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Original Article

The Role of Donors' Psychological Status and Given Structured Information in Increasing Convalescent Plasma Procurement

Arda Kazim Demirkan,[1] Sude Hatun Aktimur,[2] Necla Gökçe Genç,[3] Ahmet Şen[4]

[1]Department of Psychiatry, Samsun Liv Hospital, Samsun, Türkiye
[2]Department of Hematology, Samsun Education and Training Hospital, Samsun, Türkiye
[3]Department of Internal Medicine, Samsun Education and Training Hospital, Samsun, Türkiye
[4]Department of Anesthesiology, Samsun Education and Training Hospital, Samsun, Türkiye

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Correspondence:
Arda Kazim Demirkan
Psikiyatri Kliniği, Samsun Liv Hospital,
Samsun, Turkey

E-mail:
ardakazimdemirkan@gmail.com

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ABSTRACT

Objective: Promising reports from recent studies show the effect of convalescent plasma as an adjunct alternative in treatment. The subject of our study is evaluating the current knowledge level about convalescent plasma donation and psychometric properties of possible plasma donors and their change of tendency toward being donors after receiving structured information.

Methods: Four hundred plasma donor candidates were assessed for their current knowledge level, anxiety, depression, and health anxiety scores. Their tendency to be voluntary plasma donors before and after structured information was evaluated with surveys.

Results: In participants who are undereducated or uneducated, correct information changed the decision of being a plasma donor more than educated persons, and the statistical difference between donors that have different education levels nearly disappeared with sufficient knowledge (0.006 vs. 0.037, p values). Furthermore, the previous blood donation or need for blood products in the past was important factors to be a plasma donor volunteer, regardless of sufficient information. After the structured information given, it was observed that the psychological states of the participants had no effect on plasma donation tendencies.

Conclusion: It was observed that after the correct information, the dispositional differences between the individuals disappeared, regardless of the psychological and educational status of the individuals. Furthermore, this study suggests that the previous blood donation history is a predictive factor for being a plasma donor; so, interventions to encourage blood donation are seen as an effective approach for the long-term to increase plasma donation supply in acute situations. The results of our study emphasize that informing individuals and society is one of the basic approaches to increase plasma donation in the short- and long-term.

INTRODUCTION

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) caused a pandemic and brought about a health crisis worldwide. It has caused millions of deaths to date.[1] While scientists are continuing to develop various types of vaccines and health authorities are trying to achieve mass vaccination,[2-4] the war against the virus that causes the global health crisis continues with all available treatments.

In addition to antivirals and supportive treatments with limited efficacy in treating the disease, historical and current evidences show that human convalescent plasma therapy may be an appropriate option for alleviating and treating COVID-19 infection, especially in the early period of the disease.[5-8] The growing data we recently obtained in the COVID-19 outbreak support that the convalescent plasma can be used as an adjunct alternative in treatment.[9,10] The effect of convalescent plasma is based on the antibody response generated by recently recovered COVID-19 patients.[9] The human immune system elicits a strong antibody response from 11 to 21 days after the onset of Sars-Cov-2 infection.[11] Convalescent plasma collected from voluntary donors provides a good resource for inducing passive immunity by giving neutralizing antibodies to already infected patients.[12] Although there is

no consensus on the effectiveness of convalescent plasma in the treatment of COVID-19, promising reports from recent studies have increased clinical interest and use in the treatment.[5]

To meet the rapidly increasing plasma demand, various evaluations have been made on logistics issues such as the adequacy of blood product collection centers, processing, storage of blood products, and transportation to the place of use.[13] However, we still do not know the mechanisms and motivation behind voluntary plasma donation, which is the only source of convalescent plasma collection. In addition, the factors underlying the decision-making mechanism that affect potential plasma donors to become actual donors have not been adequately elucidated. We think that it is essential to study these factors in a patient who is just recovered from a situation that can have fatal consequences and cause direct and indirect psychological stress.

This study aims to determine the effect of the current psychological stress, level of knowledge on the subject, and previous blood product donation experiences on desiring to be a resource for plasma therapy to be used in the treatment of other patients, on people who had been sick and recovered from COVID-19 infection. In addition, it is aimed to evaluate the effect of receiving structured information on the attitude about being a donor.

