estadísticas más bajas en relación al tema. **Conclusiones:** Es fundamental incentivar en las naciones programas de educación relacionados con la importancia de donar sangre, asegurando una buena comunicación para derribar algunas barreras entre los posibles donantes.

Palabras clave: altruismo, donación, estadísticas, sangre, solidaridad

There's no doubt that blood is essential for health systems, which require it not only for life-saving or patient health recovery transfusions but also to advance clinical and biomedical research contributing to the success of therapeutic and surgical procedures¹. Therefore, blood donations are crucial to ensure the success of surgeries or address emergency cases, hence the importance of stimulating and supervising blood donation and collection worldwide through blood banks².

Even though blood transfusion procedures are common therapeutic alternatives and are considered simple processes, they also pose some risks to patients³. This necessitates testing once collected to identify or detect risks or elements that could transmit diseases from the donor to the recipient, including HIV 1 and 2 antibodies, hepatitis C, hepatitis B surface antigens, syphilis serology, among others⁴. It is inferred that each year, 234 million complex surgeries requiring blood transfusions are performed globally^{5,6}.

It's estimated that 80 million units of blood were donated worldwide in 2021, with 38% coming from developing countries⁷. Sub-Saharan Africa, for instance, requires 18 million units of blood annually, but only 15% of the needed blood was collected⁸, often because blood donors typically

provide the valuable fluid when relatives or friends need a blood transfusion for an operation. In developed countries, most donors are volunteers, unpaid⁹. The World Health Organization in 2013 estimated that a total of 112.5 million blood donations were collected in 180 countries during the reference period, with 100.6 million being whole blood donations and 11.9 million being apheresis donations from all types of blood donors (unpaid volunteers, family or replacement, and paid)¹⁰.

In Japan, the number of blood donations is expected to decrease from 5,260,000 in 2012 to 4,770,000 by 2025 (9.3%). This decline is mainly associated with donors aged between 20 and 30 years. Furthermore, it is estimated that 5,660,000 donations will be needed by 2025, representing 15.7% of that year's donations, expected to double by 2050. Similar challenges in recruiting an adequate number of blood donors are anticipated in Germany and the United States, exacerbated by the aging population and increasingly strict donor selection criteria¹¹. The World Health Organization (WHO) specifies a minimum of 10 donations per 1,000 inhabitants. The current rate per 1,000 inhabitants is 31.5 donations in high-income countries, 15.9 in upper-middle-income countries, 6.8 in lower-middle-income countries, and 5 in low-income countries¹².

A statistically significant increase is observed in the demand for blood component transfusions with a reduction in blood donation rates. This temporal perspective points to a future blood shortage, driven by an increase in the elderly

