Determining the Likelihood of an Individual to Become a Blood Donor Using Regression Analysis

Junelyn DJ. Soriano RMT[1*], Laurence P. Usona MS[2]

[1*,2]*Graduate School, Polytechnic University of the Philippines.*

Email: [2]lpusona@pup.edu.ph
Corresponding Email: [1]junelyn.djs@gmail.com*

Abstract: Blood products are a huge part of the health care system. Not having an option to have it manufactured limits the source to collecting blood from willing donors. This leads to a question on how we can ensure that the supply of the blood product will meet the demand of the patients in a health care institution? Through this study, the demographic profile of the respondents, which includes age, sex, employment status educational attainment, previous blood donation; together with their self-assessment of the knowledge on blood donation, personal hesitations, time to be allotted for the donation process, and location of the blood collection site; were analyzed through binomial logistic regression to determine the probability of each individual to become a blood donor. A self-made, validated and reliability tested, questionnaire was given to randomly selected residents of Taguig City, Philippines, whose age is between eighteen to sixty-four. The data gathered treated statistically using the binary logistic function of SPSS to determine the significant variables that affects the individual's decision to donate blood. The analysis led to identifying age, employment status, previous donation, hesitation on blood donation and location of the collection site as significant variables that affect an individual's preference to donate blood. Among these, only previous blood donation has a positive effect on the person's choice of donating blood. It is also noteworthy that the said variable had increased the odds of becoming a repeat blood donor by sixty-six times, when compared to those who have not yet donated blood. This left sex, educational attainment, the person's knowledge on blood donation and their time allotted for blood donation as non-significant contributors to the person's choice to donate. Through these findings, it was evident that there are variables that significantly influence the probability of the individual to donate. These include age, employment status, previous donation, hesitation on blood donation and the location of the collection. People would more likely choose to become blood donors when they are younger, presently unemployed and has less hesitation. A previous experience will increase the likelihood further. With the identification of the variables that would affect the individual

preference, this will enable the recruitment team to adjust their strategies on how to encourage people to become volunteers and help save lives.

Keywords: Blood Supply, Donor Recruitment, Likelihood, Regression Analysis.

1. INTRODUCTION

Through the years, immeasurable advancement has been made to ensure that the blood product can be collected, processed, and stored in accordance with certain standards. The Philippines is not that far behind when it comes to the handling of this precious life extending elixir. However, the challenge of ensuring that enough supply is available starts not in the processing but in the adequate number of individuals who are willing to become blood donors [31]. Currently, the adequacy of blood supply has been overshadowed by the ongoing health crisis. The challenge has always begun with the recruitment of possible blood donors including the list of reasons why a person is not willing, if not hesitant, to donate their blood is quite long. Added to that fact, the physical movement of people from all social classes during the ongoing pandemic led to country's blood supply declining. This challenge is being faced not only by Filipinos, but by other nations as well.

According to the Journal of Multidisciplinary Healthcare, the outbreak of Covid-19 did lower the blood supply in Saudi Arabia [20]. This is a result of the events that led countries to implement lockdowns and travel restrictions in the attempt to stop the spread of the virus. During the same period, scheduled procedures were also put on hold leading to a decline in the demand for blood products. However, as the pandemic started to resolve patients were back with more severe symptoms, in turn requiring more blood products for their recovery [18].

2. METHODS

Locally, National Blood Services Act of 1994, a law that phased out the existence of commercial blood banks [4], has always been a powerful tool that supports the availability of blood products. Since renumeration is not to be expected, the individual's preference is assumed to be influenced by factors related to their basic needs as defined by Maslow's Hierarchy of Needs [17]. This theory shed light as to the person's choice as each individual need should be met first, prior to helping others. Literature on the local movement of the Filipinos have also been reviewed [19], in addition to the business idea of location being an important factor for successful operations [22] have led to the inclusion of the blood donation site as a variable in the study.

Based on previous research, the study delved on nine variables, age, sex, educational attainment, employment status, previous donation, knowledge on blood donation, hesitations, convenience of the time allotted and location of blood donation. Figure 1 illustrates the conceptual framework where the variables mentioned influences the individual preference of the person to donate blood. This was aimed to identify the important contributors that may aid the donor recruitment officers to encourage more persons to donate, in turn increasing the blood supply. This will benefit not only the patients and the doctors through the health care system,

but also the experimental researchers who share the same burden of the shortness of blood supply.

