

## **Inter-rater Reliability Assessment for Motivating Factors in Blood Donation Using Cohen's Kappa Analysis**

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### **Abstract**

The identification of motivating factors for blood donation, especially for new donors, is important for donor recurrence and retention to ensure that blood stock is always maintained. The aim of this study is to identify the inter-rater reliability of the motivating factors for blood donation, in order to verify that the identified factors are reliable and can be used for further research work. The result from the reliable item has the potential to be used to discover possible blood donation candidates, particularly among the younger generation. It involved two professionals called experts from health industry to give the rating. Therefore, this research performed the Cohen Kappa analysis in order to obtain the mutual agreement value among raters. The result shown the Kappa value is 0.7 which is considered to be in substantial agreement, with 12 out of 16 pairs had perfect agreement, 3 had perfect disagreement while there was one item, which does not have the same level of consensus among raters. The reliability evidence from previously identified factors was provided by these findings and significantly proven for creating appropriate incentive schemes for individual potential donors, which could help raise donation volumes without jeopardising blood supplies. The agreed-upon parameters can then be utilised to create any promotional scheme to ensure that blood is always available and never runs out.

**Keywords:** blood donation, appreciation, notification

### **1.0 Introduction**

Blood Donation are essential to saving one's life. The need for blood is growing in tandem with the improvement of modern medical treatment and the rise in human life expectancy. However, only a small percentage of eligible blood donors, on the other hand, option to donate blood on a regular basis (Vimal & Nishanthi, 2020). As a result, hospital and institutional blood banks are always on the lookout for new donors in order to meet their blood product needs while also maintaining current donors.

Donor recruitment, donor invitation, donor selection, donation processes, and donor retention are all part of the donor cycle idea (Pallavi, Vijaya & Rashmi B, 2017). Therefore, along with the rapid pace of digital technology, many initiatives have recently been made around the world to leverage social media and smartphone applications to make blood donation easier, provide additional services, and establish a community around the blood donation centre. As a result, advertising urging healthy persons to

donate blood to patients who require rapid blood transfusions are common on social media. This is in response to a shortage of blood at the blood bank (Mostafa, Youssef & Alshorbaf, 2014).

Identifying the motivation factors and targets who have the potential to donate blood especially the young is one of the most exciting endeavours, as these donors are usually in good health and may have a very long donation period. However, this demographic is under-represented among blood donors in general (Yuan, Hoffman, Lu, Goldfinger & Ziman, 2011). Therefore, better understanding of the factors that deter and attract potential blood donors to donate blood will enable to build more effective recruitment and retention program. In fact, any factors that are significantly connected with blood donation behaviour, blood donor status, or the intention to contribute or become a blood donor are referred to as motivation. Thus, more information and observations regarding what prevents and motivates people from donating blood are needed to improve successful retention.

While most countries have various blood donation and supply systems, the barriers, motivators, and facilitators may differ. Previous research on barriers and motivators has been summarised but not explored in depth (Klinkenberg, Huis, Wit, Dongen, Daams, Kort & Fransen, 2019). This will complicate the process of designing campaigns focused on promoting blood donation especially targeted for new donor. Therefore, the goal of this research is to evaluate the inter-rater reliability of the motivational factors to donate blood in order to verify that the identified factors are reliable and can be used for further research work.

To get insight into the factors that inspire blood donation, particularly among young people, we applied the Cohen Kappa analytical technique to obtain mutual agreement between two experts. Both experts would then rate each item to verify its reliability. The level of agreement between raters is referred as dependability between evaluators or inter-rater agreement in statistics. The judges/raters assign a score based on how much homogeneity, agreement, or consensus there is. To establish inter-rater reliability, the components' dependability will be assessed using the Cohen Kappa agreement index. Elements with mutual agreement will be taken into account while elements that are not agreed upon will be removed from the list of factors. In this case, items that identified from two categories of motivators can be used to formulate strategies and actions to help promote blood donation campaigns.

This paper is organized as follows: Section I and II presents introduction of motivating factor on blood donation followed by the proposed conceptual framework, Section III presents the methodology; Section IV presents all the obtained results based on mutual agreement between rater; and finally, we close discussing of each aspect by suggesting strategies and actions that might be taken to ensure the country's blood supply.

