

**MOTIVATION FACTORS AND
POTENTIAL BARRIERS FOR BLOOD
DONATION DURING CORONAVIRUS
(COVID-19) PANDEMIC IN KELANTAN,
MALAYSIA**

By

DR. SAMIAH BINTI MOHD MAHFDZUZ

Submitted to the Department of Clinical Medicine

Advanced Medical and Dental Institute (AMDI)

Universiti Sains Malaysia

in partial fulfilment of the requirement for

the Degree of

MASTER OF MEDICINE

(TRANSFUSION MEDICINE)

November 2023

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DISCLAIMER

I hereby declare that this research has been sent to Universiti Sains Malaysia (USM) for the degree of Master of Medicine in Transfusion Medicine. I certify that this dissertation records the results of the study performed by me and that it is my own composition.

Date: 17th November 2023

Dr. Samihah binti Mohd Mahfdzuz

P-IPM0024/19

ACKNOWLEDGEMENT

Alhamdulillah, all praises to Allah SWT, peace and blessings be upon the Prophet Muhammad SAW, his family members, and his companions. My highest gratitude goes to the Almighty for giving me the opportunity, good health, courage, and strength to complete my master's degree by submitting my dissertation.

I would like to express my sincere gratitude to my beloved mother, Zakiah binti Tajudin, my lovely daughter, Nur Zulfa Sofea binti Muhammad Zulfadli, my parents-in-law, Zulkiply bin Bakar and Halimahtus Saadiah binti Zainal Abidin and all my siblings for their endless encouragement, support, and prayers throughout my entire journey.

I am deeply grateful to my supervisors, Dr. Sharifah Azdiana binti Tuan Din, Dr. Mastura binti Mohd Sopian, Senior Lecturers of Advanced Medical and Dental Institute, Universiti Sains Malaysia, Dr. Shafini binti Mohamed Yusoff, Senior Lecturer of School of Medical Sciences, Universiti Sains Malaysia for their thoughtful comments, guidance, and patience through the entire process of completing my thesis.

I would like to express my heartfelt gratitude to all staff of Transfusion Medicine Unit, Hospital USM, and Department of Transfusion Medicine of Hospital Sultanah Aminah, Johor Bahru for cooperation and assistance throughout the study. I would also like to give my special thanks to my best colleague, Dr Hannah Ismail for always being the person I can rely on during our entire master journey. I would also like to acknowledge the support from my colleagues of the Transfusion Medicine master program, who worked together with me in completing the master's degree.

Last but not least, I would like to thank those who helped me directly or indirectly in my thesis writing and contributed to the success of my research.

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LIST OF ABBREVIATIONS

| | |
|----------------|---|
| AMDI | Advanced Medical and Dental Institute |
| COVID-19 | Coronavirus Disease of 2019 |
| CI | Confidence Interval |
| CVI | Content Validity Index |
| EFA | Exploratory Factor Analysis |
| FVI | Face Validity Index |
| HA | Alternative Hypotheses |
| H ₀ | Null Hypotheses |
| MJMHS | Malaysian Journal of Medicine and Health Sciences |
| MLR | Multiple Logistic Regression |
| MOH | Ministry of Health |
| MCO | Movement Control Order |
| NBC | National Blood Centre |
| NMRR | National Medical Research Register |
| OR | Odds Ratio |
| PHEIC | Public Health Emergency of International Concern |
| PDN | Pusat Darah Negara |
| SARS-CoV-2 | Severe Acute Respiratory Syndrome Coronavirus 2 |
| SD | Standard Deviation |
| SLR | Simple Logistic Regression |
| SPSS | Statistical Package for the Social Sciences |
| USM | Universiti Sains Malaysia |
| WHO | World Health Organization |

ABSTRAK

PENGENALAN: Pandemik COVID-19 memberi kesan negatif kepada kutipan darah di seluruh dunia. Jumlah penderma darah berkurangan dengan peningkatan bilangan kes harian disebabkan orang ramai tinggal di rumah sebagai langkah berjaga-jaga dari dijangkiti penyakit ini. Oleh itu, kajian ini bertujuan menerangkan ciri-ciri sosio-demografi penderma darah semasa COVID-19, faktor-faktor motivasi, dan faktor-faktor penghalang yang berpotensi terhadap pendermaan darah semasa pandemik.

