ORIGINAL ARTICLE

Study of Knowledge, Motivational Factors, and Potential Barriers Concerning Blood Donation Between Lapsed and Regular Blood Donors

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ABSTRACT

Introduction: Many countries struggle to supply enough blood while maintaining their quality and safety. Increasing the number of regular donors is expected to increase the donor pool and blood safety. Thus, this study describes lapsed and regular blood donors' characteristics, knowledge, motivation, and barriers concerning blood donation. **Methods:** This observational cross-sectional study has adopted an assisted self-administered questionnaire, which was distributed to blood donors at the Department of Transfusion Medicine, Hospital Sultanah Bahiyah, Kedah. A total of 328 participants consisting of 164 lapsed and 164 regular donors were selected. Logistic regression tests were used to determine the factors that predict lapsed donors. **Results:** Out of the selected 328 respondents, 54.3% were in the 25–39 age group, 66.2% were males, and 85.1% were Malays. Most of the respondents (88.4%) showed adequate blood donation knowledge, and 99.7% cited altruism as a motivator for blood donation. About 47.0% of the respondents claimed they lack enough time as their donation barrier. Donors who were younger in age, had a moderate blood donation knowledge (adjusted OR, 3.60; 95% CI, 1.34-9.64), didn't know where to donate (adjusted OR, 2.79; 95% CI, 1.47-5.29), lack enough time (adjusted OR, 1.83; 95% CI, 1.04-3.24), and insufficient information about blood donation campaigns (adjusted OR, 2.19; 95% CI, 1.23-3.91) were more likely to lapse. **Conclusion:** Donor education, convenient time and location, and sufficient information about blood donation campaigns targeted at young donors are critical for preventing lapsed donors, which could subsequently increase the regular donor pool. *Malaysian Journal of Medicine and Health Sciences* (2023) 19(2):20-29. doi:10.47836/mjmhs19.2.5

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INTRODUCTION

Malaysia's blood services achieved 100% voluntary non-remunerated blood donors in 2017, in line with the policy set by the Ministry of Health, with a total blood donation of 698 412 (1). The total number of blood recipients in Malaysia in 2000 was 152 000, and it increased dramatically to 343 950 in 2017 (1). This increase can be attributed to the massive development of tertiary-level specialised care that has supported the needs of the public for the past 30 years (2). At the same time, the requirement for blood and blood products in most nations is rising steadily due to the increased human average lifespan, as well as the development of new and aggressive surgical techniques that require large amounts of blood and blood products (3, 4).

With the development of health facilities in Malaysia and the present trend in blood use, blood requirements are anticipated to increase in the years to come. Therefore, it is essential to increase blood donation rates and the donor pool to avoid blood supply shortages (5). The need to increase the number of regular and voluntary blood donors is crucial in maintaining blood requirements, as well as blood safety for better patient care throughout the nation. From the point of view of blood supply organisations, lapsed donors are the main target group to be increased in the donor pool, as they have already shown interest in donating blood and thus, have the ability to boost blood supply (6).

Recruitment and retention programmes aimed at less

dangerous donors are one of the ways to enhance the safety of the blood supply and further decrease the risk of transfusion-borne viral infections (7). Some researchers have proposed recruitment programmes for people who have previously donated blood to improve blood safety (8). This proposal was supported by another study findings, whereby donors who have passively lapsed have strong intentions to resume donating (9).

Repeat donor donations are generally considered advantageous, as they are generally safer and more dedicated. In addition, regular donors generally have fewer adverse donor reactions, making it simpler to run the blood service (10). Regular donor blood products are used to prepare special products, such as paedipacks, plateletpheresis, and plasmapheresis (11). It is clear that blood services and patients will benefit most, if we can maximise the number of regular blood donors.

This study has focused on lapsed and regular blood donors at the Department of Transfusion Medicine, Hospital Sultanah Bahiyah (HSB), Kedah. In order to maximise the number of regular donors and minimise the number of lapsed donors, it is crucial to understand their demographics, knowledge, motivation, and barriers to donate blood.

Previous studies have revealed that aged donors have a greater chance of donating again, with a higher possibility of becoming regular blood donors compared to younger donors (12–14). Studies have also shown that donors without formal education and staff in the formal sector were more likely to donate again (14). Meanwhile, other studies reported that donor status is associated with educational level, whereby tertiary-educated donors were less likely to become regular donors (15).

According to the World Health Organization and the International Red Cross Federation, people with good knowledge of the procedure and benefits of donating blood are more motivated to donate their blood (16). Among blood donors in Malaysia, altruism, helping family and friends in need, and time/place convenient for donation are the main reasons for blood donation (17). Another study among blood donors in Iran reported that donors do not have enough time due to occupation commitments and they exclude themselves due to health issues were the common barriers faced by lapsed donors (18).

A study into the motivation and barriers to donate blood is crucial in understanding donor behaviour. Numerous studies have been conducted locally to understand donor knowledge, motivation, and barriers concerning blood donation among donors and non-donors (15,17,19). However, none of these studies have compared regular and lapsed blood donors. To the best of our knowledge, this is the first study to compare lapsed and regular donors in Malaysia. This study was designed to determine the characteristics, knowledge, barriers, and motivation of donors concerning blood donation, and its association with donor status, as well as to identify predictors for donors to lapse. With this information, proper intervention can be proposed in order to increase and retain current regular blood donors, as well as to reduce lapsed blood donors and subsequently convert them into regular blood donors.

MATERIALS AND METHODS

Subject Recruitment
A cross-sectional study was conducted starting from June 2020 to May 2021 at the Department of Transfusion Medicine, HSB, and various mobile blood donation programmes. A sample size of 328 participants in this study was calculated using two proportion formulas. Purposive sampling was used to select 164 lapsed donors and 164 regular donors among those who came to donate blood at the donation centre and at mobile blood donation programmes. All registered blood donors' donation records with specific dates and places of donation were screened using the Blood Bank Information System 2 and blood donation books. The participants' inclusion criteria consisted of lapsed and regular blood donors who came to donate blood at the Department of Transfusion Medicine, HSB and mobile blood donation programmes in Kedah, donors who were 18–65 years old, consented to whole blood donation, and Malaysian citizens who can read and understand Bahasa Malaysia. First-time blood donors, apheresis donors, and donors who have donated at other blood centres in the last 24 months were excluded from the study.