## **2.0 Background of the blood donation**

In terms of the demand for blood transfusions, it has been found that blood supply is quite important, particularly for victims of car accidents who require blood urgently. In Malaysia, the long holiday season also contributes

for seasonal blood shortages, particularly around holiday periods (such as Eid-al-Fitr and Chinese New Year), school breaks, and the month of Ramadhan (Tey, Arsil, Brindal, Lee, & Teoh, 2020). Consequently, a source of obtaining blood during the season is desperately needed. In these conditions, a huge volume of blood is necessary to address such a wide range of needs. Accordingly, many countries are also facing an increase in demand for blood or blood components. Because it is collected from people who voluntarily donate blood, blood is a valuable source of health. As a result, health facilities have to run constant promotions to encourage voluntary blood donations in order to satisfy demand.

In study, young adults have the potential in terms of being repeated blood donors. If individuals begin donating blood in their 20s, they have the ability to donate for up to 40 years. Based on statistic, nearly a quarter of Malaysia's blood supply originates from college student donors in their twenties, though critical blood shortages continue as an ongoing concern in Malaysia (Jaafar, Chong & Alavi, 2017).

Based on previous study, individuals that donate on a regular basis have been universally proven to be the basis for a safe source of blood (Pal, Sengupta & Shenga, 2008). This activity is seen as a voluntary act to support blood needs, hence, the act of donating blood by the donor contribute to sustain a continuous supply of blood over time. Decision-making by the donor ultimately determines the stability of the blood bank supply. However, the recruitment and retention of recurring donor volunteers is a major challenge for health care systems around the world. Therefore, identifying the motivation factors that contribute to the recurrence of blood donation is crucial to ensure the blood donation cycle continues.

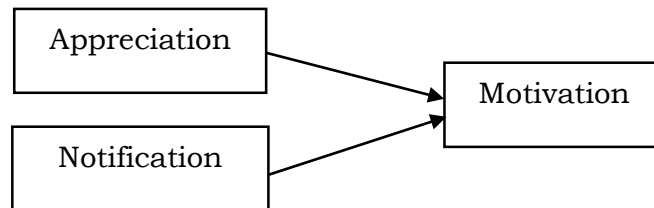
## **2.1 Motivation factors associated to blood donation among donor**

In order to meet the demands of the blood transfusion process and ensure that the blood supply is always adequate and continuous in all hospitals, it is important to understand the driving factors to blood donation for the formulation and implementation of effective donor recruitment programs. Hence, the implementation of strategies to retain first-time donors as voluntary permanent donors can also be devised if such factors can be identified. Individuals will be motivated to donate blood when they are well informed about the process and benefits of saving someone's life (Mohammed & Essel, 2018) and have positive experience during blood donation process (Vimal & Nishanthi, 2020). This shows that, individuals are motivated to donate if they have knowledge in the matter and will be more aware of blood donation if they are educated about it. In study, social continues support to encourage blood donation and experience with knowledgeable and skilled of blood collection staff were factors that contributed to imparting knowledge to donors as well as associated with repeat blood donors (Jaafar et al., 2017).

There are several factors to impart knowledge and give a positive experience to blood donors. Evidence from previous researchers shows that among the factors that contribute towards the positive experience among the blood donor is appreciation (Suemnig, Konerding, Hron, Lubenow, Alpen, Hoffmann & Greinacher, 2017; Cicolini, Comparcini, Alfieri, Zito, Marta, Tomietto & Simonetti, 2019; Domingos Lima, Messias, Feijo, Diniz & Soares,

2016). The elements involved in this appreciation are incentive, certification, star, medical preference, praise and greeting, material reward, interaction and recognition.

Moreover, factors that can convey knowledge among blood donor is through notification (Raza, Qureshi & Qureshi, 2018; Basnotra & Sidhu, 2019; Pallavi et. al., 2017). Notification can be used as a medium for screening information, donation locator, advertisement, campaign, reminder and awareness. Figure 1 shows the conceptual framework of motivation to donate blood.