KAEDAH: Ini adalah kajian keratan rentas dengan menggunakan borang soal selidik isi sendiri yang diadaptasi dan diedarkan kepada penderma darah di Kelantan. Sebanyak 350 peserta yang terdiri daripada penderma darah telah dipilih dari 1 Oktober 2021 sehingga 31 Ogos 2022. Ujian regresi logistik digunakan untuk menentukan perkaitan antara ciri-ciri sosio-demografi penderma darah dengan faktor-faktor motivasi dan faktor-faktor halangan terhadap pendermaan darah.

KEPUTUSAN: Daripada 350 peserta, 54.9% adalah lelaki, 46.9% berumur 18-25 tahun, 82.3% adalah Melayu, 60.6% adalah bujang, 72.6% responden mempunyai tahap pendidikan yang tinggi, dan 45.7% adalah penderma darah tetap. Sebanyak 97.7% daripada responden menderma darah kerana motivasi altruisme manakala 53.2% daripada responden mendakwa mereka tidak mempunyai masa sebagai faktor penghalang untuk menderma darah. Tiada perkaitan antara ciri-ciri sosio-demografi penderma darah dengan faktor-faktor motivasi. Responden lelaki lebih cenderung mempunyai kemungkinan 1.82 kali lebih tinggi untuk mempunyai halangan terhadap pendermaan darah berbanding responden wanita (adjusted OR = 1.82, p = 0.020).

KESIMPULAN: Altruisme adalah perkara yang amat mendorong penderma darah untuk hadir menderma darah semasa pandemik. Kebanyakan responden tidak mempunyai masa yang cukup untuk menderma darah, justeru strategi yang terancang dan berfokus adalah

penting untuk memastikan keberkesanan kutipan darah semasa COVID-19.

Kata Kunci: COVID-19, pendermaan darah, faktor motivasi, faktor penghalang, penderma darah

ABSTRACT

INTRODUCTION: COVID-19 pandemic had negative impact on blood collection worldwide. The number of blood donors is likely to decline as the number of everyday cases increases because people stay at home as precautions measures to avoid contact with the disease. Hence, this study described blood donors' socio-demographic characteristics during COVID-19, motivation factors, and potential barriers to blood donation during the pandemic.

METHODS: This was an observational cross-sectional study using self-administered adapted questionnaires that distributed to blood donors in Kelantan. A total of 350 participants consisting of blood donors were selected from 1st October 2021 till 31st August 2022. Logistic regression tests were used to determine the association between socio-demographic characteristics of blood donors with motivation factors and potential barriers for blood donation.

RESULTS: Out of 350 participants, 54.9% were males, 46.9% were in 18-25 years old, 82.3% were Malays, 60.6% were single, 72.6% had high education levels, and 45.7% were regular donors. About 97.7% of the respondents donated blood due to altruism motivations while 53.2% of the respondents claimed did not have enough time as their donation barrier. There was no association between socio-demographics of blood donors with motivation factors. Male respondents tend to have 1.82 times higher odds of having potential barriers for blood donation compared to female respondents (adjusted OR = 1.82, $p = 0.020$).

CONCLUSION: Altruism was the most motivational aspect for blood donors to turn up for blood donation during the pandemic. Most of our respondents do not have enough time to donate blood, thus a well-planned, focused strategy is essential in ensuring the efficacy of blood collection during COVID-19.

Keywords: COVID-19, blood donation, motivation factor, potential barrier, blood donor

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter provides an overview of Coronavirus Disease of 2019 (COVID-19) infection, blood transfusion services during COVID-19 pandemic, motivation factors and potential barriers among blood donors during pandemic. In addition, this chapter contained the study's problem statements and research justification.