Data Collection
Data was collected using an assisted self-administered questionnaire that was adopted from Chin et al. 2018 (19). The original questionnaire was prepared by Baig et al. (2013) (20). It was then translated into Bahasa Malaysia and validated by three experts. The questionnaire consisted of four sections with a total of 41 items (Table I). For Section A, the questions were focused on donor demographics, with a total of eight open-ended and multiple-choice questions. Section B contained 10 multiple-choice questions that focused on blood donation knowledge in Malaysia. Each correct answer has a score of one and none for the wrong answer. A total score of less than five was categorised as inadequate, a total score of five was categorised as moderate, and a total score of more than five was categorised as adequate (21). Section C was focused on motivators for blood donation, consisting of seven questions using two-scale answers. Section D consisted of 16 questions using two scales, focusing on motivators for blood donation.

Ethical Approval

Table I: Section, concepts measurement and response categories in the questionnaire

Section	No. of items	Concepts measured	Response category
A. Demographics	8	Demographic information, number of blood donation	Multiple choice and open-ended questions
B. Knowledge	10	Knowledge on eligible age of donation, minimum donor weight, the amount of blood drawn, duration of red cell replacement, post-donation viral screening, the maximum number of annual donations, eligibility of pregnant woman, rest after donation, the vital sign before donation, and universal blood group.	Multiple-choice questions
C. Motivation	5	Motivation to blood donation	True/false
D. Barrier	16	Barriers to blood donation	True/false

Ethical approval was obtained from the Ministry of Health (NMRR-19-3444-51398 (IIR)) in conjunction with the USM Research and Ethical Committee (USM/JEPeM/19120951). The confidentiality of the respondents was strictly protected.

Data Analysis

Collected data were analysed using SPSS software, version 24.0 for Windows. Descriptive analysis was used to describe categorical variables of donor demographics, knowledge, motivation, and barriers to donate blood. The associations between donor status (regular and lapsed) and donor demographics, knowledge, motivation, and barriers to donate blood were determined using simple logistic regression in univariate analysis. To predict the occurrence of lapsed donors, regular donors were set as the reference group. Factors with a p-value of less than 0.25 based on the univariate analysis were selected to be included in the multivariable analysis using multiple logistic regression. The final model was selected based on the p-value in the Hosmer-Lemeshow test, the overall percentage of the classification table, and the area under the ROC curve. A p-value of <0.05 was considered statistically significant.

RESULTS

Donor Characteristics

A total of 336 forms were distributed to blood donors starting from June 2020 to May 2021, and eight forms were excluded due to incomplete data. A total of 328 forms from 164 regular donors and 164 lapsed donors were analysed. Table II shows that 178 (54.3%) respondents in this study were between 25 and 39 years old. Only 6 (1.8%) respondents were older than 54 years old. Taking into account the donor status of both regular and lapsed donors, most donors were also

Table II: Donor demographics and OR of being lapsed donor

Demographics	Regular Donor (n=164) n(%)	Lapsed Donor (n=164) n(%)	Overall n (%)	Crude OR (95% CI)
Age(years)				
18-24	21 (12.8)	49 (29.9)	70 (21.3)	Reference
25-39	89 (54.3)	89 (54.3)	178 (54.3)	0.43 (0.24-0.77)*
40-54	50 (30.5)	24 (14.6)	74 (22.6)	0.21 (0.10-0.42)*
> 54	4 (2.4)	2 (1.2)	6 (1.8)	0.21 (0.04-1.26)
Gender				
Male	101 (61.6)	116 (70.7)	217 (66.2)	Reference
Female	63 (38.4)	48 (29.3)	111 (33.8)	0.66 (0.42-1.05)
Marital status				
Married	106 (64.6)	71 (43.3)	177 (54.0)	Reference
Single	55 (33.5)	89 (54.3)	144 (43.9)	2.42 (1.54-3.79)*
Divorced/widowed	3 (1.8)	4 (2.4)	7 (2.1)	1.99 (0.43-9.16)
Race				
Malay	138 (84.2)	141 (86.0)	279 (85.1)	Reference
Chinese	23 (14.0)	19 (11.6)	42 (12.8)	0.81 (0.42-1.55)
Indian	2 (1.2)	3 (1.8)	5 (1.5)	1.47 (0.24-8.92)
Others	1 (0.6)	1 (0.6)	2 (0.6)	0.98 (0.61-15.80)
Religion				
Islam	139 (84.8)	141 (86.0)	280 (85.4)	Reference
Buddha	21 (12.8)	20 (12.2)	41 (12.5)	0.94 (0.49-1.80)
Hindu	4 (2.4)	3 (1.8)	7 (2.1)	0.74 (0.16-3.36)
Christian	0	0	0	
Other	0	0	0	
Educational level				
Primary	2 (1.2)	2 (1.2)	4 (1.2)	4.00 (0.33-48.66)
Secondary	64 (39.0)	52 (31.7)	116 (35.4)	3.25 (0.66-15.97)
Diploma/Matriculation	49 (29.9)	51 (31.1)	100 (30.5)	4.16 (0.84-20.59)
ulation	41 (25.0)	57 (34.8)	98 (29.9)	5.56 (1.12-27.56)*
Degree	8 (4.9)	2 (1.2)	10 (3.0)	Reference
Master	0	0	0	
PhD				
Employment status				
Government sector	61 (37.2)	77 (47.0)	138 (42.1)	Reference
Private sector	50 (30.5)	48 (29.3)	98 (29.9)	0.76 (0.45-1.28)
Self employed	27 (16.5)	17 (10.4)	44 (13.4)	0.50 (0.25-1.00)
Unemployed	12 (7.3)	5 (3.0)	17 (5.2)	0.33 (0.11-0.99)
Student	14 (8.5)	17 (10.4)	31 (9.5)	0.96 (0.44-2.10)
No of donation				
Once	0	23 (14.0)	23 (7.0)	
Twice	3 (1.8)	43 (26.2)	46 (14.0)	
Three times	11 (6.7)	38 (23.2)	49 (15.0)	Omit from analysis
Four times	14 (8.5)	24 (14.6)	38 (11.6)	
Five times	13 (7.9)	11 (6.7)	24 (7.3)	
>Five times	123 (75.0)	25 (15.2)	148 (45.1)	

