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Impact of regular blood donation on the human body; donors' perspective. Donors' opinion on side effects of regular blood donation on human body

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Summary

Background: *Voluntary blood donation refers to "unpaid, non-remunerated" donation of blood by healthy people for those who require blood transfusion. Recently in Poland, there is an observed decrease in the number of blood donations which, among others, may be ascribed to demographic changes and epidemics of various diseases but also to myths, prejudice and misconceptions regarding the act of donating blood. The most objective source of opinion on the subject are the donors themselves. The study aim was to explore the opinions of blood donors regarding the impact of regular blood donation on the human body as well as their experience related to blood donation.*

Material and methods: *The method of a diagnostic opinion survey was used with a questionnaire developed for the purpose of the study. The questionnaire consisted of 6 closed-ended and 5 sociodemographic questions. It was completed by 2387 blood donors (responders). The IBM SPSS Statistics 20 program was used for predictive analytics and calculations. The statistical significance was established at* $p \leq 0.05$.

Results: *In the opinion of most responders (78.3%) one cannot get addictive to blood donation. The majority of blood donors (85.2%) believe that no increased production of red blood cells (RBCs) in bone marrow occurs as result of regular blood donations. As the greatest health benefit for the donor himself, 81.4% of the responders declared the boosted/enhanced sense of well-being as result of offering one's own blood to other people.*

Conclusions: *The knowledge and experience of voluntary blood donors should be carefully considered by organizers of blood-promotion campaigns. The conviction that no side effects are associated with long term blood donation gets stronger with the increase in the volume of donated blood. Altruism was the most frequently declared motive for donating blood.*

Key words: blood donation, blood donors, transfusion medicine

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Introduction

Voluntary blood donation is a social campaign based on unselfish offer of blood by healthy people to patients who require transfusions of this unique and irreplaceable drug. Blood therapy would be impossible without the good will of those who decide to give away/share a part of themselves in order to help others. Many years of research on non-blood oxygen carriers (e.g. perfluorocarbon compounds, solutions of human and non-human hemoglobin, in vitro-produced erythrocytes) have not so far resulted in the development of a method of artificial-blood production. The only source of blood is still the living organism [1]. The advancement in blood collection and transfusion medicine has affected the clinical management of diseases such as i.a severe anemia and hemophilia. The access to larger numbers of blood donations, and thus the possibility of more frequent transfusions, has resulted in lower accident-related and perioperative mortality rate. Hemotherapy has also become an inseparable part of organ transplant procedures as well as management of neoplastic diseases [2].

The fundamental challenge to contemporary blood transfusion service is promotion of the noble idea of blood donation combined with the effort of meeting the demands of transfusion medicine. To address the issue a number of marketing activities must be implemented and educational activities undertaken. They should be directed at the whole society. Considering the demand for blood and the volumes of blood available, a question arises whether the actions taken so far are effective enough. Trzpiot G et al. (2013) drew attention to seasonal variability in the demand for blood and specified the months in which blood demand surpasses blood inventories [3]. Educational campaigns which promote blood donation should therefore focus not only on increasing the number of donors i.e. volume of donated blood but also on emphasizing the benefits which blood donation has on the blood donor. Such educational activity should be conducted countrywide with particular focus on younger people as they are potentially the most numerous group of donors [4].

A disturbing trend of a steady annual decrease in the number of voluntary, non-remunerated blood donors is currently observed in Poland. In 2011 blood was donated by 625 thousand donors [5], in 2014 — by 617 thousand [6] and in 2018 — by 590 thousand [5]. According to statistics, blood is annually donated by only 2.8% of the "working age" population, which is approximately 1.9% of the general population [5]. The index is almost two fold lower than the average for the European Union and lower than recommended by the World Health Organization (WHO). According to WHO, self- sufficiency in blood and blood components is ensured only in countries where blood is regularly, annually donated by at least 2.0–2.5% of the general population. In the United States the corresponding rate is 7% [7].

The recorded decline in the number of Polish donors occurs for a variety of reasons, one of which is the lack of sufficient information and knowledge about blood donation. Insufficient knowledge gives rise to unfounded and harmful myths, prejudice and misconceptions that hinder the decision to donate [8]. The circulating myths mainly concern untrue communications that donating blood is addictive and regular donation leads to "excessive production of RBCs". Skeptics express opinions that multiple blood donations are responsible for high blood pressure. Education and careful guidance targeted at potential blood donors should be sufficient to eliminate doubts and reservations regarding blood donation [9].