MATERIALS AND METHODS

The study was carried out in our hospital between 1 and 31 February 2021. Patients who received inpatient COVID-19 treatment and recovered were included in the study as plasma donor candidates. At the first meeting with the participants, the patients' current psychological stress, their knowledge about plasma donation, their past experience of donating blood products, and their tendency to become a donor were evaluated. Afterward, structured information was given by the paramedics who were trained on plasma donation processes beforehand, and the participants' tendencies toward becoming donors were re-evaluated.

The survey was applied to 400 plasma donor candidates out of 517, who voluntarily agreed to participate and filled in survey forms. Written consent was taken from all participants, and the study was approved by the local ethics committee of the hospital.

The Structured Information, Survey, and Sociodemographic Data Form

This form was designed by the authors and applied by educated ward staff to evaluate patients' knowledge, desire to become actual plasma donors, and to record social and demographic data. The structured information was designed to educate the participants about plasma collection process, the advantages of convalescent plasma treatment in COVID-19 patients, and donation complications. Participants' thoughts about donating plasma were recorded before and after given structured information.

Hospital Depression and Anxiety Scale

14-item self-report scale,[14] each consisting of 7-question depression and anxiety subscales, scored between 0 and 3, high scores indicate increased depression and anxiety. The study's validity and reliability in Turkey have been examined.[15]

Health Anxiety Inventory

A self-report scale consisting of 18 questions,[16] the questions are scored between 0 and 3, the lowest 0 and the highest 54 points can be obtained from the scale. High scores indicate increased severity of health anxiety. The test's validity and reliability in Turkish population have been confirmed.[17]

Analytic Strategy

Statistical analyses were performed using the SPSS software version 25. To assess the normal distribution of variables, Kolmogorov–Smirnov test was used. Normally distributed variables were presented with mean±standard deviation, others presented with median (min-max). To compare the group variables, the one-way ANOVA test was used for qualitative data (Bonferroni test for post-hoc analysis) and the Chi-square test for quantitative data. The correlation coefficients and their significance were calculated using the Pearson test. Binary logistic regression was used to determine the factors predicting plasma donation behavior before and after given structured information. Values of $p<0.05$ were regarded as significant for all tests.

RESULTS

The study group consisted of 400 patients, 184 (46%) were men and 216 (54%) were women, with a mean age of 40.5±16.0 years. Twenty-six (6.5%) patients did not graduate from any school, but they were literate, the rest were graduated from primary school (%16, n=64), from high school (18.5%, n=74), and from university (59%, n=236). When their working status was examined, 316 (79%) stated that they were still working or retired from a job, 84 (21%) stated that they were not working.

The psychiatric condition of the participants was examined at the beginning of the surveys with the Hospital Depression and Anxiety Scale (HADS) and health anxiety inventory (HAI) scales. The mean HADS depression subscale score was 6.41±4.1, the HADS anxiety subscale mean score was 6.93±4.1, and the HAI total score was 16.1. According to the HADS subscales cutoff score, the presence of depression and anxiety in the participants was 198 (49.5%) and 110 (27.5%), respectively.

Before giving structured information about plasma donation to the participants; when we asked whether they were willing to donate plasma, the levels of anxiety ($F=8.842$, $p<0.01$) and health anxiety ($F=4.336$, $p=0.014$) differed statistically between the groups in the groups formed by those who said yes, no or were indecisive (Table 1). In post hoc analysis, the difference between groups was attributed

Table 1. Psychometric characteristics of groups according to plasma donation tendencies before structured information are given (n=400)

	Mean±SD			F*	p-value
	Yes	No	Indecisive		
HADS depression	6.2±4.2	5.9±3.5	7.0±4.1	0.631	0.533
HADS anxiety	7.1±3.9	2.5±3.3	7.6±4.2	8.842	<0.01**
HAI	16.5±7.7	9.6±8.6	16.6±9.2	4.336	0.014**

*F: ANOVA F value; **Significant results (p<0.05); HADS: Hospital Anxiety and Depression Scale; HAI: Health anxiety inventory; SD: Standard deviation; ANOVA: Analysis of variance.

to lower values of patients' anxiety and health anxiety levels who answered "no."