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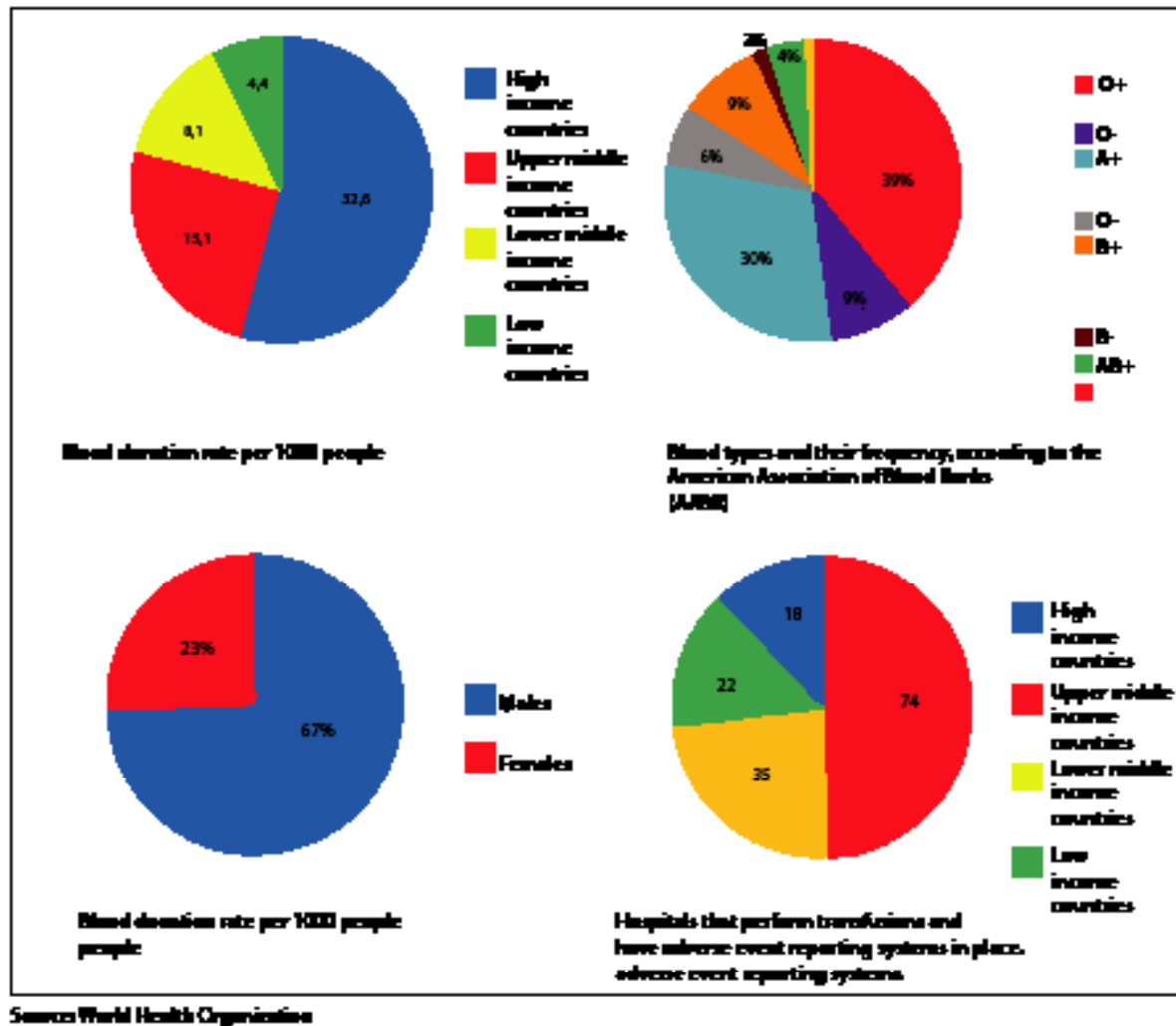


Figure 1. Some aspects associated with blood donation in the world

population and a notable reduction in the population size eligible to donate¹³. The aim of this study is to present recent statistics related to human blood donation worldwide, and additionally, to provide a classification analysis on the subject among regions.

Materials and methods

The study is an exploratory descriptive comparative study of a unidimensional nature. The information was collected from the World Health Organization, World Population Review and Statistical. The multivariate technique called cluster analysis was used for the analysis of the information. The R statistical package version 3.4.1 was used.

Results

The blood donation rate per 1,000 people stands at 32.6 in high-income countries, 15.1 in upper-middle-income countries, 8.1 in lower-middle-income countries, and 4.4 in low-income countries. Refer to Figure 1.

Blood types O-, A-, B-, and AB- represent the lowest

percentage of existence across different world regions. Blood type O+ is most commonly found in America, A+ in Oceania, B+ in Asia as well as AB+, as depicted in Table 1.

In Table 2, Europe and Oceania are classified together in one cluster in relation to blood donation, while Africa and the Middle East form another group. America and Asia are placed in separate clusters. Blood types B- and AB- belong to the same cluster regarding the percentage of blood available worldwide, similarly to blood types A+ and O+. Blood type B+ is in a unique group.

Blood type O+ is more frequently found in countries of America, especially in South America. The presence of blood type A+ spans a more diverse range of countries located in Europe, Africa, and Asia, with Armenia standing out as the nation with the highest percentage. Blood type B+ is more commonly found in countries situated in Asia, whereas blood type AB+ has the lowest statistics in percentage terms (Table 3).

Germany presents the highest blood donation rate, followed by Denmark. Generally, it's observed that there's a stronger culture of donation in European countries, while

Table 1. Blood types by geographic region in the world expressed in percentages

Type	Asia	America	Africa	Europa	Oceania	Middle East
O+	36,6	54,5	46,7	38,3	41,8	41,8
A+	27,5	27,8	26,7	35,8	33,4	27,7
B+	25,0	11,4	15,8	11,9	15,4	16,6
AB+	7,4	2,1	3,7	4,8	3,2	4,8
O-	1,3	4,8	3,8	5,9	5,8	4,4
A-	1,1	2,0	1,7	6,2	3,6	3,1
B-	0,8	1,7	2,1	1,2	1,5	1,1
AB-	0,3	0,2	0,3	0,9	0,6	0,5

Source: World Population Review and Statistics

nations located in Africa and some countries in Asia exhibit the lowest statistics concerning this issue (Table 4).