1.2 Background of study

Coronavirus Disease of 2019 (COVID-19) is a new infectious disease caused by new coronavirus strain named as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (1). It emerged in December 2019 in Wuhan, the capital of Hubei province, China (2). On 30th January 2020, World Health Organization (WHO) declared that the outbreak of COVID-19 constituted a Public Health Emergency of International Concern (PHEIC). On 11th March 2020, the World Health Organization (WHO) declared COVID-19 outbreak a global pandemic, in view of number of cases outside China increased 13-fold and threefold increase in the number of countries infected with COVID-19 (3).

By March 2023, the number of confirmed cases had reached 761 million and over 6 million deaths were reported across the globe. In Malaysia more than 5 million people were affected with this disease with 36, 982 deaths reported based on the Worldometer's COVID-19 data. Despite the fact that many confirmed cases do not result in serious illness, patients with comorbidities and elderly are at a higher risk of experiencing serious

life-threatening symptoms (4).

The response mechanism was initiated to prevent and control the spread of the disease, including restriction of movement, temperature checked before enter any place, wore face masks at crowded area, regular hand sanitized and restrained all mass gathering activities (5). While these measures have played a vital role in mitigating the spread of COVID-19, they have unfortunately had an adverse impact on blood donation.

Blood procurement in Malaysia is based on voluntary, non-remunerated blood donors. At all times, blood transfusion service is accountable in supplying sufficient and safe blood (6). Discovered the findings from the World Health Organisation (WHO) on blood donation rates in 2018, based on samples of 1000 people, the data reveals that high-income countries have a blood donation rate of 31.5 donations, while upper-middle-income countries have a rate of 16.4 donations. Lower-middle-income countries have a rate of 6.6 donations, and low-income countries have a rate of 5.0 donations (7). Based on data by Ministry of Health Malaysia in 2012, total donated blood in Malaysia only 2.2% of the entire population (8). This is far from a target, where at least 5% of Malaysia's population is expected to be recruited as blood donors, according to the Ministry of Health Malaysia (8).

Several studies had evaluated the motivators and potential barrier for blood donation globally, but currently little is known about what factors influenced blood donation during COVID-19 pandemic or during the recovery phase. There are many potential barriers that can lead to this situation such as fear of healthy people getting infected and lack of blood donations mobile. It became worse after essential lockdown that cause difficulty of blood

donors to reach blood centres, hence only few turn up to donate blood (9). Efforts to recruit blood donors during COVID-19 pandemic is very crucial to maintain enough blood stocks thus, to make sure our blood supply to patient is sufficient. Given the effect of COVID-19 on the blood supply, the possibility of future waves or development of other pandemics, understanding the socio-demographic characteristics of blood donors, motivation factors, and potential barriers are crucial for better interventions and measures to improve rates of voluntary donations.

1.3 Literature review

1.3.1 Impact of COVID-19 on blood donation

Blood donation amidst pandemic showed significantly dropped as compared to pre-pandemic situation. In Zhejiang Province, China, the average number of whole blood donations fell to less than one-third of what it was prior to the COVID-19 outbreak. This shown that only 33% of whole blood donation during Spring Festival of 2020 compared during Spring Festival of 2019 (5).

There are many reasons caused the reduction of blood collection such as cancellation of blood mobiles, social distancing rules that limited number of donors who allowed to donate blood at blood centres and mobile site that caused the major impact on blood donations following COVID-19 pandemic (10).

Blood transfusion services affected from this pandemic where shortage of blood donors to the increase wastage of blood components (9). The number of donors showed a significant decrease in the previous viral outbreak. In 2003, during the greatest outbreak

of the SARS epidemic in Singapore, there was a significant 60% reduction in the number of blood donors who turned up to donate blood (11). Similarly, 10–30% fewer blood donations reported worldwide during influenza pandemic in 2009 (11).

Approximately 80% of individuals who were invited to donate blood through text message expressed concern about contracting COVID-19 during the donation process, which led to a decrease in their willingness to donate blood. The lack of understanding regarding the transmission of COVID-19 during the early stage of the outbreak may have been the cause. The recruitment success rate of donors through text messaging has declined by 60% (5). Blood donation is under intense pressure because of social restrictions, the withhold of public events, closure of school and university, and the work from home setting. All mobile blood drives were withheld for an extended and unreliable period of time. The public's concerned about infections at the same time resulted in the cancellation of blood donation appointments and a reluctance to visit donor sites for blood donation (4).

