

Literature review

Impact of ageing & anaemia on blood donation across the globe

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Introduction

The transfusion of blood and blood products is an integral part of medicine. Red blood cells efficiently transport oxygen to other cells and tissues and are transfused in cases of anaemia, whether due to nutritional deficiencies, chronic disease, bone marrow disorders, or blood loss. However, access to blood is not equitable worldwide. A key driver for this is that the number of blood donations collected in each country varies considerably. Wealth is a key determinant of the number of donations collected, with high-income countries (HIC) collecting 31.5 donations per 1,000 population, upper middle-income countries (UMIC) 15.9 donations per 1,000 population, lower middle-income countries (LMIC) 6.8 donations per 1,000 population, and low-income countries (LIC) 5 donations per 1,000 population.¹ There are also stark differences in how and why blood is used. In LIC, more than half the blood collected is used for children under the age of 5 years, with the next largest recipient group being young women with pregnancy-related complications.² In contrast, in HIC, blood is transfused most frequently to patients aged 60 years or more for supportive care. Blood sufficiency is also variable; some countries do not have sufficient red cells, while others are challenged to meet demand for plasma-derived blood products (e.g., immunoglobulin). This brief review focuses on the impact of ageing and anaemia on blood donation across the globe.

Ageing populations

In most countries, the World Health Organisation (WHO) has identified ageing as a significant demographic shift that impacts health and social systems.² From

2020, there were more people aged 60 years or older than children younger than 5 years. Interestingly, wealth is not a determinant of longevity, as by 2050, 80% of older people will be living in low- and middle-income countries. Ageing has an impact on both blood demand and blood supply.

Older patients use more blood

A number of HICs have reported that older patients represent the age group receiving the most blood. On the Sunshine Coast in Australia, over 60% of packed red cells were transfused to patients aged over 65 years.³ In Switzerland, the bulk of red blood cells (RBC) are transfused to patients aged over 60 years.⁴ A comprehensive study on blood use in Korea from 2009 to 2018 reported a constant increase in total transfusions over the 10 years, due to the increase in transfusions to patients aged 80 years or older.⁵ In Italy, 64.5% of transfusion recipients were aged over 65 years and 33% aged over 80 years.⁶ Data on blood use by different age groups in middle-income countries (MIC) is limited. However, modelling of the changing demographics in China between 2016 and 2036 predicts an increase in blood demand (33.1%), particularly for patients aged over 60 years.⁷ Together, these observations suggest that as populations age, the demand for blood will increase.

Age criteria limit the donor pool size

Age also has a direct impact on blood donation, because most blood collection agencies (BCAs) have a lower and upper age limit for first-time donors and for repeat donors, to ensure donor safety and well-being.⁸ Lower age limits are required because of the legal age

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of consent and because of the higher risk of vasovagal reactions. Reasons for an upper age limit include the increasing incidence of cardiovascular disease with age and the potential for adverse reactions during donation. Both of these age limits restrict the pool of people eligible to donate.

WHO's 'Global Status Report on Blood Safety and Availability, 2021' (based primarily on 2018 data from 171 member states) found that 3% of donations were from donors aged less than 18 years, 25% from 18-24 years, 44% from 25-44 year, 24% from 45-64 years and 4% from 65 years or more.¹ However, the age distribution of donors is variable across the world. A study of Asian BCA showed that in low to middle-income countries (Malaysia, Mongolia and Thailand), with younger population demographics, most blood donors were aged between 20 to 49 years.⁹ Among high-income BCAs, with older population demographics (Hong Kong, Japan and Taiwan), over 20% of all donations were from donors aged over 60 years. This was not the case with Korea. While it has an older population, it is unique in that over 30% of its donations are from donors aged under 30 years.

Recent projections suggest critical challenges facing Korea's blood supply and demand; while blood demand will continue to grow, blood supply may decrease.¹⁰ This has prompted suggestions to increase donation frequency and relax age eligibility criteria. Many other countries face similar challenges. For example, Singapore's donor upper age limit was 60 years, but in December 2025, Singapore's Health Sciences Authority increased the age limit for first-time donors from 60 to 65 years to ensure a sustainable blood supply.¹¹ China raised the upper age limit for donation in 2012 from 55 to 60 years with some positive effects.¹² Emerging studies are now reporting on the impact of increasing the upper age limit for blood donation.