Before receiving structured information about plasma collection process and the importance of donation, 290 (72.5%) of the participants' answers were "yes," 26 (6.5%) "no," and 84 (21.0%) were "indecisive" regarding whether to donate plasma. However, after the structured information is given, the decision of 288 (72%) of the patients changed as "yes," 6 (1.5%) "no," and 106 (26.5%) "indecisive" (Table 2). The changes between the decisions before and after the given structured information were statistically significant (p<0.01). The post-hoc analysis showed that the significant difference was due to the decrease in "no" and the increase in "indecisive" answers.

Participants' knowledge level about plasma donation and their previous blood product donation experiences are shown in Table 2, and the fact that none of them had donated plasma before, but 154 (38.5%) of them donated blood previously. In the group that considered plasma donation has side effects (%40.5, n=162), most of the participants feared that the plasma donation would reduce immunity (64%, n=104). On the other side, a remarkable finding was that only a small proportion of the participants thought plasma donation was a painful procedure (10.5%, n=42) (Table 2).

Education (p<0.01) and working status (p<0.01) caused a significant difference in participants' knowledge about whether plasma donation is a painful procedure. Most of

Table 2. Participant's knowledge levels and attitudes toward donation about blood products (n=400)

	Yes, n (%)	No, n (%)	Indecisive, n (%)	χ^2 (df)	p-value
Would you accept to donate plasma?*	145 (72.5)	13 (6.5)	42 (21.0)	77.14 (4)	<0.01*
After the information, would you accept to donate plasma?*	144 (72.0)	3 (1.5)	53 (26.5)		
	Yes, n (%)			**No, n (%)**	
Do you know that convalescent plasma can be used in the treatment of active COVID-19 patients?*	161 (80.5)			39 (19.5)	
Do you know your blood group?*	177 (88.5)			23 (11.5)	
Have you donated blood before?*	77 (38.5)			123 (61.5)	
Have you or a your relative ever needed a blood donation?*	127 (63.5)			73 (36.5)	
Have you donated plasma before?*	0			200 (100)	
Are there any side effects of plasma donation?*	81 (40.5)			119 (59.5)	
Leads to fatigue (n=162)	47 (58.0)			34 (42.0)	
Leads to weight loss (n=162)	20 (24.7)			61 (75.3)	
Leads to weight gain (n=162)	15 (18.5)			66 (81.5)	
Leads to increased appetite (n=162)	18 (22.2)			63 (77.8)	
Leads to addiction (n=162)	13 (16.0)			68 (84.0)	
Leads to immunodeficiency (n=162)	52 (64.2)			29 (35.8)	
	Yes, n (%)		**No, n (%)**	**Not suren (%)**	
Does donating plasma cause pain?	21 (10.5)		83 (41.5)	96 (48.0)	

*Significant results (p<0.05).

Table 3. Classification of participant's knowledge about convalescent plasma donation according to sociodemographic characteristics (n=400)

	Donation is painful				Donation has side effects			
	Yes, n (%)	No, n (%)	χ^2 (df)	P	Yes, n (%)	No, n (%)	χ^2 (df)	p-value
Gender								
Male	58 (63.0)	34 (37.0)	1.738 (1)	0.187	41 (44.6)	51 (55.4)	1.168 (1)	0.280
Female	57 (53.8)	49 (46.2)		40 (37.0)	68 (63.0)			
Graduation								
None	12 (92.3)	1 (7.7)	25.283 (3)	<0.01*	4 (30.8)	9 (69.2)	1.643 (3)	0.650
Primary school	22 (68.8)	10 (31.2)		13 (40.6)	19 (59.4)			
High school	30 (81.1)	7 (18.9)		18 (48.5)	19 (51.4)			
College	51 (44.0)	65 (56.0)		46 (39.0)	72 (61.0)			
Working status								
Employees	83 (53.2)	73 (46.8)	7.181 (1)	0.007*	63 (39.9)	95 (60.1)	0.123 (1)	0.726
Unemployed	32 (76.2)	10 (23.8)		18 (42.9)	24 (57.1)			

*Significant results (p<0.05).

the patients who did not graduate from any school but literate thought that plasma donation was a painful process (92.3%, n=24), while this rate was 44.0% (n=102) for university graduates. The fear of experiencing pain was higher in unemployed participants than employees and retirees (76.2% vs. 53.2%) (Table 3).

