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Khomenko Liliia

l.khomenko@biem.sumdu.edu.ua, ORCID ID: 0000-0001-5690-1105

Researcher ID: AFD-0118-2022

Postgraduate,

Sumy State University, Sumy

THE LEVEL OF SUPPLYING UKRAINE WITH DONOR BLOOD AND BLOOD COMPONENTS: STATISTICAL ANALYSIS

Abstract. *The work aims to analyze the level of providing Ukraine with blood and blood components under stable conditions. During 2012–2020, the number of donors decreased twice; the plasma collection decreased by 30%, whole blood – by 56.8%; the number of blood transfusion centers decreased by 42.6%, transfusion departments of medical facilities – by 43.7%, hospitals collecting blood – by 15.1%. According to national reports, in 2020, the needs of Ukraine's healthcare institutions were met by 91.1% of donor blood, 94.6% of plasma, 88.9% of erythrocyte mass, and 124.1% of platelets. According to indicators recommended by WHO, the number of donations per 1,000 population in 2020 in Ukraine is three times less than necessary. Only the Sumy region has provided more than 33 donations per 1.000 population since 2015 (40.46–61.68), Crimea and Luhansk region in 2012–2013. In all other regions, the indicator is below the norm. According to this indicator, blood shortage was 952,546 donations or 66.2% of the recommended by WHO. Another recommended WHO indicator, the amount of collected blood per inhabitant during 2012–2020, was almost twice less as needed – 5.3 ml (WHO recommends 12–15 ml). The blood shortage in 2020 amounted to 276,990.5 liters or 55.7% of the WHO recommended amount. There are significant differences in approaches to the formation of needs for blood and blood components at the state level and the world. The study results show a need to create and implement a system of indicators that would reflect the country's and region's objective needs. In order to improve the provision of Ukraine with blood and blood components during stable conditions, it is necessary to implement marketing programs at the national level. For a significant increase in blood collection volume and its components, it is advisable to analyze the existing experience of leading blood centers in Ukraine and the experience of countries that fully satisfy their country's needs and implement them in their work. The organization of marketing activities and the marketing management system in blood centers should also be analyzed. It can be the subject of further research in this direction. The results of this study can be helpful to marketing specialists involved in blood service promotion.*

Key words: blood service, marketing, marketing tools, donation, demand.

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Хоменко Л. М.

l.khomenko@biem.sumdu.edu.ua, ORCID ID: 0000-0001-5690-1105

Researcher ID: AFD-0118-2022

аспірантка кафедри маркетингу,

Сумський державний університет, м. Суми

РІВЕНЬ ЗАБЕЗПЕЧЕННЯ УКРАЇНИ ДОНОРСЬКОЮ КРОВ'Ю ТА ЇЇ КОМПОНЕНТАМИ: СТАТИСТИЧНИЙ АНАЛІЗ

Анотація. *Метою роботи є аналіз рівня забезпечення України кров'ю та її компонентами за стабільних умов. Протягом 2012–2020 років кількість донорів зменшилася вдвічі, заготівля плазми скоротилася на 30%, цільної крові – на 56,8%, кількість станцій переливання крові – на 42,6%, відділень трансфузіології лікувальних закладів – на 43,7%, лікарень, що заготовляють кров – на 15,1%. Згідно вітчизняної звітності у 2020 році потреби закладів охорони здоров'я України були забезпечені донорською кров'ю на 91,1%, плазмою – на 94,6%, еритроцитною масою – на 88,9%, а тромбоцитами на 124,1%. Кількість донацій на 1000 населення в середньому по Україні становила 11 у 2020 році, що втричі менше за рекомендовану ВОЗ. Забезпечували більше 33 донацій на 1000 населення лише*