A study of older donors (60 years or more) from five Asian BCA found that this donor age group had higher donation frequency and lower deferral rates.¹³ A comparison of older (56-60 years) to younger (18-55 years)

donors in the Chongqing Blood Centre from 2012 to 2023 found that the older donors donated more frequently and had lower vasovagal reactions (VVR) rates, and lower incidence of HCV, HBV and syphilis. HIV reaction rates were higher among older donors, and older male donors had lower deferral rates.¹² The upward trends in blood donation rates in Chongqing, Hainan, Jiangxi and Guangzhou have encouraged China to reassess its blood donation upper age limit.¹⁴ This is further supported by recent United Nations data confirming that not only is the size of China's population beginning to decrease, but the proportion of people aged under 65 years is decreasing while the number of people aged 65 years is increasing.¹⁵

The Netherlands, with an upper age limit for donation now set at 79 years (it was 69 years prior to 2018), has actively surveyed its older blood donors. Older donors supported the increased age limit and were highly motivated to continue donating.¹⁶ However, some (63%) felt an obligation to continue donating, while a few (5%) found it hard to continue donating. Other BCAs such as Australia, Canada, England, New Zealand, and the United States currently have no upper age limit for blood donation.¹⁷ In these cohorts, male donors aged over 70 years had higher deferral rates compared to donors aged 24-70 years, but comparable VVR rates in both age groups. A recent Australian study into the donation experience of newly eligible upper age donors aged over 70 years reported that while overall VVR rates declined with age, there was a higher risk of more serious VVRs.¹⁸

There is presently no universal definition of an older donor. As discussed above, some studies consider an older donor as someone aged over 54 years, others over 60 years and some over 70 years. In addition, the quantity and strength of published data on the effects of blood donation on older donors are also limited. Therefore, while there is supply-demand pressure to increase donor pool sizes in many countries, this needs to be considered carefully, and importantly, should be based on relevant local data.

Incidence of anaemia among donors and patients

Anaemia impacts both arms of transfusion practice, as patients who are anaemic require blood, and individuals who are anaemic cannot donate. The WHO defines anaemia as Hb lower than 130 g/L for males and Hb lower than 120 g/L for non-pregnant women.¹⁹ However, because those Hb thresholds were based mainly on Caucasians in Europe and North America, the WHO has undertaken a project to review global guidelines for anaemia.²⁰ For donor welfare, all BCAs have a minimum Hb criteria that must be met to donate. A study of BCA in Asia showed that the Hb criteria were not consistent across the different BCA.⁹ It is interesting to note that 5 of the 10 BCAs had Hb criteria of 125 g/L for male donors, which is below the WHO definition of anaemia for men.¹⁹ This supports the necessity of the above-mentioned project to review global guidelines for anaemia.

Across the globe, the prevalence of anaemia across all ages in 2021 was estimated to be 24.3%.²¹ The burden of anaemia varies by age, sex, and geography, and those most affected are children younger than 5 years and women in sub-Saharan Africa and South Asia. Among women of reproductive age (15-49), the prevalence of anaemia in 2023 was 30.7%.²² As a result of the high prevalence of anaemia many individuals do not qualify to donate. Low Hb is the most common cause of donation deferrals.¹ Reports also show that low Hb deferrals affect not only females²³ but also males.^{24,25} While anaemia is more common in low-resource countries, high-income countries like Australia also report high prevalence of anaemia among women aged 18-49 years.²⁶

Even with Hb criteria, there is growing evidence that repeat donations can deplete iron stores and eventually cause iron deficiency.²⁷ Strategies to avoid iron depletion include ferritin screening, and iron supplementation. In addition, recent studies emphasise the need for ferritin-based donor management to be localised to the population.²⁸ Success with iron supplementation appears to vary between countries but can be successful where there is high willingness to take supplements.^{29,30}

Conclusion

All BCAs face the challenge of ageing, which increases the demand for blood supply, while concurrently shrinking the pool of blood donors. While repeat donors are a safe source of blood, if unmanaged, they risk developing iron deficiency. To secure an adequate blood supply BCAs need to ensure that the donation criteria and donor management strategies in use are customised to their populations. This is important given the physical, physiological, and dietary differences between populations. To do this, BCA needs to gather accurate and current local data to develop criteria such as relevant Hb thresholds and minimum weight. BCA may consider a program to reduce anaemia in their community, as this would strengthen their donor pool and may even reduce blood demand.

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