Participants' tendency to be a plasma donor was examined according to sociodemographic characteristics before and after given structured information. Gender did not cause a difference in tendency to be a plasma donor before and after the information, while the education level caused statistically significant difference in both interrogations (p=0.006, 0.037, respectively). The working status caused a significant difference only before the given structured information (p=0.012) (Table 4).

Factors affecting the tendency to become plasma donors before and after the given structured information were also examined by binary logistic regression analysis. The factors affecting the willingness to donate plasma before given information were determined as; already having knowledge about the advantages of the use of convalescent plasma in COVID-19 therapy (odds ratio [OR]=13.188, %95 confidence interval [CI]=(2.95–58.8)), having donated blood before (OR=6.031, %95 CI=(1.989–18.293)), thinking that plasma donation will be painful (OR=3.858, %95 CI=(1.333–11.161)), and the higher HADS depression score (OR=1.197, %95 CI=[1.034–1.386]). Participants' willingness to donation after given information is predicted by having donated blood before (OR=3.399, %95 CI=(1.356–8.519)), having needed blood products before (OR=0.403, %95 CI=[0.174–0.935]), and knowing

Table 4. Classification of participant's attitudes about convalescent plasma donation according to sociodemographic characteristics (n=400)

	I will donate plasma (before given structured information)				I will donate plasma (after given structured information)			
	Yes, n (%)	No, n (%)	χ^2 (df)	p-value	Yes, n (%)	No, n (%)	χ^2 (df)	p-value
Gender								
Male	67 (72.8)	25 (27.2)	0.009 (1)	0.924	62 (67.4)	30 (32.6)	1.795 (1)	0.180
Female	78 (72.2)	30 (27.8)			82 (75.9)	26 (24.1)		
Graduation								
None	8 (61.5)	5 (38.5)	12.498 (3)	0.006*	11 (84.6)	2 (15.4)	8.470 (3)	0.037*
Primary school	21 (65.6)	11 (34.4)			26 (31.3)	6 (18.3)		
High school	20 (54.1)	17 (45.9)			20 (54.1)	17 (45.9)		
College	96 (81.4)	22 (18.6)			96 (81.4)	22 (18.6)		
Working status								
Employees	121 (76.6)	37 (23.4)	6.289 (1)	0.012*	121 (76.6)	37 (23.4)	1.139 (1)	0.286
Unemployed	24 (57.1)	18 (42.9)			33 (78.6)	9 (21.4)		

*Significant results (p<0.05).

Table 5. Binary logistic regression analysis of factors that may affect plasma donation attitude, before, and after given structured information plasma donation

	Before given structured information		After given structured information	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	0.985 (0.942–1.029)	0.501	0.967 (0.931–1.0)	0.081
Gender	0.898 (0.313–2.572)	0.841	0.741 (0.302–1.810)	0.513
Working status	0.694 (0.192–2.508)	0.578	2.879 (0.813–10.196)	0.101
To have information about the use of plasma in treatment	13.188 (2.95–58.8)	0.001*	3.079 (0.868–10.928)	0.082
To know what her/his blood type	0.285 (0.044–1.847)	0.188	0.433 (0.062–3.022)	0.399
Donating blood at least once in the past	6.031 (1.989–18.293)	0.002*	3.399 (1.356–8.519)	0.009*
Medical history of needing blood product	1.052 (0.432–2.562)	0.911	0.403 (0.174–0.935)	0.034*
Knowing that plasma donation has no side effects	1.460 (0.601–3.549)	0.404	2.262 (1.058–4.839)	0.035*
Knowing that plasma donation is not painful	3.858 (1.333–11.161)	0.013*	2.258 (0.927–5.50)	0.073
HADS depression	1.197 (1.034–1.386)	0.06	1.066 (0.946–1.201)	0.293
HADS anxiety	0.933 (0.799–1.091)	0.385	0.949 (0.828–1.0)	0.455
HAI	0.968 (0.902–1.039)	0.369	1.001 (0.941–1.064)	0.978

*Significant results (p<0.05); OR: Odds ratio; CI: Confidence interval; HADS: Hospital Anxiety and Depression Scale; HAI: Health anxiety inventory.

that plasma donation has no side effects (OR=2.262, %95 CI=[1.058–4.839]) (Table 5).