Сумська область з 2015 року (40,46–61,68), а в 2012–2013 роках АР Крим та Луганська область. В усіх інших регіонах показник менше норми. Нехватка крові у 2020 році склала 952546 донацій або 66,2% від рекомендованих ВООЗ. Кількість заготовленої крові на одного мешканця протягом 2012–2020 років скоротилася майже вдовічі і у 2020 році склала 5,3 мл (ВООЗ рекомендує 12–15 мл). Нестача крові у 2020 році становила 276990,5 л або 55,7% від рекомендованих ВООЗ. Є значні розбіжності в підходах до формування потреб в крові та її компонентах на рівні держави та світу. Результати дослідження показують, що є необхідність в створенні та впровадженні системи показників, як б відображали об'єктивну потребу галузі та окремих регіонів. Для покращення забезпечення України кров'ю та її компонентами за стабільних умов потрібно впроваджувати на загальнодержавному рівні маркетингові програми. Для цього доцільно проаналізувати існуючий досвід центрів крові, що займають лідерські позиції в Україні, та світовий досвід країн, які повністю забезпечують свої потреби та впровадити їх в діяльність центрів крові. Також слід проаналізувати організацію маркетингової діяльності та систему управління маркетингом в центрах крові. Це може бути темою подальших досліджень у даному напрямку. Результати даного дослідження можуть бути корисними маркетологам, які займаються просуванням в службі крові.

Ключові слова: служба крові, маркетинг, маркетингові інструменти, донації, потреби.

Formulation of the problem. Blood service is one of the priority sectors of the economy. Every year it saves millions of lives worldwide; more than 118.5 million units of blood are collected from donors worldwide, although much more is needed to meet the needs of all patients. If not enough, operations are postponed, injured people in traffic accidents and women during difficult childbirths die, cancer patients cannot undergo therapy courses, and others. [1]. The need for donors and voluntary blood donations is constant.

Because of the nation's aging and the changing way of life of the population, there is an increasing need for donor blood. The blood service is also of critical importance during disasters and military operations. In such situations, the blood need increases many times. At the same time, people's motives change, and in some cases, it is possible to achieve the maximum collection of donor blood and its components.

Analysis of recent research and publications. The works of domestic scientists, including Lyubchak V. P. [2], Lyubchak V. V. [2], Tymchenko A. S. [2–7], Perekhrestenko P. M. [3–11], Nazarchuk L. V. [3–6], Yaroshevsky V. S. [4–8], Horiyanova N. V. [8–11], and others. Their work focuses on current activities of blood service institutions, quality management and donor blood safety improvement, and evaluation of blood center activities. Among foreign scientists, France C. R., France J. L., Shaz B. H., Hillyer C. D., Martin-Santana J. D., Masser B. M., Schreiber G. B., and others have the most works on the activities of the blood service. Most of their works are devoted to marketing aspects of promoting voluntary blood donation. In the WHO global report on blood safety and availability, there are also recommendations for promoting the idea of voluntary unpaid blood donation with the help of marketing tools [12]. At the same time, in Ukraine, there are almost no scientific publications on blood

service marketing to increase the number of donors and donations.

The relevance of the work is that after military actions on Ukrainian territory end, people's motivation will change, and the indicators of the blood service will return to the pre-war level. Therefore it is necessary to develop measures to eliminate the shortage.

Research goals. The work aims to analyze Ukraine's supply level with donor blood and blood components during stable conditions. The objectives of the article are the study of the dynamics of indicators: the implementation of plans for the provision of health care facilities, the number of donors, collected blood and plasma, blood transfusion centers, donations per thousand population, and donations per inhabitant during stable conditions.

Presentation of the main research material. Donor blood is needed regularly, both everyday and in emergencies. Some internal indicators of Ukraine's blood service show the industry's situation (Table 1).

As seen from table 1, during 2012–2020, the number of donors decreased twice, collection of plasma – by 30% and whole blood – by 56.8%. The number of blood transfusion stations decreased by 42.6%, transfusion departments of medical facilities – by 43.7%, and hospitals collecting blood – by 15.1%. The staffing of full-time positions with doctors also decreased by 15.9%. All these indicators show a letdown in the industry. In order to understand whether the given volumes of blood collection and its components are sufficient, let us compare them with the planned indicators for meeting healthcare needs.