In Malaysia, blood collection in National Blood Centre (NBC) and other blood collection centre reduced by 40% during this pandemic in Malaysia compared to total collection of blood in previous years (Ministry of Health Malaysia, May 2020) (12). A similar situation occurred in other countries based on the study by Raturi et al., 2020, where blood donations drastically decreased by 40% to 67%, especially when a restriction of movement order was in effect (13). The number of blood donors in Hospital Universiti Sains Malaysia, Kelantan had decreased to 80.7% from the average units collected three months prior to the movement control order period in Malaysia (14).

Blood availability can be disrupted by various factors, including restriction movement orders that make it difficult for collection centres to reach donors or for donors to get to those centres. Additionally, staff members may hesitate to collect blood in public places due to concerns about contracting the infection (15).

1.3.2 Socio-demographic characteristics of blood donors during COVID-19 pandemic

A study conducted in Germany showed that women (54.6%) were more likely to donate blood compared to men (45.3%) during COVID-19 pandemic (16). This result consistent with a study done in Hong Kong, where from 40 participants, 27 participants were female and 13 were males (17). However, a study done in Cameroon during pandemic found the opposite result where majority of their blood donors were 79.5% from males and only 20.5% from female (18).

Majority of the blood donors who donated blood during pandemic in India and Saudi Arabia were between 18-29 years old (19,20). Oppositely, a study by Weidmann et al., 2021 found that age of blood donors in Germany was between 30-64 years old were predominant during COVID-19 pandemic (16). This is similar to the study done in China where majority of blood donors' age were more than 45 years old (5).

For the education level, donors who received education up until secondary school were predominant among blood donors in a study done in Sudan (32.4%) (21). Miskeen et al., 2021 found that donors with pre-university education level had donated blood more during pandemic (20). However, a study done in United States showed that there was no significant difference for education levels among their blood donors during COVID-19 pandemic (22).

A study done in Iran showed that regular donors (56%) dominated among donor status (23), consistent with a study done in Zhejiang province, China where 87.7% blood donors who donated during COVID-19 were among regular donor (5). According to Vassallo et al., 2021, from March 2020 until May 2020, regular donors were the highest group of donors donated blood in United States (22). Differently, one study done in Sudan found that most of their blood donors were new donors (44.7%) (21).

1.3.3 Motivation factors for blood donation during COVID-19 pandemic

According to Sayedahmed et al., 2020, donors more likely to give blood if regular invitations sent to them, and if the pandemic is controlled (21). During COVID-19 period, majority of donors were motivated to make special effort to support their healthcare system, where a study done in Netherland showed most of the blood donors were motivated in donation if they received call from blood bank for donation, besides to help COVID-19 patient (24). According to a study conducted in Saudi Arabia, the main motive for blood donation was being aware of an individual requiring a blood transfusion (20).

A study conducted during the avian influenza outbreak in 2011 revealed that the primary motivational factors for blood donation were patients or their relatives requesting blood donations, individuals in need of blood transfusions, and appeals made through social media (25). Similarly, a study conducted in Saudi Arabia found that the presence of a person in need of a blood transfusion was the primary motivation factor for blood donation (20).

A study done across European countries, most donors' decisions to donate blood were influenced by altruistic motives, which were carefully considered in regard to potential risks. However, concerns about the strain on the healthcare system during the COVID-19 pandemic were also present. Other than that, public appeals for blood donation has been successful in the past crisis (26).

According to a study done by Siu et al., 2022, higher motivations for blood donation during COVID-19 pandemic are divided into 1- perceptual, where donated blood overcome a sense of helplessness feelings during the COVID-19 pandemic, 2- social, motivated for blood donation in view of only small numbers of donors, and 3- institutional level, where the main key for blood donation are donors' trust in blood donation centres resulted in turned up for blood donation (17).