Discussion

Blood donation equates to giving life, making it undeniable that the most valuable and precious contribution one can make to another individual in need of this vital liquid for health recovery is precisely the donation; blood aids daily in the recuperation of millions of patients worldwide. Blood transfusion has facilitated significant advancements in the medical treatment of diseases, especially traumas and surgical procedures. This has led to a substantial increase in the demand for blood transfusion services globally¹⁴.

It is estimated that only 5% of the population in developed countries donate blood voluntarily¹. According to the World Health Organization, each year, around 13,000 donation centers in 176 countries collect 112.5 million units of blood, indicating at least 10 donations per 1,000 inhabitants¹⁰. Donating blood to help another person regain health is considered a free and generous act, an altruistic action that benefits another human being. However, the demand for this precious liquid is high, hence the need for regular donations to ensure the health and life of many patients¹⁵. Precisely because this is a voluntary act without any remuneration, responsible

entities encourage this action by highlighting the importance of healthy living habits of donors and also seek to implement new strategies to ensure and call on new individuals to become donors¹⁶.

In the donation process, additional risks must be monitored and controlled by blood bank personnel. Sometimes, with a large number of donors, based on the information obtained from each, there may be an individual risk, especially if a person with a known albeit low risk is accepted, which can lead to an unexpected complicated situation^{17,18}.

Data provided by the World Health Organization in 2022 shows a significant increase in voluntary, non-remunerated blood donations in low- and middle-income countries, highlighting the following statistics: 119 countries reported an increase of 10.7 million blood donations from voluntary, unpaid donors between 2008 and 2018. The most significant increase was in the Southeast Asia Region (127%), followed by the Americas Region (81%) and Africa (81%). The largest increase in absolute numbers was recorded in the Western Pacific Region (4.15 million donations), followed by Southeast Asia (3.05 million) and Africa (1.53 million donations). 79 countries obtain more than 90% of their blood supply from voluntary, unpaid donations (38 high-income countries, 33 middle-income countries, and eight low-income countries).

Table 2. Cluster analysis by blood type donation and origin

Cluster analysis by blood type			
Cluster 1	Cluster 2	Cluster 3	Cluster 4
B+	O+	AB+	B-
	A+	O-	AB-
		A-	
Analysis of classification by geographical area			
Cluster 1	Cluster 2	Cluster 3	Cluster 4
Europa	Africa	America	Asia
Oceania	Middle East		

Source: prepared by the authors based on information from WHO and World Population Review and Statistics

Table 3. Countries with the highest percentage of blood type

O+	A+	B+	AB+
Chile (85,5)	Armenia (46,8)	India (88,1)	Bangladesh (16,8)
Ecuador (75,0)	Norway (41,6)	Tailandia (36,8)	North Corea (11,3)
Perú (70,0)	Malta (41,0)	Bangladesh (54,5)	South Corea (10,9)
Zimbabwe (63,0)	Cyprus (40,3)	Pakistan (34,4)	Japón (9,9)
El Salvador (62,0)	Portugal (39,8)	Myanmar (32,7)	Pakistan (9,5)
Colombia (61,3)	Japón (39,8)	Vietnam (30,8)	India (8,9)
Congo (59,5)	Uganda (39,0)	North Corea (38,1)	Nepal (8,6)
México (50,1)	Cameroon (38,8)	Indonesia (28,8)	Kazakstán (8,3)
Venezuela (38,3)	Switzerland (36,8)	Malaysia (27,8)	Hungary (8,0)
Honduras (57,5)	Turkey (37,8)	Nepal (27,1)	Indonesia (7,9)

Source: WHO and World Population Review and Statistical

This includes 64 countries with 100% of their blood supply coming from voluntary, unpaid blood donors. In 54 countries, more than 50% of the blood supply still depends on blood donors from family members or paid for the donation¹².

An indicator of Africa's great need to increase blood transfusion processes in its region is evidenced by the high mortality rates among mothers and infants due to complications directly related to pregnancy. It is estimated that 34% of maternal deaths are a direct consequence of severe bleeding during and after childbirth; also, other diseases that increase mortality rates in the region, which could be reduced with a larger number of donated blood units, include malaria and anemia¹⁹.