The purpose of the study was to explore the opinions and experience of voluntary blood donors regarding the impact of regular blood donation on the human body with the aim of fighting the myths about blood donation in the Polish society.

Material and methods

The survey was conducted countrywide in the period July-September 2021. The method of a diagnostic opinion survey was used with our own questionnaire developed for the purpose of the study. The questionnaire consisted of the following 6 closed-ended questions:

1. Do you think regular donation of blood may have side effects for the human organism?
2. Do you think regular donation of blood may be addictive?
3. Do you think regular donation of blood may cause excessive production of RBCs?
4. Do you think regular donation of blood may lead to higher blood pressure/hypertension?
5. Do you think the donor can get infected during blood collection?
6. What are the greatest benefits of donating blood for the human organism?

The diagnostic opinion survey also included 5 sociodemographic questions regarding gender, age, place of residence, education and volume of donated blood. Enrolled in the study were people who

had made at least one voluntary, non-remunerated blood donation. They were recruited from country wide Voluntary Blood Donor Societies. A total of 2,387 blood donors were included in the study. They were informed about the study purpose and the anonymity of their contribution. They knew their participation was voluntary and gave their informed consent to participate. The study was conducted in compliance with the principles of Helsinki Declaration. The calculations were performed with IBM SPSS Statistics 20. The basic test used for statistical analysis was the Chi-square test for independence. The Chi-square and Cramer's V coefficients measured the strength of association between the variables. The significance level was determined at $p \leq 0.05$.

Results

The study group was dominated by men (52.1%). Most responders lived in cities (68.6%). The largest percentage was reported in the 31–40 and 21–30 age groups (32.4% and 26.7% respectively). Secondary education and higher education prevailed (37.6% and 26.1% respectively). Most responders had donated either more than 10 liters of blood (29.2%) or 2–4.9 liters (21%).

The vast majority of voluntary blood donor-respondents (78.3%) declared blood donation as non-addictive. 85.2% thought excessive RBC production as result of frequent donations was unlikely. A significant percentage (89.7%) believed that long-term donating does not lead to arterial hypertension. The responding blood donors were convinced that no infection can occur during blood collection (92.6%) (Table 1).

The greater the volume of donated blood, the higher the percentage of responders convinced that blood donation is non-addictive. The lowest percentage of those convinced that blood donation is not addictive was recorded in the donor-group with the smallest volumes of donated blood (52.9%); the highest percentage — in the group with the highest volumes of donated blood (97.7%). The phenomenon is statistically significant with the significance level of $p < 0.001$ (Table 2).

The survey analysis demonstrates a statistically significant impact of the volume of donated blood on the conviction/belief that there is no "excessive RBC production" as result of regular blood donation ($p < 0.001$). Responders with the highest volume of donated blood (98%) are more convinced than those who donated the smallest volume (66%) (Table 3).

In the group of responders who donated the smallest volume of blood, 73% believe that regular blood donation does not lead to high blood pressure/ /hypertension. The higher the volume of donated blood, the larger the number of responders convinced that regular blood donation has no effect on blood pressure whatsoever. 98.7% of responders with the highest number of donations share the opinion. The results are statistically significant ($p < 0.001$) (Table 4).

The higher the number of blood donations, the higher the percentage of responders convinced

Table 1. Responders' opinion on the possible side effects of donation on the human body

Opinion/Side effects	Addiction	Excessive production of RBCs	Higher blood pressure	Infection at venipuncture
Unlikely (N)	1870	2034	2142	2211
Unlikely (%)	78.3%	85.2%	89.7%	92.6%
Possible/likely (N)	517	353	245	176
Possible/likely (%)	21.7%	14.8%	10.3%	7.4%
Total	**2387 (100%)**	**2387 (100%)**	**2387 (100%)**	**2387 (100%)**

N — number of responders to the question, % — percentage of responders to the question