A questionnaire was then designed to investigate the factors that may influence an individual's preference to become a blood donor. Face validation was performed by experts in blood donor recruitment, followed by a content validity review from ten other medical technologists who worked in a blood collection facility. Afterwards, a pre-survey was conducted with fifty respondents coming from the same age group included in the population. Reliability Test was performed using SPSS Ver 23.0, and lastly, Ethics Review Clearance Certification was secured.

Figure 1: Conceptual Framework

The variables were limited to those mentioned above and did not include religion, as well as other psychological aspects of the individual preference such as personal misconceptions, in respect to the individual beliefs of the respondents. Likewise, the current health condition of the person was not made a variable due to the lack of a medical personnel to assess the respondent's status during the conduct of the survey. The renumeration of the doors was not made part of the study based on the regulation that commercial blood banks ceased to continue their operation. Other limitations encountered in the data gathering were the freedom of the selected respondents to refuse to participate, unavailability of the household member during the survey period and the health restriction for certain areas brought about by the pandemic. The fit of the variables to the model highly depended on the honestly of each respondent in completing the survey.

The data was gathered from residents of Wawa, Taguig City aged eighteen to sixty-four years old, the age specified by the World Health Organization as part of the blood donor's basic eligibility guidelines [35].

The population size of 8,331 was estimated from the available data from the Philippine Statistics Office [26] since listing is not feasible during the conceptualization of this survey due to the Covid-19 Pandemic. The minimum sample size was determined by the formula $n = (10*i)/p$ where i = number of independent variable and p = expected probability of the least frequent outcome, hence a minimum of one hundred ninety-six respondents was deemed fit for the study.

The respondents were selected using the Simple Random Sampling Method and the survey questionnaire was made available online through google forms during the survey period and through printed forms for the ease of those who have no internet connection and who are not technologically adept. With the assistance of barangay health workers were also requested to ensure good coverage of the area the survey lasted from January 23 to February 28, 2023, and a total of three hundred valid response was collected.

This study utilized the logistic regression analysis analyzed to determine if the variables included affect the decision of an individual to donate blood alongside descriptive presentation of the data collected. It allowed the researcher to weight the significance of each significant variable. Thus, the variables that highly affects the outcome may have been identified for the benefit of a better recruitment process.

3. RESULTS AND DISCUSSIONS

Of the three hundred respondents, individuals in the age range 35-39 contribute the most with fifty-three collected responses making up around eighteen percent. Majority were female with a total count of one hundred ninety-four, while there are one hundred six male respondents recorded. Sixty-seven percent were employed at the time the survey is conducted and the remaining thirty-three percent are in between jobs. It is noteworthy that all of them have received formal education, of which only one percent does not complete elementary education and four percent graduate from elementary. Remarkably, forty-seven percent were high school graduates, followed by twenty five percent at the college level, and then fourteen percent received a college degree or higher.

Only twenty- five percent have undergone previous blood donation, while the remaining seventy-five percent or two hundred twenty-five out of the three hundred have yet to try donating blood products. The data reflected that fifty four percent of the participants prefer not to donate blood as shown in figure two.

To measure how the respondents assessed blood donation on the aspect of knowledge, hesitation, time allotted for blood donation and the location of the collection facility, the Net Agreement Rating was utilized.
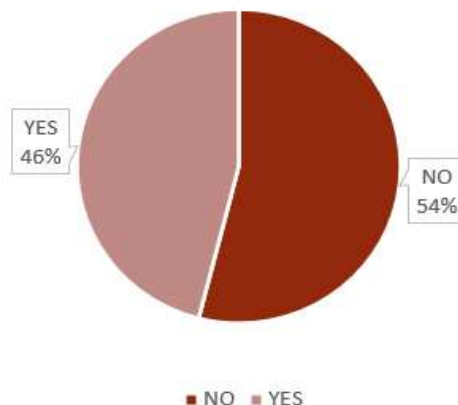
Figure 2: Frequency Distribution of Respondent's Choice in becoming a Blood Donor

The data implied that they have excellent agreement on all the main topic related to blood donation, which can be attributed to the level of education that the respondents have received. With their hesitations, the fear of losing too much blood earned the lowest agreement, followed by the fear of the negative effect on the capacity to perform tasks with thirty-seven percent agreement. The fear of undergoing medical examination earned fifty percent agreement between the respondents while the fear of needles earned the highest agreement from the respondents.