DISCUSSION

On one hand, the fight against COVID-19 is carried out with preventive health practices by trying to prevent the spread of the virus with widespread vaccination studies and social life restrictions. On the other hand, people who are not included in the vaccination program yet and, more importantly, who cannot reach vaccines globally are treated after being infected. It is known that the ideal approach in infectious diseases is to prevent the occurrence of the disease with preventive public health practices. At the point, we reached in the fight against the COVID-19 pandemic, we did not come close to this ideal since the global vaccine production capacity has not reached the level to meet the global need and the unfair distribution of vaccines in the world. It is clear that in the transition from the therapeutic approach to the preventive approach, there is still a need for development and use of all kinds of therapeutic agents. Due to the lack of definitive treatment for viral infection, in addition to existing antiviral treatments and palliative treatments, convalescent plasma collected from recovered COVID-19 patients is also tried as an additional treatment alternative. Since the one and only source of convalescent plasma is human, and its supply is based on voluntary donation, we think that it is imperative to identify the factors that may affect the decision-making process to encourage potential donors to become actual donors. From this aspect, understanding the current psychological state and knowing previous blood product donation experiences of recovered patients, and evaluating the impact of knowledge about convalescent plasma donation to become a voluntary plasma donor may be the main starting point. We showed that giving structured information by educated paramedics significantly affects our participants' decision to become a plasma donor, especially in undereducated and uneducated groups.

During the pandemic, many studies have been conducted to investigate the depression and anxiety levels of COVID-19 patients in outpatient and inpatients settings, and the reported prevalence was 19%–97% for depression and 14%–100% for anxiety.[18-20] We found 49.5% depression and 27.5% anxiety rates, consistent with the literature. Furthermore, we found that the anxiety and health anxiety scores of the groups who answered "yes-indecisive" before the given structured information was significantly higher than the group who answered "no." Although it seems paradoxical at first sight, we could argue that increased anxiety levels can increase altruism and helping behavior.[21,22] In regression analysis, we realize that, structured information given by the educated ward staff, significantly changed the influence of depression on patients' decision-making algorithm (Table 5) In participants who are less or un-educated, correct information changed the decision of being plasma donors more than educated persons. Sufficient knowledge virtually eliminated the statistical difference between education levels in the study (0.006 vs. 0.037, p values). However, in educated group, we found no significant change in tendency to become a donor with given information (Table 4). Due to the low number and proportion of participants with low education level in the sample of our study limited this promising finding. Although there is no previous study on the impact of education on plasma donation, Yildiz et al.[23] reported a similar change in people's attitude and behavior towards donating whole blood with even a brief briefing. However, considering the nature of convalescent plasma donation in a patient who has just recovered from a potentially

lethal disease, unlike a healthy person's healthy decision on donating blood, it is much more complicated and may need more knowledge in the hospital environment. While the decision to become a plasma donor before and after the information did not change according to gender, this decision differed according to the education and working status. From this aspect, our findings can guide projects to increase plasma donation rates, especially in regions with low education levels.

In regression analysis, positive answers to some of our questions ("plasma donation can be used in the treatment of COVID-19" and "plasma donation is not painful") and donating blood at least once in the past are determined as predictive factors to become a plasma donor before given information (Table 5). After given structured information, donating blood at least once in the past, medical history of needing blood product, and the knowledge about plasma donation has no side effects showing predictive value. These findings interpretable as having correct knowledge about immune plasma transfusion and its advantages in treating COVID-19 patients positively affected people's tendency to be plasma donors, regardless of their education or working status. Participants' previous blood donation experiences is determined as predictive factor to be a plasma donor volunteer, regardless of sufficient knowledge about convalescent plasma donation. To meet the increasing need for convalescent plasma during the pandemic period, we may state that inpatient education by educated staff the most effective policy in the short-term. Furthermore, social responsibility projects and campaigns about donation of blood and blood products could be beneficial to raise awareness to become plasma donors in the long-term.

Despite the encouraging results, our study has limitations, we assessed only a small inpatient group of patients, and the proportion of uneducated persons was low in our study population.