Table 2. Responders' opinion on the possibility of addiction to blood donation

Opinion/Volume of donated blood	< 2 liters	2–4.9 liters	5–7.9 liters	8–10 liters	> 10 liters
Addiction unlikely (N)	190	338	340	321	681
Addiction unlikely (%)	52.9%	67.6%	74.1%	86.3%	97.7%
Addiction likely (N)	169	162	119	51	16
Addiction likely (%)	47.1%	32.4%	25.9%	13.7%	2.3%
Total	**359 (100%)**	**500 (100%)**	**459 (100%)**	**372 (100%)**	**697 (100%)**
Chi-square = 343.47 (df = 4) p < 0.001, Cramer's V = 0.379					

N — number of responders to the question, % — percentage of responders to the question

Table 3. Responders' opinion on the possibility of excessive RBC production after years of blood donation

Opinion/Volume of donated blood	< 2 liters	2–4.9 liters	5–7.9 liters	8–10 liters	> 10 liters
Excessive production of RBCs unlikely (N)	237	385	399	330	683
Excessive production of RBCs unlikely (%)	66.0%	77.0%	86.9%	88.7%	98.0%
Likely excessive production of RBCs (N)	122	115	60	42	14
Likely excessive production of RBCs (%)	34.0%	23.0%	13.1%	11.3%	2.0%
Total	**359 (100%)**	**500 (100%)**	**459 (100%)**	**372 (100%)**	**697 (100%)**
Chi-square = 226.74 (df = 4) p < 0.001, Cramer's V = 0.308					

N — number of responders to the question, % — percentage of responders to the question

that no infection may occur during blood collection. The lowest percentage of responders sharing this opinion was recorded in the group that donated the smallest volume of blood (82.5%); the highest — in the group of the most experienced blood donors (99.3%). The differences are statistically significant ($p < 0.001$) (Table 5).

According to the responders, the greatest benefits for the human organism as result of blood donation are: positive impact on mental health and boosted well-being (81.4%), the opportunity for regular medical check-ups (39.3%) and leading healthy life style to be found eligible for blood donation (Fig. 1).

Discussion

According to literature reports, one of the myths responsible for the decline in the number of blood donors is that donating blood is addictive and once you start you will be forced to do so for the rest of your life [10]. The study demonstrates that the vast majority of blood donors (78.3%) are

Table 4. Responders' opinion on arterial hypertension following long-term blood donation

Opinion/Volume of donated blood	< 2 liters	2–4.9 liters	5–7.9 liters	8–10 liters	> 10 liters
Hypertension unlikely (N)	262	419	417	356	688
Hypertension unlikely (%)	73.0%	83.8%	90.8%	95.7%	98.7%
Hypertension likely (N)	97	81	42	16	9
Hypertension likely (%)	27.0%	16.2%	9.2%	4.3%	1.3%
Total	**359 (100%)**	**500 (100%)**	**459 (100%)**	**372 (100%)**	**697 (100%)**
Chi-square = 204.461 (df = 4) p < 0.001, Cramer's V = 0.293					

N — number of responders to the question, % — percentage of responders to the question

Table 5. Responders' opinion on the possibility of infection during blood collection

Opinion/Volume of donated blood	< 2 liters	2–4.9 liters	5–7.9 liters	8–10 liters	> 10 liters
Infection unlikely (N)	296	440	423	360	692
Infection unlikely (%)	82.5%	88.0%	92.2%	96.8%	99.3%
Infection likely (N)	63	60	36	12	5
Infection likely (%)	17.5%	12.0%	7.8%	3.2%	0.7%
Total	**359 (100%)**	**500 (100%)**	**459 (100%)**	**372 (100%)**	**697 (100%)**
Chi-square = 124.83 (df = 4) p < 0.001, Cramer's V = 0.229					

N — number of responders to the question, % — percentage of responders to the question

convinced that blood donation is not addictive. Moreover, the higher the number of donations made, the higher the percentage of people who unequivocally declare that giving blood is not addictive. The phenomenon is statistically significant ($p < 0.001$). The largest percentage of responders (97.7%) convinced that donating blood is non-addictive were found among donors who donated more than 10 liters. Our study results are confirmed by those of Czapla et al. (2015), where 82% of students believed that the risk of becoming addicted to blood donation is a myth [11]. In another study, Czapla et al. (2017) analyzed the perception of myths on blood donation among students to find that most of them think blood donation is non-addictive (82%) [12]. Studies by Pirincci et al. demonstrated that only 1% of responders believed that regular blood donation may lead to addiction [13]. This is also confirmed by Niechwiadowicz-Czapka, who see no evidence confirming the necessity of subsequent donations once the first donation is finalized. The authors also point out that the human organism