**Figure 1:** Conceptual framework of motivation to donate blood

### **3.0 Methodology**

This study involves two professionals called experts from health industry to give the rating on the factors which have been identified as a motivator and contributor to donate blood. One of the rater is a practitioner engaged in collecting the blood at blood collection center while another rater is a medical officer whom actively involved with Malaysian Red Crescent Malaysia. Both raters were given directions on how to provide the rating with the use of a checklist sheet. 16 items from two categories which are appreciation and notification with two ranks of agreements, which are Agree (1) and Disagree (0).

The 16 items were identified based on previous studies on motivational factors as shown in Figure 1. Therefore, from the conceptual framework, Ratings Agreement Table (Table 1) is constructed to be assessed its consensus by two experts called rater. Rater will indicate which items they agree to be as motivating factor in blood donation based on their experience involved in previous blood donation campaigns.

The result then will be analysed using the Cohen Kappa values to establish its reliability (Cohen, 1960). Jacob Cohen established the Cohen Kappa index analysis as a way for measuring the reliability of qualitative data. As a result, it's also to figure out how much agreement there is on the theme of the constructs being researched. Mahamod & Ishak, (2003) stated that in order to determine the high value of reliability for each item used to characterise a theme, agreement between raters is required. These items whose reliability has been measured can be used in developing questionnaires.

Thus, to determine whether the agreement's significance is strong or weak, Landis & Koch (2013) proposed the method of calculation is based on the Cohen Kappa agreement scale presented in Table 2.

**Table 1 :** Ratings Agreement Table Based on Category

<b>Category</b>	<b>Items</b>	<b>Rater 1</b>	<b>Rater 2</b>
Appreciation	Incentive		
	Certification		
	Star		
	Medical Preference		
	Praise And Greeting		
	Material Reward		
	Material incentive (allowance)		
	Message to think		
	Interaction		
	Recognition		
Notification	Screening Information		
	Donation Locator		
	Advertisement		
	Campaign		
	Reminder		
	Awareness		

**Table 2 :** Cohen Kappa Agreement Scale

<b>Kappa Value</b>	<b>Degree of consensus</b>
Below 0.00	Poor
0.01-0.20	Slight
0.21-0.40	Fair
0.41-0.60	Moderate
0.61-0.80	Substantial
0.81-1.00	Almost perfect

#### 4.0 Results and discussion

The findings of the study indicate that the 16 items previously identified as motivators to donate blood are beneficial. All of the items have been evaluated and are deemed valid cases. The items from two categories of data provided in Table 3 are being rated.

Table 3 shows that there were 16 valid cases, with 12 of 16 pairings (75%), having perfect agreement, three items having perfect disagreement (18.75%) while one item did not have the same agreement across raters. Based on the evaluation process by experts, the calculation process is carried out using the formula below:

$$K = \frac{fa - fc}{N - fc}$$

Fa = no of agree units

Fc = 50% expected agreement

N = No of valid cases

**Table 3 :** Assessment of agreement by experts

<b>Category</b>	<b>Items</b>	<b>Expert 1</b>	<b>Expert 2</b>
Appreciation	Incentive	/	/
	Certification	/	/
	Star	/	x
	Medical Preference	/	/
	Praise And Greeting	/	/
	Material Reward	x	x
	Material incentive (allowance)	x	x
	Message to think	/	/
	Interaction	/	/
	Recognition	/	/
Notification	Screening Information	x	x
	Donation Locator	/	/
	Advertisement	/	/
	Campaign	/	/
	Reminder	/	/
	Awareness	/	/

Table 4 shows the total value of agreement between experts based on each category. After computing the agreement value for both experts, the researcher has obtained the Cohen Kappa Coefficient Index at the level of 0.5 for category 1 and 0.7 for category 2.

**Table 4 :** Value of agreement between experts based on Cohen Kappa analysis

Categories	Expert 1	Expert 2	Total agreement value
Appreciation	$K = \frac{8-5}{10-5}$ = 0.6	$K = \frac{7-5}{10-5}$ = 0.4	$= \frac{0.6 + 0.4}{2}$ = 0.5
Notification	$K = \frac{5-3}{6-3}$ = 0.7	$K = \frac{5-3}{6-3}$ = 0.7	$= \frac{0.7 + 0.7}{2}$ = 0.7

According to Cohen Kappa Agreement Scale, result of this study shows moderate agreement between raters for appreciation and substantial agreement for notification, as presented in Table 4.