Conclusion

We showed that knowledge significantly affects our participants' decision to become a plasma donor, especially in less and uneducated group. In this point, it would not be wrong to conclude that educating potential plasma donors with even brief information by educated staffs is much more critical in developing countries or populations with low education levels.

As far as we know, this is the first study that evaluates the current knowledge level of potential convalescent plasma donors and their change of tendency toward being donors after given structured information during the SARS-CoV-2 pandemic. It was observed that after the correct information, the dispositional differences between the individuals disappeared, regardless of the psychological status and educational status of the individuals. Furthermore, the present study suggests previous blood donation history as a predictive factor for being a plasma donor; so, interventions to encourage blood donation in the long-term are looking as an effective approach to increase plasma donation supply in acute situations. The results of our study emphasize that informing individuals and society is one of the basic approaches to increase plasma donation in the short- and long-term.

Ethics Committee Approval

This study approved by the Samsun Education and Training Hospital Clinical Research Ethics Committee (Date: 01.01.2021, Decision No: GOKA2021/1/2).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: A.K.D.; Design: A.K.D., S.H.A.; Supervision: A.K.D., S.H.A., A.Ş.; Materials: S.H.A., N.G.G., A.Ş.; Data: N.G.G., A.Ş.; Analysis: A.K.D., S.H.A., N.G.G., A.Ş.; Literature search: A.K.D., S.H.A., N.G.G.; Writing: A.K.D., S.H.A.; Critical revision:A.K.D., A.Ş.

Conflict of Interest

None declared.

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Konvalesan Plazma Tedarikini Artırmada Donörlerin Psikolojik Durumlarının ve Verilen Yapılandırılmış Bilgilerin Rolü

Amaç: Son çalışmalardan elde edilen umut verici raporlar, tedavide yardımcı bir alternatif olarak konvalesan plazmanın etkisini göstermiştir. Çalışmamızın amacı, olası plazma bağışçılarının, konvalesan plazma bağışı konusunda mevcut bilgi düzeylerini, psikometrik özelliklerini ve yapılandırılmış bilgiler verildikten sonra bağışçı olma eğilimlerinin değişimini değerlendirmektir.

Gereç ve Yöntem: Dört yüz plazma bağışçısı adayı mevcut bilgi düzeyleri, kaygı, depresyon ve sağlık kaygısı puanları açısından değerlendirildi. Yapılandırılmış bilgilerden önce ve sonra gönüllü plazma bağışçısı olma eğilimleri anketlerle değerlendirildi.

Bulgular: Daha az eğitimli veya eğitimsiz katılımcılarda, doğru bilgi plazma bağışçısı olma kararını eğitimli kişilere göre daha fazla değiştirmiş ve eğitim düzeyleri arasındaki istatistiksel fark yeterli bilgi ile neredeyse ortadan kalkmıştır (0.006'ya karşı 0.037, p değerleri). Ayrıca, önceden kan bağışı yapmış olmak veya daha önce kan ürünlerine ihtiyaç duymak, yeterli bilgiye bakılmaksızın plazma bağışçısı gönüllüsü olmak için önemli faktörlerdir. Verilen yapılandırılmış bilgilerden sonra katılımcıların psikolojik durumlarının plazma bağış eğilimleri üzerinde herhangi bir etkisinin olmadığı gözlemlendi.

Sonuç: Doğru bilgi verildikten sonra bireylerin psikolojik durumları ve eğitim durumları ne olursa olsun bireyler arasındaki yatkınlık farklılıklarının ortadan kalktığı gözlemlenmiştir. Ayrıca, bu çalışmada önceki kan bağışı öyküsünün plazma bağışçısı olmak için öngörücü bir faktör olduğu sonucuna ulaşılmıştır; bu nedenle, uzun vadede kan bağışını teşvik etmeye yönelik müdahaleler, akut durumlarda plazma bağışı arzını artırmak için etkili bir yaklaşım olarak görülmektedir. Çalışmamızın sonuçları, kısa ve uzun vadede plazma bağışını artırmak için bireyleri ve toplumu bilgilendirmenin temel yaklaşımlardan biri olduğunu vurgulamaktadır.

Anahtar Sözcükler: Hasta eğitimi, pandemi, plazma bağışı, psikoloji.