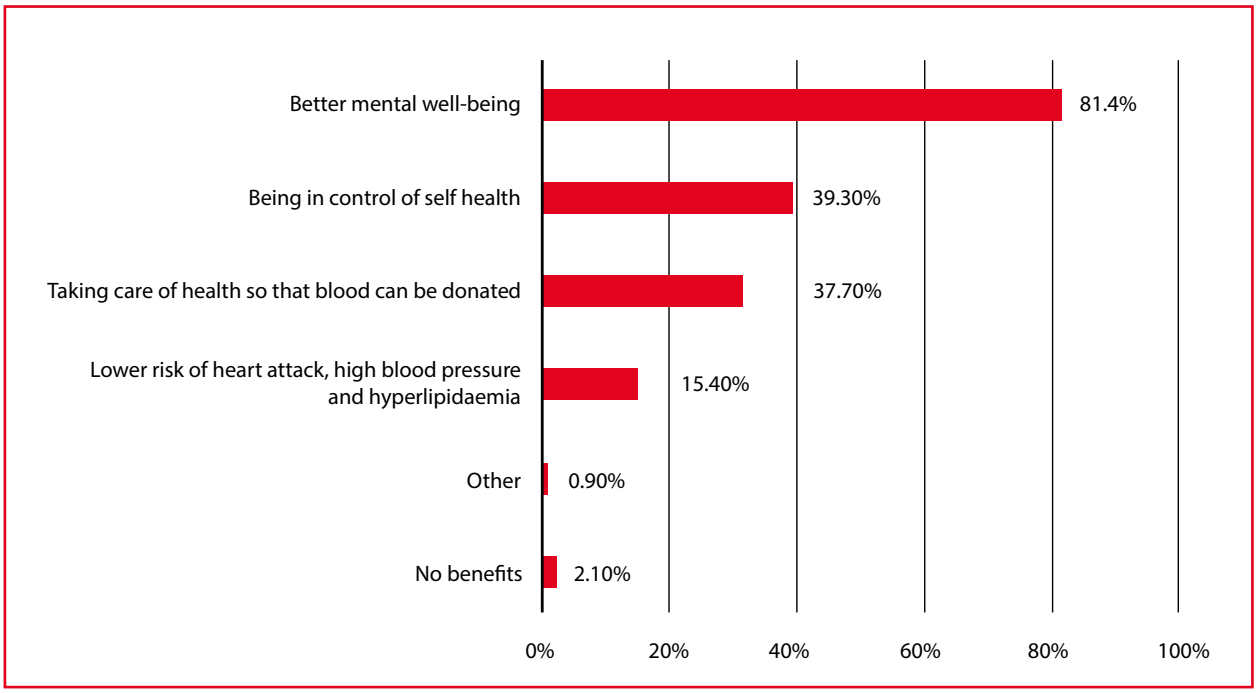

Figure 1. Responders' opinion on the benefits for the human body related to blood donation

adapts itself to short, periodic blood losses [1]. On the other hand, Sojka et al. proved that frequent blood donation is not associated with the psychological imperative to donate regularly [14].

Closely related to this stereotype is the myth of excessive production of RBCs in consequence of regular blood donations [9]. The study outcome demonstrates that as many as 85.2% of blood donors believe that regular blood donation does not contribute to excessive production of RBCs. Noteworthy is the relationship between the percentage of people convinced of the unlikelihood of excessive RBC production and the increase in the number of donations ($p < 0.001$). In this study, 98.0% of responders who donated the largest volume of blood, denied the occurrence of such phenomenon. Czapla demonstrated that the highest percentage of her student responders (65%) believed that excessive RBC production c is in no way associated with regular, voluntary blood donation [12]. In her analysis, Orzeł-Nowak demonstrated that only 5.2% of responders felt anxiety over excessive production of RBCs after regular donations [15]. Niechwiadowicz-Czapka et al. are very particular in emphasizing that regular blood donation should not be associated with abnormal increase in the production of erythrocytes (polycythemia). Regular donors do not experience excessive production of blood simply because the human body adjusts blood production to the current needs [1]. The studies by Edgren et al. clearly demonstrate the lack of relationship between long-term blood donation and higher frequency of polycythemia in blood donors [16].