*significant with p value<0.05

in the age range of 25-39 years old, with 89 (54.3%) respondents respectively. A total of 217 respondents (66.2%) were male, while the remaining 111 (33.9%) were female. Male respondents dominated both groups; namely, 101 regular donors (61.6%) and 116 lapsed donors (70.3%). Thus, there was a higher prevalence of male respondents among the lapsed donors. In this study, 177 (54.0%) respondents were married, while 144 (43.9%) and 7 (2.1%) respondents were single and divorced/widows, respectively. Among the married respondents, 106 were regular donors (64.6%), while the remaining 71 were lapsed donors (43.3%). Of the 328 respondents, 279 (85.1%) were Malays, and 280 (85.4%) were Muslims. The number of respondents with secondary, diploma/matriculation, and degree levels of education was close, with 64 (19.5%), 49 (14.9%), and 41 (12.5%) respondents, respectively. The number of donors who were working in the government sector was the highest, with 138 (42.1%) respondents. As shown in

Table II, 148 respondents donated more than five times (45.1%), with 123 respondents (75.0%) being regular blood donors.

Knowledge on Blood Donation

Out of 10 knowledge variables, 198 (60.4%) respondents answered incorrectly for the correct age range for blood donation in Malaysia, with 124 (75.6%) were among the lapsed donors as shown in Table III. For the minimum weight of a donor and how many times a person can donate blood in a year, 159 (48.5%) and 137 (41.8%) respondents answered wrongly, with the majority consisting of 92 (56.1%) and 86 (42.4%) lapsed donors, respectively. As shown in Table IV,

Table III: Knowledge on blood donation and donor status

Knowledge variable	Regular Donor (n=164) n(%)	Lapsed Donor (n=164) n(%)	n=328 n (%)
The correct age range for blood donation in Malaysia			
Correct answer	90 (54.9)	40 (24.4)	130 (39.6)
Wrong answer	74 (45.1)	124 (75.6)	198 (60.4)
Minimum weight of the donor			
Correct answer	97 (59.1)	72 (43.9)	169 (51.5)
Wrong answer	67 (40.9)	92 (56.1)	159 (48.5)
Amount of blood drawn for each donation			
Correct answer	149 (90.9)	101 (61.6)	250 (76.2)
Wrong answer	15 (9.2)	63 (38.4)	78 (23.8)
Duration of donated red blood cells replacement in donor			
Correct answer	127 (77.4)	83 (50.6)	210 (64.0)
Wrong answer	37 (22.6)	81 (49.4)	118 (36.0)
Donated blood is screened for AIDS, Hepatitis B & C before transfusion			
Correct answer	152 (92.7)	150 (91.5)	302 (92.1)
Wrong answer	12 (7.3)	14 (8.5)	26 (7.9)
How many times can a person donate blood in a year			
Correct answer	113 (68.1)	78 (47.6)	191 (58.2)
Wrong answer	51 (31.9)	86 (42.4)	137 (41.8)
Pregnant women can donate blood			
Correct answer	152 (92.7)	155 (94.5)	307 (93.6)
Wrong answer	12 (7.3)	9 (5.5)	21 (6.4)
A donor should rest at least 10 minutes after blood donation			
Correct answer	163 (99.4)	156 (95.1)	319 (97.3)
Wrong answer	1 (0.6)	8 (4.9)	9 (2.7)
A potential donor should have a stable vital sign before donating blood			
Correct answer	163 (99.4)	159 (97.0)	322 (98.2)
Wrong answer	1 (0.6)	5 (3.0)	6 (1.8)
Which blood group can be received by all patients who need a blood transfusion			
Correct answer	138 (84.1)	140 (85.4)	278 (84.8)
Wrong answer	26 (15.9)	24 (14.6)	50 (15.2)

Table IV: Knowledge score and OR of being lapsed donor

Knowledge Score	Regular Donor (n=164) n(%)	Lapsed Donor (n=164) n(%)	n=328 n (%)	Crude OR (95% CI)
Inadequate	2 (1.2)	11 (6.7)	13 (4.0)	6.32 (1.38-28.99)*
Moderate	7 (4.3)	18 (11.0)	25 (7.6)	2.95 (1.20-7.28)*
Adequate	155 (94.5)	135 (82.3)	290 (88.4)	Reference

*significant with p value<0.05

most of the respondents in this study showed adequate knowledge on blood donation, whereby 290 of them (88.4%) answered more than five questions correctly. Meanwhile, 25 respondents (7.6%) scored moderately, and only 13 respondents (4.0%) scored inadequately in relation to their knowledge of blood donation. If the status of donors was taken into consideration, the number of lapsed donors with inadequate and moderate knowledge was higher compared to regular donors, with 18 (11.0%) and 11 (6.7%) respondents, respectively.

Motivation to Donate Blood

Almost all 327 respondents (99.7%) showed altruism as their motivation for donating blood. Meanwhile, 313 (95.3%) and 300 (91.5%) respondents were motivated to help their family/friends who were in need and the convenient time/place for blood donation, respectively. Only 41 (12.5%) respondents were motivated to donate because the blood bank offered money/gifts as seen in Table V.