According to Article 22 of the Law of Ukraine "On Donation of Blood and Its Components" No. 239/95-BP of June 23, 1995, the Cabinet of Ministers of Ukraine determined and approved plans for the mandatory provision of the health care needs of Ukraine with donated blood, its components and blood collecting based on data received from health care institutions, the Ministry of Health,

Table 1

Indicators of the blood service of Ukraine in 2012–2020

Year	Total donors, people	Collected plasma, l	Collected whole blood, l	Number of blood centers, pcs	Number of transfusiology departments of medical facilities, pcs	Number of hospitals collecting blood, pcs	Staffing of full-time doctors
2012	628552	207169,5	399884,5	61	419	86	2406,75
2013	608497	209502,1	309944,7	62	394	97	2241,75
2014	504959	169074,6	261003,9	53	349	86	2744,25
2015	437425	164990,3	233555,0	49	323	83	2567,50
2016	410929	162519,3	220240,3	44	315	77	2498,25
2017	392274	156819,2	217859,7	43	309	76	2402,25
2018	385353	159479,3	208946,2	42	302	73	2336,25
2019	377328	161302,4	208040,7	40	288	72	2226,25
2020	319098	145349,1	172089,9	35	236	73	2024,75
2021	309255	175795,6	210991,2	*	*	*	*

*data unavailable

Source: built by the author on the basis [3–11; 13]

the Ministry of Defense of Ukraine and other state authorities. Data on planned and actual indicators in 2015–2021 are presented in Tables 2 and 3 [3–11]. Data for 2012–2014, 2019, and actual volumes in 2021 are unavailable. The Sumy blood service center mainly prepares blood plasma for processing into drugs. Therefore, the excess values are excluded from the calculation and are listed in the "Plasma for processing" column.

As the data from Tables 2 and 3 show, there are almost no problems in providing healthcare facilities with donor blood and blood components in Ukraine. Thus, the needs of healthcare institutions in 2020 were secured by donor blood by 91.1%, plasma – by 94.6%, erythrocyte mass – by 88.9%, and platelets – by 24.1%. However, there are significant changes in the planned volume of blood and its components collections in 2021. Thus, the plan for collecting donor blood

decreased from 2016 to 2020, and 2020 reached 71% of the plan in 2016. In 2021 it increased to 72.5% (by 2020). The plan for donor plasma collecting in 2021 increased by 2.7 times (by 2020), erythrocyte mass – by three times, and platelets – by only 5%. These may indicate the subjectivity of plans and their inconsistency with market conditions.

One of the indicators used in international practice indicates the level of providing the country with donor blood and its components is the number of donations per thousand of the population. WHO recommends 33 donations per 1000 population [12]. In Ukraine, this indicator was at the level of 11.15 in 2020 (Table 4). Table 4 also presents the calculation of the shortage of donor blood.

As seen from Table 4, the number of donations per 1000 population in Ukraine decreased from 18 in 2012–2013 to 11.15 in 2020, which is three times

Table 2

Implementation of the plan for providing the health care needs of Ukraine with donor blood and plasma in 2015–2021

Year	Donor blood, l			Plasma for processing, l	Donor plasma, l		
	plan	in fact	% execution of the plan		plan	in fact	% execution of the plan
2015	290336,4	378907,3	130,5	25360,2	130940,3	155841,1	99,6
2016	308677	236795,3	76,7	16041,3	142605	156304,6	98,4
2017	283386	243066,1	85,8	21560,8	130571	150672,1	98,9
2018	244178	233220	95,5	44926,5	104621	153621,9	103,9
2019	*	*	*	*	*	*	*
2020	219613,3	200073	91,1	45664,6	100319,6	140571,5	94,6
2021	378923	*	*	*	269158	*	*

*data unavailable

Source: built by the author on the basis [6–11]

Table 3

**Implementation of the plan for providing the healthcare needs of Ukraine
with erythrocyte mass and platelet concentrate in 2015–2021**

Year	Erythrocyte mass, l			Platelet concentrate, l		
	plan	in fact	% execution of the plan	plan	in fact	% execution of the plan
2015	149369,1	119655,1	80,1	13575	19426	143,1
2016	136339	115836,2	85	19075	20322	106,5
2017	125096	115739,3	92,5	17251	24202	140,3
2018	112012	111718,9	99,7	20220	26774,5	132,4
2019	*	*	*	*	*	*
2020	106033	94263	88,9	28353	35187,3	124,1
2021	317429	*	*	30000	*	*

*data unavailable

Source: built by the author on the basis [3–11; 13]