On the time allotted for the donation process and location of the blood collection facility, forty three percent have no time to go to the blood collection site and a larger fifty- six percent agreed that they do not have the time for the blood donation process to be completed. Less than fifty percent agreed to the inconvenience of having the blood donation facility at a distance from their residence and place of work or study, a reflection of the Filipino value of charity among pears and family member [23].

Table 1 summarizes the binomial regression analysis which resulted to identifying age (p-value = 0.038) employment status (p-value=0.031), previous donor (p-value=0.000), hesitation (p-value=0.000), and location (p-value=0.000), as statistically significant variables that contribute to an individual's preference to become a blood donor. The analysis also shows that sex(p-value=0.623), educational attainment (p-value=0.449), knowledge (p-value = 0.126), and time(p-value=0.177) does not contribute significantly to the preference of an individual to become a blood donor, with a p-value > 0.05.

Table 1: Variables that Affects the Likelihood of an Individual to Donate				
	B	Sig.	Odds	Interpretation
Age	-0.037	**0.038**	0.964	**Significant**
Sex	-0.220	0.623	0.803	Not Significant
Educational Attainment	0.179	0.449	1.196	Not Significant
Employment Status	-1.014	**0.031**	0.363	**Significant**

Previous Donation	4.192	**0.000**	66.151	**Significant**
Knowledge	0.522	0.126	1.686	Not Significant
Hesitation	-1.766	**0.000**	0.171	**Significant**
Time	-0.629	0.062	0.533	Not Significant
Location	-1.451	**0.000**	0.234	**Significant**

Figure three indicates how the probabilities were computed using the coefficient for each variable (B) as indicated in table 1. It is evident that an increase in the odds of sixty-six times for a person to donate blood if he had previous donation experience can be observed. This gives a ninety-nine percent probability for a person to become a returning donor with all other variables held at a constant rate

Figure 3: Computation for the Odds and Probability of Becoming a Blood Donor

The results further show the probability of choosing to donate lessen as the age increases, with the odds at 0.96, the probability of the person to become a donor will decrease by forty nine percent for every year that the person ages. A decreasing probability with the increase in the hesitation of the person can also be observed. With the odds at seventeen percent, the probability of the person declines by fifteen percent for every increment in the degree of hesitation. Having the odds for location at twenty three percent, the probability of an individual to decide on donating is reduced by nineteen percent for every increase in the concern with the location of the blood donation site. With the probability of an employed person to donate at twenty seven percent, while a higher odd, at thirty-six percent, was observed for those who are not employed.

After thorough analysis of the data collected, it can be said that the demographics of the would-be donors have a huge impact in increasing the probability of collecting more blood products. This study supports the preceding publications that previous donation is a huge contributing factor for a person to donate blood. There is nothing more effective in debunking the cultural beliefs than by personally experiencing the event, proving that a person will not fall sick after blood collection after personally experiencing the process contradicts the fallacies surrounding blood donation.

It is crucial to design programs to target the correct group of people to recruit more donors. Even though the respondents were knowledgeable about blood donation, they still have hesitations about undergoing the process. In addition to that, both the time to be allotted to complete the process as well as the blood collection site were concerns that needs to be given special consideration.

Based on these findings, it is recommended to create blood donation programs that are targeted to the individuals who are more likely to donate. Since it has been proven with previous studies that women donating are less likely due to their physical condition, coupled with the findings that sex is not an issue with regards to the willingness to donate having additional programs that will improve their health may lead to more women being able to donate. Hopefully, the screening for TTI's as part of the benefits of the donor be emphasized in the programs to be created. This may very well be a start to solving yet another health crisis looming in our doorsteps.

The availability of blood products has always been an understated issue in the Philippine healthcare sector. Substitutes may not be available to fill the deficient supply, we have no scarcity of people who may very well become blood donors. It is a must to make donation a normal by understanding how individuals would choose to become donors. This way, data driven decisions will lead to effective policies about blood donor recruitment and retention may be drafted.

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