Barriers Against Blood Donation

Table VI illustrates 16 barriers against blood donation among regular and lapsed blood donors. Out of 328 respondents, 154 (47.0%) claimed that they lack enough time as a barrier to donate blood. Specifically, 99 (60.4%) lapsed donors claimed this as their barrier to donate blood compared to only 55 (33.5%) regular blood donors making that claim. Meanwhile, 151 (46.0%) respondents answered that they do not know where to donate blood, and 100 (61.0%) out of 151 respondents were lapsed donors, while 51 (31.1%) were regular donors. Furthermore, 135 (41.2%) respondents claimed that the collection facility is too far from their residence as a barrier to donate with a major difference was observed between 56 regular donors (34.2%) and 79 lapsed donors (48.2%), as shown in Table VI. Additionally, 120 (36.6%) respondents reported that they do not have enough information regarding blood donation campaigns, as a barrier to donate blood. A significant difference was observed between 80 (48.8%) respondents from the lapsed donor group and 40 (24.4%) respondents from the regular donor group.

Associations between Donor Demographics, Knowledge, Motivation, and Barriers Concerning Blood Donation, with Donor Status

Table V: Motivational factors on blood donation and OR of being lapsed donor

Motivation	Regular Donor (n=164) n(%)	Lapsed Donor (n=164) n(%)	n=328 n (%)	Crude OR (95% CI)
I can help family or friends in need				
Yes	155 (95.5)	158 (96.3)	313 (95.4)	Reference
No	9 (5.5)	6 (3.7)	15 (4.6)	0.65 (0.23-1.88)
The time/place for blood donation is convenient				
Yes	153 (93.3)	147 (89.6)	300 (91.5)	Reference
No	11 (6.7)	17 (10.4)	28 (8.5)	1.61 (0.73-3.55)
They give money/gift				
Yes	20 (12.2)	21 (12.8)	41 (12.5)	1.06 (0.22-2.04)
No	144 (87.8)	143 (87.2)	287 (87.5)	Reference
I can learn about AIDS/Hepatitis B&C status				
Yes	64 (39.0)	85 (51.8)	149 (45.4)	1.68 (1.08-2.61)*
No	100 (61.0)	79 (48.2)	179 (54.6)	Reference
The practice of selfless concern for the well-being of others/altruism				
Yes	164 (100)	163 (99.4)	327 (99.7)	p> 0.850ᵇ
No	0	1 (0.6)	1 (0.3)	
Religious reason				
Yes	69 (42.1)	75 (45.7)	144 (43.9)	Reference
No	95 (57.9)	89 (54.3)	184 (56.1)	0.86 (0.56-1.33)
No specific reason				
Yes	77 (47.0)	71 (43.3)	148 (62.2)	Reference
No	87 (53.0)	93 (56.7)	180 (37.8)	1.16 (0.75-1.79)

*significant with p value<0.05
ᵇ Fisher exact test was performed

A simple logistic regression analysis was performed to determine the associations between donor demographics, knowledge, motivation, and barriers concerning blood donation, with donor status. To predict the occurrence of lapsed donors, regular donors were set as a reference group. Table II summarises the association between donor demographics with donor status and the OR of being a lapsed donor based on donor demographics. As shown in Table II, donors are less likely to become lapsed donors with increasing age up to 54 years old, with OR of 0.43 (95% CI, 0.24–0.77) in the 25–39 age category and 0.21 (95% CI, 0.10–0.42) in the 40–54 age category. The analysis also revealed that lapsed donors were more likely to be single, or never married (OR, 2.42; 95% CI, 1.54–3.79) and highly educated (OR, 5.56; 95% CI, 1.12–27.56) compared to regular donors. The univariate analysis showed the presence of multicollinearity with a high correlation between total donation and donor status (r = 0.958). Hence, this variable was omitted from the analysis. As shown in Table IV, respondents with moderate (OR, 2.95; 95% CI, 1.20–7.28) and inadequate (OR, 6.32; 95% CI, 1.38–28.99) knowledge of blood donation, were more likely to become lapsed donors. Statistical analysis results on the motivation for donating blood (Table V)