Table 4

The need for donations number in Ukraine in 2012–2020

Year	Total donations, l	Number of donations per 1,000 population	Minimum need according to WHO recommendations, l	Blood shortage, l	Blood shortage, %
2012	845362	17,9	1558489	713127	45,8
2013	837348	18,5	1493648	656300	43,9
2014	682435	14,88	1513465	831030	54,9
2015	623920	13,63	1510591	886671	58,7
2016	601107	13,47	1472645	871538	59,2
2017	581080	13,05	1469398	888318	60,5
2018	563030	12,75	1457254	894224	61,4
2019	561437	12,76	1451992	890555	61,3
2020	486082	11,15	1438628	952546	66,2

Source: built by the author on the basis [3–11]

less than the WHO recommends. At the same time, in Denmark, France, Finland, Italy, and Germany, this indicator was more than 40 in 2015 [14]. In Ukraine, only the Sumy region provided more than 33 donations per thousand population starting in 2015 (40.46–61.68), and in 2012–2013 Crimea and Luhansk region [3–6]. In all other regions, the indicator is below the norm.

Table 4 shows that the blood shortage in Ukraine in 2020 amounted to 952,546 donations or 66.2% of the WHO recommended amount. In Ukraine, blood is collected twice less as recommended by the WHO, and every year there is a tendency to increase the gap between the WHO recommendation and the actual value in Ukraine.

The next indicator in international practice is the amount of collected blood per inhabitant. According to WHO recommendations, it should be 12–15 ml [11].

Table 5 shows that the amount of collected blood per inhabitant during 2012–2020 was almost halved and amounted to 5.3 ml, which is more than half the required amount. The lack of blood in

2020 was 276,990.5 liters or 55.7% of the recommended by WHO.

Conclusions and prospects for further research in this direction. Comparing the values of planned domestic and international standards, one can see significant differences in approaches to the needs of donor blood and its components at the state and world levels. According to national reporting, the blood service functions normally, providing the basic needs of health care institutions in donor blood and its components. If we focus on international experience and standards recommended by the WHO, an acute shortage of blood and its components becomes noticeable. The industry's supply will be approximately 40% in 2020 of the required amount.

Research data show that there is a need to create and implement a system of indicators that would reflect the objective needs of the industry as a whole and individual regions in particular.

Until 1991, there was a system of indicators for calculating the need for healthcare facilities for donor blood and its components in Ukraine. Each station

The need for the amount of stored canned donor blood in Ukraine in 2012–2020

Year	Total collected, l	Collected per 1 inhabitant, ml	The minimum need according to WHO recommendations, l	Blood shortage, l	Blood shortage, %
2012	417800,4	9,4	544472,4	126672	23,3
2013	485395,1	10,7	542950,8	57555,7	10,6
2014	405689,6	9,47	513115,9	107426,3	20,9
2015	407591,7	9,55	512103,6	104511,9	20,4
2016	257238,6	8,9	512103,6	254865	49,8
2017	263672,3	6,2	506601,2	242928,9	48,0
2018	253708,6	6	503802,8	250094,2	49,6
2019	255680,4	6,1	500793,3	245112,9	48,9
2020	220034,1	5,3	497024,6	276990,5	55,7

Source: built by the author on the basis [3–11]

clearly understood how many products needed to be procured. However, after the collapse of the Soviet Union, these indicators were canceled, and no others were adopted instead. Some blood transfusion centers addressed directly with local healthcare facilities about their needs and made collecting based on this information. At the same time, there is not yet a united system of standards for blood service. Nowadays, a blood service institution can sell its products to any buyer, not only within its region. Moreover, the issue of rational procurement planning still needs to be solved.

Since the needs of the industry are provided half as much, it becomes clear that in order to eliminate a significant gap between the real and actual need, it is necessary to implement at the national level marketing programs for the promotion of free voluntary donations. Currently, each station independently searches for donors in its region, and only a few provide for their region's needs. For a significant increase in the volume of blood and its components collections, it is advisable to analyze the existing experience of leader blood centers in Ukraine and the country's experience that fully satisfied their country's needs and implement them in their activities. The organization of marketing activities and the marketing management system in blood centers should also be analyzed. These can be the subject of further research in this direction.

The results of this study can be helpful to marketing specialists involved in blood service promotion.

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