According to a study conducted in northeastern Germany in 2017, blood donations per thousand inhabitants decreased by 28.1% in the age range of 31 to 40 years. However, there was an increase of 17.1% in donations from adults between 51 and 60 years, and 12.5% among those aged 61 to 69 years²⁰. Another factor influencing donation is family thinking; family influence on this issue worries and discourages donation, with greater interest found in donating and receiving blood only from the same family²¹.

According to behaviors analyzed in Japan, especially among the population aged 20 to 30, it is estimated that donations will decrease significantly by close to 10% in the next two years. This is contrary to actual needs¹¹. Studies in the United States indicate that out of a total of 953,926 donations, 16.8% were from first-time donors, and 83.2% were from people who have donated two or more times. Of that total, 55% of donors were female, and 45% were male. Furthermore, 44.7% of the total corresponded to adults aged 55 years or older, and 94.4% were white donors²².

Table 4. Countries with higher and lower blood donation rates

Countries with the highest donation rate	Rate	Countries with the lowest donation rate	Rate
Germany	59,8	Congo	6,4
Denmark	50,8	Togo	6,3
Sweden	50	Uganda	5,9
Greece	49,3	Burundi	5,7
Luxembourg	46,7	Chad	5,6
Estonia	45,9	Spain	5,4
Slovenia	45,1	Philippines	5,3
Belgium	44,9	Sudan	5,1
Italy	44,8	Senegal	5,1
Korea	44,3	Nigeria	4,4
Switzerland	43,5	Bangladesh	3,9
Croatia	42,2	Kenia	3,8
Poland	41,8	Ghana	3,7
France	39,9	Tanzania	3,4
Slovakia	39,1	Cameroon	3,4
Cuba	36,4	Mauritania	2,9
Israel	35,8	Afghanistan	2,5
Australia	35,1	India	0,7
Portugal	33,8	North Korea	0,6

Source: World Health Organization (WHO).

According to a study conducted among individuals residing in the Netherlands who originate from Africa, it was determined to be motivating, especially for those who had never donated (50%), to receive information related to the benefits of this procedure. Additionally, this practice was directly associated with the intention to donate ($p < 0.05$). It was also found that there were other motivators to encourage the purpose of donating, such as non-monetary incentives, convenience factors, and awareness of the importance of doing so. Furthermore, 8% of those who had donated at some point and 25% who had never donated expressed fear due to not feeling well health-wise or the stress this action might cause. Other barriers like preferences, religion, or mistrust are reported less frequently as impediments to donating²³. In Africa, between 60% and 90% of donated blood is given in response to the specific needs of a known patient or a relative²⁴.

In Latin America, statistics reflect a wide diversity when it comes to determining the supply of blood. Thus, it is recorded that in Colombia, about 93% of the units held by blood banks come from voluntary donations, while in Brazil and Argentina, voluntary donation accounts for 50% of units, and in Peru, this figure is 5%, the lowest in the region²⁵.

Ensuring the supply of blood necessary to attend to patients with various types of diseases and accidents has become a challenge for developing countries, especially due to the significant influence that families have on this decision and the fact that the region has become accustomed to compensated donors, which carries risks of infection through transfusion²⁶. This is compounded by other reasons why people refuse to donate, such as fear of needles, the impression caused by seeing blood, fear of falling ill or dizzy, rejection of the same healthcare centers where these procedures are performed, negative experiences, and even the perception of a lack of privacy or access difficulties²⁷.

The main challenge for those leading this process, although

it cannot be guaranteed that a donation will be completely safe, is to implement all necessary mechanisms to make the donation as low-risk as possible for everyone, including donors, recipients, and healthcare personnel alike. Issues such as verifying the health status of those who come to donate voluntarily, which qualifies as an additional risk, are matters that the blood bank manager must validate. Given the number of people who donate, an individual risk always exists that could pose a high risk to some recipients, hence the need to thoroughly evaluate any risk an individual might have, however low it might be.

Conclusions

It is essential to encourage education programs in the nations about the importance of donating blood. Good communication with the support of the mass media depends on communities becoming aware of the need to contribute to the health of all by donating blood. One way to motivate people is to generate monetary and non-monetary incentives. However, it is necessary to ensure good communication to break down some barriers among potential donors, such as the lack of truthful information including the benefits of this practice. There is no doubt that religious, spiritual, cultural, racial and other connotations are discouraging components associated with blood donation.

Conflict of interest

The author declares that there is no conflict of interest in the development and presentation of the research article.

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