Table VI: Barrier on blood donation and OR of being lapsed donor

Barrier	Regular Donor (n=164) n(%)	Lapsed Donor (n=164) n(%)	n=328 n (%)	Crude OR (95% CI)
I have unknown fear				
Yes	15 (91.5)	25 (15.2)	40 (12.2)	1.79 (0.91-3.53)
No	149 (8.5)	139 (84.8)	288 (87.8)	Reference
I do not know where to donate blood				
Yes	51 (31.1)	100 (61.0)	151 (46.0)	3.46 (2.20-5.46)*
No	113 (68.9)	64 (39.0)	177 (54.0)	Reference
The collection facility is very far away from my living place				
Yes	56 (34.2)	79 (48.2)	135 (41.2)	1.79 (1.15-2.80)*
No	108 (65.9)	85 (51.8)	193 (58.8)	Reference
I don't have enough time to donate blood				
Yes	55 (33.5)	99 (60.4)	154 (47.0)	3.02 (1.92-4.74)*
No	109 (66.5)	65 (39.6)	174 (53.0)	Reference
I am concerned about the sterilization of equipment that used to draw blood				
Yes	9 (5.5)	26 (15.9)	35 (10.7)	3.25 (1.47-7.16)*
No	155 (94.5)	138 (84.2)	293 (89.3)	Reference
No one ever asked me for a blood donation				
Yes	24 (14.6)	46 (28.0)	70 (21.3)	2.27 (1.31-3.95)*
No	140 (85.4)	118 (72.0)	258 (78.7)	Reference
I never thought to donate blood				
Yes	14 (8.5)	29 (17.7)	43 (13.1)	2.30 (1.17-4.54)*
No	150 (91.5)	135 (82.3)	285 (86.9)	Reference
I do not have enough information about blood donation campaign				
Yes	40 (24.34)	80 (48.8)	120 (36.6)	2.95 (1.85-4.72)*
No	124 (75.6)	84 (51.2)	208 (63.4)	Reference
I believe that there is no need to donate blood				
Yes	9 (5.5)	11 (6.7)	20 (6.1)	1.24 (0.50-3.07)
No	155 (94.5)	153 (93.3)	308 (93.9)	Reference
I am anxious they would take too much blood				
Yes	7 (4.3)	15 (9.2)	22 (6.7)	2.26 (0.90-5.69)
No	157 (95.7)	149 (90.8)	306 (93.3)	Reference
I am afraid of the sight of blood				
Yes	17 (10.4)	23 (14.0)	40 (12.2)	1.41 (0.72-2.75)
No	147 (89.6)	141 (86.0)	288 (87.8)	Reference
I am afraid of the needle prick, pain or discomfort				
Yes	23 (14.0)	31 (18.9)	54 (16.5)	1.43 (0.79-2.58)
No	141 (86.0)	133 (81.1)	274 (83.5)	Reference
I am not eligible because of medical reasons				
Yes	35 (21.3)	31 (18.9)	66 (20.1)	0.86 (0.50-1.48)
No	129 (78.7)	133 (81.1)	262 (79.9)	Reference
The donation process is long and boring				
Yes	9 (5.5)	15 (9.2)	24 (7.3)	1.73 (0.74-4.08)
No	155 (94.5)	149 (90.9)	304 (92.7)	Reference
My blood may be misused by the blood bank				
Yes	8 (4.9)	8 (4.9)	16 (4.9)	1.00 (0.37-2.73)
No	156 (95.1)	156 (95.1)	312 (95.1)	Reference
No specific reason				
Yes	35 (21.3)	42 (25.6)	77 (23.5)	1.27 (0.76-2.12)
No	129 (78.7)	122 (74.4)	251 (76.5)	Reference

*significant with p value<0.05

show that donors who donate blood just to learn about their AIDS/Hepatitis B and C status were more likely to become lapsed donors (OR, 1.68; 95% CI, 1.08–2.61). Only one respondent did not cite altruism as the motivation to donate blood. Hence, the Fisher exact test was performed to determine the association between altruism and donor status. As shown in Table VI, donors who do not know where to donate blood (OR, 3.46; 95% CI, 2.20–5.46), lack enough time to donate blood (OR, 3.02; 95% CI, 1.92–4.74), and do not have enough information about the blood donation campaign (OR, 2.95; 95% CI, 1.85–4.72) were more likely to lapse. These donors also have a higher probability of lapsing, if the collection centre is far from the donor's home (OR, 1.79; 95% CI, 1.15–2.80), and if the donor is concerned about sterilisation of equipment used (OR, 3.25; 95% CI, 1.47–7.16). The results also showed two factors that could significantly increase the chance of becoming a lapsed donor: i) no one has previously asked the donor to donate blood (OR, 2.27; 95% CI, 1.31–3.95); and ii) the donor has previously never thought about donating blood (OR, 2.30; 95% CI, 1.17–4.54).

Predictors of Lapsed Donor Based on Multiple Logistic Regression

Multiple logistic regression was performed by controlling all variables with a p-value of less than 0.25. As seen in Table VII, the following age categories of 25–39 years old (adjusted OR, 0.30; 95% CI, 0.16–0.58), 40–54 years old (adjusted OR, 0.15; 95% CI, 0.07–0.32), and > 54 years old (adjusted OR, 0.72; 95% CI, 0.01–0.67)

were less likely to lapse. This observation suggested that younger donors were more likely to lapse. Donors in the > 54 years old age category, which was insignificant in simple logistic regression, became significant in multiple logistic regression. However, the odds of becoming a lapsed donor were increased for donors older than 54 years old. Donors with a moderate knowledge score (adjusted OR, 3.60; 95% CI, 1.34–9.64) were also found to have a higher chance of lapsing. Additionally, donors who do not know where to donate blood (adjusted OR, 2.79; 95% CI, 1.47–5.29), donors who lack enough time to donate blood (adjusted OR, 1.83; 95% CI, 1.04–3.24), and donors who do not have enough information about the blood donation campaign (adjusted OR, 2.19; 95% CI, 1.23–3.91) have a significantly higher probability of becoming lapsed donors.

DISCUSSION

This study was conducted to better understand the characteristics, knowledge, motivation, and barriers to donate among blood donors. Given the ongoing reduction in regular donors and the increase in lapsed donors across the country (1,22,23), it is critical to have a thorough understanding of donor characteristics, and their knowledge, motivation, and barriers. This study aimed to identify specific characteristics associated with donor status as a follow-up to a previous study. With the univariate analysis, most parameters predicted lapsed donors in the expected direction, yet with the multivariate analysis, only several parameters

Table VII: Adjusted logistic regression with the odds of being a lapsed donor

	Regular Donor (n=164) n(%)	Lapsed Donor (n=164) n(%)	Crude OR (95% CI)	Adjusted OR[a] (95% CI)
Age(years)				
18-24	21 (12.8)	49 (29.9)	Reference	Reference
25-39	89 (54.3)	89 (54.3)	0.43 (0.24-.077)	0.30 (0.16-0.58)*
40-54	50 (30.5)	24 (14.6)	0.21 (0.10-0.42)	0.15 (0.07-0.32)*
> 54	4 (2.4)	2 (1.2)	0.21 (0.04-1.26)	0.72 (0.01-0.67)*
Knowledge Score				
Inadequate	2 (1.2)	11 (6.7)	6.32 (1.38-28.99)	5.02 (0.97-25.75)
Moderate	7 (4.3)	18 (11.0)	2.95 (1.20-7.28)	3.60 (1.34-9.64)*
Adequate	155 (94.5)	135 (82.3)	Reference	Reference
I do not know where to donate blood				
Yes				
No	51 (31.1)	100 (61.0)	3.46 (2.20-5.46)	2.79 (1.47-5.29)*
	113 (68.9)	64 (39.0)	Reference	Reference
I don't have enough time to donate blood				
Yes	55 (33.5)	99 (60.4)	3.018 (1.92-4.74)	1.83 (1.04-3.24)*
No	109 (66.5)	65 (39.6)	Reference	Reference
I do not have enough information about the blood donation campaign				
Yes	40 (24.4)	80 (48.8)	2.95 (1.85-4.72)	2.19 (1.23-3.91)*
No	124 (75.6)	84 (51.2)	Reference	Reference