**Table 4 :** Symmetric Measure

	Value	Degree of consensus
Appreciation	0.5	Moderate
Notification	0.7	Substantial

Based on Mahamod & Ishak, (2003), no specific value is appropriate to indicate the level of agreement between experts, though according to Fleiss & Cohen (1973), a kappa of 1.0 indicates complete agreement, a kappa of -1.0 indicates consistent disagreement, and a kappa of 0 indicates a random level of agreement/disagreement between the two raters. While, Wood (2007) argues that the value indicates to be strong agreement if value of kappa should be at least 0.60 or 0.70.

Therefore, based on the findings from this analysis, the factors obtained were found to be reliable for use in developing questionnaire items related to individual motivation to donate blood for research purposes.

The above finding consistent with Vimal et al., (2020), stated that voluntary action of blood donors deserves special consideration and should be appreciated. Appreciations such as the awarding of certificates for voluntary blood donations, stars for each donation, priority in medical examinations will encourage more voluntary donors. Mohammed & Essel (2018) reported similar finding among South African which appreciation in the form of gift items, time off work, material support such as money and recognition, among most validated motivator. In addition, feeling warm or satisfied after donating explains positive emotions from the act of donating are important to attract repeat donors. The feeling of satisfaction after donating can be explained through the appreciation of caring staff and thank you note after going through the blood donation process (Suemnig et al., 2017).

Similar to this study, the sign of the appreciation given by the blood collection staff has a significant positive impact on the donor experience. They found a simple "thank you" greeting was more meaningful than a material reward. Respondents reported feeling appreciated after donating blood with such kind treatment thus encouraging them to donate again (Jaafar et al., 2017). Therefore, such feelings should be nurtured and stimulated in blood donation campaigns.

In addition, the driving factor towards blood donation is contributed by information factors through notification. First-time donors especially young donors are attracted to interactive websites such as social media platforms to get information regarding blood donation campaigns. Therefore, Sümnnig et. al., (2018) developed communication system through social media to recruit new donors and to motivate repeat donors as the use of social media among the young population has increased significantly. This is also agreed upon by Domingos et. al., (2016), where one of the methods to keep new donors from becoming frequent donors is being to keep in touch with them. Notification of the new location of blood donation and the nearest location where they can do so are among the information that can be updated. Social networking is an innovative type of communication for blood donation circle since it allows donors and donation centers to communicate.

Furthermore, providing relevant information on blood donation needs may enable prospective donors to make a clear decision to volunteer in blood donation especially among young people (Tanye & Ahorlu, 2015). This is agreed by Vimal et. al., (2020) where the information through media and peers, are influential in determining a donor's decision to donate blood in

future. Information on blood donation will create awareness among donors about blood donation campaigns.

Therefore, it can be concluded that the factors that have been identified and tested the reliability are seen to be consistent with some findings from previous studies and earlier research work.

#### **4.0 Conclusion**

This study has focusing on verifying the factors that motivate individual to donate blood which are appreciation and notification. Finding from this study is proven reliable and can be used as a variable to assess the level of motivation among donor to donate blood as well as a repeat donor for future research. Identifying the factors that motivate individuals to donate can help in comprehensive coordination and cooperation activities from various parties especially the government and non-governmental organizations. This is important to increase the encouragement of blood donation in the community as well as educating the younger generation on blood donation practices. Hence, it will help to recruit more voluntary donors and also to achieve retention of existing blood donors.

Every blood bank should use a strategy to get individuals to voluntarily donate blood on an ongoing basis. Regular blood donation awareness campaigns and promotion through technology need to be expanded to strengthen social support as well as to recruit new blood donors on a voluntary basis.

#### **References**

- Basnotra, R. M., & Sidhu, M. D. (2019). Donor notification in reactive donors and their response to communication. *International Journal of Research in Medical Sciences*, 7(4), 1088–1092.
- Cicolini, G., Comparcini, D., Alfieri, S., Zito, E., Marta, E., Tomietto, M., & Simonetti, V. (2019). Nursing students' knowledge and attitudes of blood donation: A multicentre study. *Journal of Clinical Nursing*, 28(9–10), 1829–1838.
- Cohen, J. (1960). A Coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20(1), 37–46.
- Domingos, D. C. L., Lima, L. F. S. G., Messias, T. F., Feijo, J. V. L., Diniz, A. A. R., & Soares, H. B. (2016). Blood hero: An application for encouraging the blood donation by applying gamification. *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS, 2016-Octob*, 5624–5627.
- Fleiss, J. L., & Cohen, J. (1973). The Equivalence of Weighted Kappa and the Intraclass Correlation Coefficient as Measures of Reliability. *Educational and Psychological Measurement*, 33(3), 613–619.