Another myth encountered in the Polish society refers to hypertension as the consequence of long-term blood donation [17]. Most of our responders (89.7%) claim that the statement is false. The study shows that the number of donors convinced of unlikely risk of side effects such as higher blood pressure increases with the number of blood donations. The phenomenon is statistically significant ($p < 0.001$). Stainsby's analysis of international studies has demonstrated that there is no reliable justification for linking arterial hypertension with regular blood donation [17]. The study by Damulak showed that regular blood donation does not contribute to the development of hypertension. It is also worth noting that prior to every donation, the donor-candidate is subjected to a series of tests which help to keep his health under control [18]. In the study by Özgür et al. only 0.7% of responders believed that regular blood donation led to hypertension [19]. Among long-term blood donors, Ghetto et al. observed a decrease in BMI and lipid levels which contributed to lower blood pressure [20]. Kamhieh-Milz et al went a step further and said that voluntary blood donation may be considered a method for management of arterial hypertension [21]. Houschyar et al. emphasized the

positive effect of phlebotomy-induced reduction of blood pressure [22].

Another misconception is the likelihood of transmission of various infections at blood collection. This seems to be quite a common myth both in Poland [23] and worldwide [24, 25]. The data is quite alarming as they concern young people who are the hope and promise for the future of blood donation. In this study, most responders deny such rumors and only 7.4% believe that such infections are likely to occur. In the group of responders who donated the largest volumes of blood only 0,7% of responders share the opinion. Again, the likelihood of such infection decreased with the increase in the amount of donated blood; the phenomenon was statistically significant at the level of $p < 0.001$. In the study by Orzeł-Nowak, 8% of responders expressed anxiety over the risk of infection during blood donation [15]. In the Kołłątaj study, the result was even lower; only 3.1% of the responders believed in the risk of infection due to voluntary blood donation [26]. Niechwiadowicz-Czapka et. al address the issue by emphasizing that there is no chance of infection-transmission during blood collection [1]. Sterile equipment is used for blood collection and in developed countries the equipment is disposable. Poland is a safe country for blood donors. There is no likelihood of infection-transmission during blood donation [1].

In his study, Mishra et al. demonstrated blood donors to be more knowledgeable and aware about blood donation than non-donors. They more often expressed the opinion that frequent blood donation has no negative consequences ($p < 0.05$) [27]. Wang et al. revealed that only 0.1% of blood donors had side effects after donating blood [28] and Orru et al. indicated that only 0.04% of donors required hospitalization [29]. It is worth noting that in the study by Kumari et al, 92.38% of student- donors experienced only positive emotions [30]. Sojka et al. indicated that self-reported effects of blood donation were positive and included: satisfaction, boosted sense of well-being, respect of others, relaxation and better physical condition [31]. The fact that many health care professionals (physicians, nurses, paramedics) are among blood donors only proves that donating blood is not likely to have a negative impact on the human body. As compared to the society in general, health professionals are people who–on the one hand have better medical education and on the other — appreciate the value of blood for saving human life [1].

The last aspect explored in the study was identification of the greatest benefits of blood donation for the human body. Satisfaction from helping others was pointed out as number one (81.4%). This only confirms that one of the most important determinants of the decision to donate blood is undoubtedly the willingness to help others. Orzeł-Nowak found altruism to be the main motivating factor (55.3%) alongside the opportunity of saving someone's life [15]. Also Buciuniene showed that the willingness to help others is the main determinant of the decision to donate [32]. In his study, Ahmed revealed that 80.7% of those willing to donate are motivated by the altruistic approach and sense of social duty [33]. Ray's research also confirms that the most common motivators of the decision to donate are the willingness to support a noble idea and the desire to save human life [34]. In other research studies, altruism and social responsibility are also mentioned as the main determinants of the decision to donate [27, 30]. What is more, Raghuwanshi et al. reported that 75.18% of responders were against receiving financial remuneration for donating blood [35].

Conclusions

1. Voluntary blood donors are the obvious target group for assessing the impact of blood donation on the human body. Their knowledge and experience related to long-term blood donation should be the foundation of promotion campaigns directed at the general population.
2. Donors' conviction of no side effects of frequent blood donation grows with the number of blood donations. The statement is most reliable as it is based on self-assessment and experience of people directly involved in voluntary blood donation.
3. Blood donors are guided by altruistic motives and they draw satisfaction from helping others.

Conflict of interest: none declared

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