[a] multiple logistic regression was performed controlling for variables with p-value <0.25
Backward LR was applied. Hosmer-Lemeshow test (p=0.46), classification table (overall percentage of 68 percent), and area under the ROC 0.83 were applied to assess the model goodness-of-fit
*significant with p value<0.05

remained significant predictors of lapsing. In our study, approximately three-quarters of the respondents were in the working age group (25–54 years old), and more than half were in the 25–39 age category. This is consistent with the data collected by the Department of Statistics, Malaysia, whereby donors between 20 and 39 years old accounted for 56.8% of eligible donors in Kedah (24). Additionally, the majority of the respondents were Malay and Muslims. These findings were not in agreement with a study conducted in Penang, whereby the percentages of Malay and Chinese respondents were similar at 44.3% and 44.7%, respectively (15). This difference can be explained by the fact that Malays make up the majority (77.9%) of the population in Kedah (24).

The current study found a strong association between a donor's age and status. As the age of the donor increases up to 54 years, they are less likely to become lapsed donors. This observation was also in accord with our earlier observations, which showed that aged donors have a higher possibility of becoming regular donors, and with advancing age, donors were more likely to donate again (12,13,25). In our study, however, the likelihood of becoming a lapsed donor increased after the age of 54 years old. This may be because donors at this age are unable to donate blood due to medical illnesses. They could have also retired, which means they could not donate blood at mobile blood donation programmes at their former workplace. These findings suggested that all efforts and strategies to increase regular blood donors should be focused on the young age population. In our study, single and educated donors were more likely to lapse based on the univariate analysis. The present findings were consistent with previous research that found strong predictors for donors to donate again, namely, being married and being without formal education (14). These findings were also in accordance with a local study by Lim et al. (2018), which found that single donors are more likely to become occasional donors than regular donors (15). Most of the respondents in this current study were working in the government sector. A possible explanation for this would be that many mobile blood drives were dependent on government organisations, since few non-government organisations were willing to arrange blood drives during the Covid-19 pandemic. However, employment status was not associated with donor status, in contrast with an earlier study that found donors in the formal sector were more likely to donate again (14).

This study has been unable to demonstrate that the number of donations was associated with donation practice, as stated by G. B. Schreiber et al. (2005); future donations are more likely to be made, as the amount of previous donations rises (12). This study was also unable to prove that the number of donations served the main role in creating the donor profile, as stated by Schlumpf et al. (2007) (13). Approximately 75.0% of the respondents

in this study, who were regular donors, donated more than five times, and they accounted for 83.1% of the total number of respondents who donated more than five times. The presence of multicollinearity in the univariate analysis could be related to the case definition of regular donors, which requires donors to donate at least twice to be included in this group, resulting in only lapsed donors contributing to the number of respondents who donated once.

Approximately 88.4% of the survey participants in this study had a good knowledge score. These findings were congruent with those of Noh et al. (2019), who reported a good mean knowledge score, with the majority of respondents having a good knowledge score in a study conducted among the inhabitants of Kuala Terengganu (17). This was not surprising given that we live in a technological period where modern technologies and communication tools are available to everyone, and the majority of the respondents were young donors. A significant association was found between blood donation knowledge and donor status, which is similar to the findings of a previous study that reported that blood donation knowledge was associated with donation practice (26). This study discovered that donors with poor knowledge of blood donation were more likely to lapse. However, inadequate knowledge became insignificant based on the multivariate analysis model, and moderate knowledge remained. Although the data were analysed based on the total donation knowledge score, each item had to be thoroughly investigated separately. In this study, 35.1% of the participants claimed that less than four donations could be made every year. Approximately 60.4% of the participants incorrectly answered 18–35 and 18–45 years old as the right age ranges for donating in Malaysia. Since blood donation cannot be maximised due to these misconceptions, this situation may have an impact on the annual blood collection. This information has revealed that proper education on blood donation is required to prevent donors from lapsing, which could subsequently increase the annual collection of blood banks.

Numerous studies have identified altruism as the primary motivator for blood donation. Shamsudeen Mohamad et al. (2018) and Chee et al. (2018) found that altruism drove 98.7% and 85.1% of their respondents to donate, respectively (14,19). This study has also confirmed that altruism was the primary motivator for donating, with 99.7% of the respondents stating that they donated because of a selfless concern for the well-being of other people. However, in this study, altruism was not associated with donor status. The current findings were congruent with those of Germain et al. (2007), whereby no correlation was found between altruistic behaviour and donor status, with the total rates of reported altruism being equal in lapsed and current donors (25). However, Shamsudeen Mohamad et al. (2018) discovered a significant association between altruism and donation

status (14). This discrepancy could be caused by lapsed donors who did not choose blood donation as a primary activity to fulfil their altruistic goals. In our study, 86.6% of the lapsed donors donated blood because the time and/or place of blood donation were convenient. This finding has demonstrated that in order to tackle the issue of lapsed donors, the blood centre must provide good services, with convenient times and locations for blood donation, as the altruistic desire is already present.

It was rather surprising to discover that more than half of the lapsed donors were motivated to donate in order to know their AIDS/Hepatitis B & C status. Based on the univariate analysis, donors were more likely to lapse, if they were driven by this motivator. However, in order to donate blood, high-risk donors may conceal critical information regarding Transfusion Transmissible Infections (TTI), mainly so that their blood can be tested (27–29). The blood centres must explain to donors that donation should not be used as a platform to test a donor's infectious status. Blood centres should also educate the community that blood donation is not the appropriate platform for infectious disease screening and that they should instead visit their nearest health facility.