- Jaafar, J. R., Chong, S. T., & Alavi, K. (2017). Experience as factors associated with repeat blood donation among university students in Malaysia. *Southeast Asian Journal of Tropical Medicine and Public Health*, 48(5), 1118–1126.
- Klinkenberg, E. F., Huis In't Veld, E. M. J., de Wit, P. D., van Dongen, A., Daams, J. G., de Kort, W. L. A. M., & Franssen, M. P. (2019). Blood donation barriers and facilitators of Sub-Saharan African migrants and minorities in Western high-income countries: a systematic review of the literature. *Transfusion Medicine*, 29(S1), 28–41.
- Landis, J. R., & Koch, G. G. (2013). The Measurement of Observer Agreement for Categorical Data. *Biometrics*, 33(1), 159–174.
- M. Mostafa, A., E. Youssef, A., & Alshorbag, G. (2014). A Framework for a Smart Social Blood Donation System Based on Mobile Cloud Computing. *Health Informatics - An International Journal*, 3(4), 1–10.
- Mahamod, Z., & Ishak, N. H. M. (2003). Analisis Cohen Kappa Dalam Penyelidikan Bahasa: Satu Pengalaman. *Seminar Penyelidikan Pendidikan Guru Peringkat Kebangsaan*, 1–7. Retrieved from <http://www.ipbl.edu.my/portal/penyelidikan/seminarpapers/2003/zamriUKMkk1.pdf>
- Mohammed, S., & Essel, H. B. (2018). Motivational factors for blood donation, potential barriers, and knowledge about blood donation in first-time and repeat blood donors. *BMC Hematology*, 18(1), 1–9.
- Pal, R., Sengupta, S., & Shenga, N. (2008). Behavior disparities towards blood donation in Sikkim, India. *Asian Journal of Transfusion Science*, 2(2), 56.
- Pallavi, P., Vijaya, B., & Rashmi B, K. (2017). Blood donor Notification: Boon for the community, bane for blood donors and blood Centers? *Global Journal of Transfusion Medicine*, 2(2), 124–129.
- Raza, N., Qureshi, H., & Qureshi, A. (2018). Reactive blood donor notification; their responses and perceptions: Experience From Southern Pakistan. *Journal of Ayub Medical College, Abbottabad : JAMC*, 30(3), 351–355.
- Suemnig, A., Konerding, U., Hron, G., Lubenow, N., Alpen, U., Hoffmann, W., Greinacher, A. (2017). Motivational factors for blood donation in first-time donors and repeat donors: a cross-sectional study in West Pomerania. *Transfusion Medicine*, 27(6), 413–420.
- Sümnnig, A., Feig, M., Greinacher, A., & Thiele, T. (2018). The role of social media for blood donor motivation and recruitment. *Transfusion*, 58(10),

2257–2259.

- Tanye, S., & Ahorlu, C. S. (2015). Perceptions of Voluntary Blood Donation Among the Youth in La Dadekotopon.
- Tey, Y. S., Arsil, P., Brindal, M., Lee, S. K., & Teoh, C. T. (2020). Motivation structures of blood donation: a means-end chain approach. *International Journal of Health Economics and Management*, 20(1), 41–54.
- Vimal, M., J, B., & Nishanthi, A. (2020). Motivating and deterring factors for repeat blood donation among donors of blood bank. *IP Journal of Diagnostic Pathology and Oncology*, 5(1), 53–56.
- Wood, J. M. (2007). Understanding and Computing Cohen's Kappa: A Tutorial. In *WebPsychEmpiricist* (pp. 1–18).
- Yuan, S., Hoffman, M., Lu, Q., Goldfinger, D., & Ziman, A. (2011). Motivating factors and deterrents for blood donation among donors at a university campus-based collection center. *Transfusion*, 51(11), 2438–2444.