1.3.4 Potential barriers for blood donation during COVID-19 pandemic

Research conducted in Hong Kong and China had revealed that anxiety and fear of contracting COVID-19 were the biggest barriers to blood donation during the pandemic. (4,5), the similar findings from studies on the SARS and avian flu outbreaks (15,25). The result of the study was similar to study done by Tripathi et al., 2021, among blood donors in India and also as reported in China by Wang et al., 2020 (5,19).

According to a study conducted in Sudan, the biggest barrier for giving blood were individuals stayed at home to prevent contracting COVID-19, not having enough time, and facing problem with transportation (21). Other study done among blood donors in Saudi Arabia had also identified the primary barrier to donations was the concern over getting an infection. This explained most donors fear of acquiring COVID-19 infection

despite no documented report that SARS-CoV can be transmitted through blood (20).

Despite the implementation of preventive measures, there may still be an increased in donor health risks, which could serve as additional barriers (24). This explained by another study done in Hong Kong, reported that donors are afraid to go to blood donation centres since it's considered as a medical facility and given blood donation is an invasive procedure where they can be infected with COVID-19. Others were afraid that patients can get infection from their donated bloods (17).

1.4 Research justification

Blood transfusion service is an important supportive service in each hospital regardless of time and situation worldwide. Adequate blood supply is important to fulfill a patient's need and demand. It is very crucial ensure the availability of blood and to maintain enough and safe blood stock especially in current pandemic in view of potential of community spread. Understanding the blood donors' socio-demographic characteristics during COVID-19 pandemic may help the blood center to overcome this crisis by identifying and focusing on the targeted potential donors.

The shortage of blood during the pandemic is a global focus due to decrease in voluntary blood donors. The reasons behind blood donors' willingness to donate during the ongoing pandemic remain unclear. To date, there is no study done in Malaysia to ascertain the motives behind blood donation amidst the ongoing pandemic. Limited literature available worldwide on blood donation during the COVID-19 pandemic. The data from this study may be useful for blood transfusion services for better planning strategies to promote blood donation in motivating people to donate blood to prevent blood shortages.

In view of unavailability of local data regarding barriers for blood donation during pandemic situations, this study aims to identify the potential barriers that prevent blood donors from donation blood during the COVID-19 pandemic. The result of this study can help donation centre to develop future policies and improved donation centre as a safer place to donate blood during the crisis.

1.5 Research questions

1. What are the socio-demographic characteristics of blood donors predominant during COVID-19 pandemic in Kelantan?
2. What are the motivation factors and potential barriers among blood donors to donate blood during COVID-19 pandemic?
3. Is there any association between blood donors' socio-demographic characteristics with motivation factors and potential barriers for blood donation during COVID-19 pandemic?

CHAPTER TWO

OBJECTIVES

2.1 General Objective

To study socio-demographic characteristics of blood donors, motivation factors and potential barriers for blood donation among blood donors in Kelantan during Coronavirus Disease of 2019 (COVID-19) pandemic.

2.2 Specific Objectives

1. To identify socio-demographic characteristics of blood donors during COVID-19 pandemic in Kelantan.
2. To determine the association between socio-demographic characteristics of blood donors with motivation factors for blood donation during COVID-19.
3. To determine the association between socio-demographic characteristics of blood donors with potential barriers for blood donation during COVID-19 pandemic.

2.3 Alternative Hypotheses

HA1: There is a significant association between socio-demographic characteristics of blood donors and motivation factors during COVID-19 pandemic.

HA2: There is significant association between socio-demographic characteristics of blood donors and potential barriers during COVID-19 pandemic.

2.4. Null Hypotheses

H01: There is no significant association between socio-demographic characteristics of blood donors and motivation factors during COVID-19 pandemic.

H02: There is no significant association between socio-demographic characteristics of blood donors and potential barriers during COVID-19 pandemic.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This study mainly focused on donors' characteristics, motivations, and potential barriers for blood donors' participation in blood donation during the COVID-19 pandemic in Kelantan. It involved distribution of the validated questionnaire to blood donors in Kelantan.