The results of this study showed that time constraint was the major barrier to blood donation, with 47.0% of respondents making this claim. Time constraint to donate blood was also significantly associated with donor status, in which donors are more likely to lapse if they do not have enough time to donate blood. This finding was similar to that made by van Dongen et al. (2012) in the Netherlands, whereby passively lapsed donors mentioned busy life and the time it takes to donate blood as the main reasons for discontinuing donations (9). It was also encouraging to compare this finding with that by Charbonneau et al. (2016), whereby the majority of respondents, regardless of donor type, chose reasons linked to time restrictions (30). However, a local study in Kelantan revealed only 32.0% of the respondents addressed the lack of time to donate (19). This might be explained by the fact that their study was conducted at a university, where the majority of the participants were between the ages of 18 and 25, implying that they were mostly students with more time to donate blood. Our study found that 72.0% of respondents worked in the government and private sectors, with working hours ranging from 8 a.m. to 5 p.m. This factor, combined with the fact that local blood donation centres and blood drives typically close at 5 p.m., may be the best explanation for why our respondents cited time constraints as their top reason for not donating blood. With this information, blood centres can overcome this barrier by arranging for more blood donation drives at workplaces. This approach could offer our blood donors additional opportunities to donate at work, without taking too much time of their work schedule. Furthermore, a weekend blood donation campaign at shopping centres could make it easier for donors to donate blood while shopping. Blood donation centres should also consider extending their hours so that donors can donate after work. However, the effectiveness of this intervention needs to be thoroughly researched because it requires a lot of resources.

Not knowing where to donate and not having enough information about blood donation campaigns were two of the major barriers identified in our study. Those who did not know where to donate, as well as those who did not have information about blood donation campaigns, were more likely to lapse. This result contrasted with a previous study, in which less than 13.0% cited these factors as barriers to donate blood (19). In another study, the most frequently cited barrier for lapsed whole blood donors was the lack of information, and this barrier was significantly associated with donor status (30). These two barriers were primarily related to the information received by the participants. A survey of internet users in 2020, which was conducted by the Malaysian Communications and Multimedia Commission (MCMC), revealed that approximately two-thirds (67.1%) of Malaysia's internet users were between the ages of 20 and 40 (31). Additionally, 75.6% of our study population is comprised of people between the ages of 17 and 39; thus, we recommend that blood centres fully utilise social media to promote and disseminate information about their location and blood donation campaign schedules to this age group.

This study found four barriers to be significantly associated with donor status based on the univariable analysis, but were shown to be insignificant when other variables were controlled in the multiple logistic regression. These barriers were collection facilities being too far away from the donor's residence; the donor was concerned about the sterilisation of the equipment used in blood donation; no one has previously asked the donor to donate; and the donor has previously never thought of donating. Approximately 41.0% of the respondents cited that the collection facility is very far from their residence, and donors who cited this were more likely to lapse based on the simple logistic regression. These results differed from an earlier study that reported only 13.2% of the respondents mentioning distance to the blood collection facility as a barrier (19). The static blood collection centre in our study is located in the Alor Setar district, the capital of the state of Kedah. This blood collection centre not only collects blood from this district alone, but also from four nearby districts. The total area of these five districts is 3598 km2, which may be the reason why many donors cited collection facilities being far away from their residence as a barrier (24). Thus, this study suggests that the blood collection centre organises a regular mobile donation campaign that covers attractive spots in each nearby district to make it easier for people to donate.

Donors who were concerned about sterilisation of equipment, has previously never been asked to donate blood, and has previously never thought of donating blood were more likely to lapse based on simple logistic regression. A study conducted in Ghana reported an association between fear of infection and donor status (14). Another study conducted among university students in Qatar discovered that the most common obstacles observed by non-blood donors were failure to meet the criteria, followed by never been asked to give blood (32). These findings suggested that blood centres should increase their promotional efforts to raise public awareness about blood donation.

CONCLUSION

This study has concluded that it is critical to increase public knowledge and promotion for blood donations. A well-planned strategy, with a targeted approach, is required to ensure the effectiveness of blood collection drives. Donor education is critical for increasing donor knowledge and consequently, influencing the return rate of donors. These steps are important in maintaining and increasing current regular blood donors, as well as preventing donors from lapsing.

REFERENCES

1. Pusat Darah Negara. Annual Report Blood Transfusion Services 2017. 2017;18:82.
2. Thomas S, Beh L, Nordin R Bin. Health care delivery in Malaysia: Changes, challenges and champions. J Public Health Africa. 2011;2(2):93–7. doi: 10.4081/jphia.2011.e23
3. Greinacher A, Fendrich K, Alpen U, Hoffmann W. Impact of demographic changes on the blood supply: Mecklenburg-West Pomerania as a model region for Europe. Transfusion. 2007;47(3):395-401. doi: 10.1111/j.1537-2995.2007.01129.x.
4. Mathew SM, King MR, Glynn SA, Dietz SK, Caswell SL, Schreiber GB. Opinions about donating blood among those who never gave and those who stopped: A focus group assessment. Transfusion. 2007;47(4):729–35. doi: 10.1111/j.1537-2995.2007.01177.x.
5. Drackley A, Newbold KB, Paez A, Heddle N. Forecasting Ontario's blood supply and demand. Transfusion. 2012;52(2):366–74. doi: 10.1111/j.1537-2995.2011.03280.x

6. Murphy W, Mcsweeney E. Lapsed donors: an untapped resource. Pract Transfus Med Third Ed. 2009;43(January):190–9.
7. Davey RJ. The "safe" blood donor and the national blood supply: is there a new interface? Transfusion. 1998;38(4):323–6. doi: 10.1046/j.1537-2995.1998.38498257368.x.
8. Katz LM. Transfusion safety in the 21st century: How tightly should the blood community close the window(s)? J Infect Dis. 2008;198(9):1258–61. doi: 10.1086/592278.
9. Van Dongen A, Abraham C, Ruiter RAC, Schaalma HP, De Kort WLAM, Dijkstra JA, et al. Are lapsed donors willing to resume blood donation, and what determines their motivation to do so? Transfusion. 2012;52(6):1296–302. doi: 10.1111/j.1537-2995.2011.03447.x
10. Lee CK, Hong J, Hung ATF, Kong H, Cross R. An update of blood donor recruitment and retention in Hong Kong. Asian J Transfus Sci. 2008;2(2):47-50. doi: 10.4103/0973-6247.42691.
11. National Blood Centre. Transfusion Practice Guidelines for Clinical and Laboratory Personnel. 2016;4:152.
12. Schreiber GB, Sharma UK, Wright DJ, Glynn SA, Ownby HE, Tu Y, et al. First year donation patterns predict long-term commitment for first-time donors. Vox Sang. 200;88(2):114-21. doi: 10.1111/j.1423-0410.2005.00593.x.
13. Schlumpf KS, Glynn SA, Schreiber GB, Wright DJ, Randolph Steele W, Tu Y, et al. Factors influencing donor return. Transfusion. 2008;48(2):264–72. doi: 10.1111/j.1537-2995.2007.01519.x.
14. Mohammed S, Essel HB. Motivational factors for blood donation, potential barriers, and knowledge about blood donation in first-time and repeat blood donors. BMC Hematol. 2018;18(1):1–9. doi: 10.1186/s12878-018-0130-3
15. Lim Mei Ling, Thock Sheng Hui, Andrew K. G. Tan, Gwee Sai Ling. Published online: 27 April 2018 To cite this article: Lim, M. L., S. H. Thock, A. K. G. Tan and S. L. Gwee. Determinants of blood donation status in Malaysia: Profiling the non-donors, occasional donors and regular donors. Kajian Malaysia. 2018;36(1):43–62. doi: 10.21315/km2018.36.1.3
16. World Health Organization and International Federation of Red Cross and Red Crescent Societies. Towards 100 % Voluntary Blood Donation A Global Framework for Action. World Health. 2010;123.
17. Noh SM, Karim FA, Kambali MM, Fauzi HM. Knowledge and attitude towards blood donation among non blood donor residents of Kuala terengganu at Hospital Sultanah nur zahirah, Kuala Terengganu. Malaysian J Med Heal Sci. 2019;15(9):53–62.
18. Kasraian L. Causes of discontinuity of blood donation among donors in Shiraz, Iran: cross-

sectional study. Sao Paulo Med J. 2010;128(5):272–5. doi: 10.1590/S1516-31802010000500006

19. Chin CK, Kueh YC, Yusoff DM. Knowledge, Perceptions and Barriers of Blood Donation Among Adults in Hospital Universiti Sains Malaysia. 2018;(May).

20. Mukhtiar Baig, Hamed Habib, Abdullah H Haji, Faisal T Alsharief, Abdulelah M Noor RGM. Knowledge , misconceptions and motivations towards blood donation among university students in Saudi Arabia. Pakistan Journal of Medical Sciences Online 2013;29(6):1295–9. doi: 10.12669/pjms.296.4137

21. Bantayehu D. Knowledge, Attitude, and Practice of Voluntary Blood Donation and Associated Factors among Health Care Providers in Addis Ababa health Facilities, Ethiopia. Occup Med Heal Aff. 2015;03(04). doi: 10.4172/2329-6879.1000209

22. Pusat Darah Negara. Annual Report Blood Transfusion Services 2016. 2016;37(2):84.

23. Pusat Darah Negara. Annual Report Blood Transfusion Services 2015. 2015;80.

24. Department of Statistics Malaysia. Kedah (State, Malaysia) - Population Statistics, Charts, Map and Location [Internet]. 2010 [cited 2021 Aug 19]. Available from: https://www.citypopulation.de/en/malaysia/admin/02__kedah/

25. Germain M, Glynn SA, Schreiber GB, Gǔlinas S, King M, Jones M, et al. Determinants of return behavior: A comparison of current and lapsed donors. Transfusion. 2007;47(10):1862–70. doi: 10.1111/j.1537-2995.2007.01409.x.

26. Amatya M. Study on knowledge, attitude and practice of blood donation among students of different colleges of Kathmandu, Nepal. Int J Pharm Biol Arch. 2013;4(3):424–8.

27. Lau JTF, Thomas J, Lin CK. HIV-related behaviours among voluntary blood donors in Hong Kong. AIDS Care - Psychol Socio-Medical Asp AIDS/HIV. 2002;14(4):481–92. doi: 10.1080/09540120208629667.

28. Andrews J, Hughes J, Murphy MF, Goodnough LT. Test-Seeking as Motivation in Volunteer Blood Donors. Wintrobe's Clin Hematol Fourteenth Ed. 2018;14(3):1686–801.

29. Goncalez T, Sabino E, Sales N, Chen YH, Chamone D, Busch M, et al. Human immunodeficiency virus test-seeking blood donors in a large blood bank in Sгo Paulo, Brazil. Transfusion. 2010;50(8):1806–14. doi: 10.1111/j.1537-2995.2010.02650.x.

30. Charbonneau J, Cloutier MS, Carrier É. Why Do Blood Donors Lapse or Reduce Their Donation's Frequency? Transfus Med Rev. 2016;30(1):1–5. doi: 10.1016/j.tmrv.2015.12.001.

31. Malaysian Communications and Multimedia Commission. Internet Users Survey 2016. Internet Users Surv. 2016;76.

32. Ibrahim AA, Koз M, Abdallah AM. Knowledge Level, Motivators and Barriers of Blood Donation among Students at Qatar University. Healthcare. 2021;9(8):926. doi: 10.3390/healthcare9080926.