3.2 Study design

This was an observational cross-sectional study using a self-administered questionnaire.

3.3 Study area

This study was conducted at the static donation centre of Transfusion Medicine Unit, Hospital Universiti Sains Malaysia (USM), and various places of mobile blood donation programs around Kelantan. The blood bank service of Hospital USM is among the main blood collection centres in Kelantan with various donor characteristics. Hospital USM blood bank collects blood from numerous locations in Kelantan through a mobile donation campaign. Transfusion Medicine Unit mainly carries out three functions: collecting blood, supplying blood and blood components, and offering clinical transfusion services to patients in Hospital USM. This hospital offers many specialties and subspecialties services to patients. Kelantan is one of the main states in Malaysia that affected with COVID-19 in year 2020. Until October 2022, 253,967 cases of COVID-19 were reported in Kelantan. Therefore, Kelantan is a suitable place to do this study.

3.4 Study population

Reference population : All blood donors in Kelantan

Target population : Blood donors age from 18-60 years old.

Source population : Blood donors age from 18-60 years old in Kelantan who were registered under Transfusion Medicine Unit Hospital USM (centre and mobile blood donation) from 1st October 2021 till 31st August 2022.

Sampling Frame : All blood donors in Kelantan who were registered under Transfusion Medicine Unit Hospital USM (static centre and mobiles blood donation) who met inclusion criteria.

3.5 Subject criteria

3.5.1 Inclusion criteria

- i. Malaysian citizen
- ii. A whole blood donor under Transfusion Medicine Unit, Hospital USM
- iii. Age from 18 years until 60 years old
- iv. Consented for study

3.5.2 Exclusion criteria

- i. Apheresis donation
- ii. Unable to comprehend in Malay or English languages
- iii. Donors who had previously participated in answering the same questionnaires.

3.6 Sample size

Objective 1: To identify socio-demographic characteristics of blood donors during COVID-19 pandemic in Kelantan

The estimated sample size for this objective is based on 5% precision and 95% confidence level, using single proportion calculation where 87.7% of blood donors who donated in Zhejiang province China during the pandemic of COVID-19 are regular donors (5).

Single proportion:

$$n = (z/\Delta)^2 p (1-p)$$

n = sample size

z = the value to estimate the 95% confidence interval (1.96)

p = true population proportion (in proportion of one; if 100%, $p = 1$)

Δ = absolute precision or detectable difference of expected population proportion and true population proportion (in proportion of one; if 5%, $\Delta = 0.05$)

$$n = (1.96/0.05)^2 0.88 (1-0.88)$$

$$= 162 + 10\% \text{ drop out} = 178$$

For this objective, a minimum sample size of 178 is required.

Objective 2: To determine the association between socio-demographic characteristics of blood donors with motivation factors for blood donation during COVID-19

The estimated sample size for this objective is based on 5% level of significance and power of 80%, using double proportion calculation where 62.5% were first time donors and 42.41% were repeat donors, incentives for donation is motivation factors (27).

Two proportions:

$$n = \frac{p_1(1-p_1)+p_2(1-p_2)}{(p_1-p_2)(p_1-p_2)} (z\alpha + z\beta)^2$$

n = sample size

$z\alpha = 1.96$; fix value when using level of significance of 5%

$z\beta = 0.84$; fix value when using power of 80%

p_1 = Expected proportion of exposure in cases (expert opinion)

p_2 = Proportion of exposure in controls (previous study)

$$n = \frac{0.63(1-0.63)+0.42(1-0.42)}{(0.63-0.42)(0.63-0.42)} (1.96 + 0.84)^2$$

$$= 85 + 10\% \text{ drop}$$

$$= 94 \times 2 = 188$$

To achieve this objective, a minimum sample size of 188 is required.

Objective 3: To determine the association between socio-demographic characteristics of blood donors with potential barriers for blood donation during COVID-19 pandemic

The estimated sample size for this objective was based on 5% level of significance and power of 85%, using double proportion calculation where 58.33% were first time donors and 41.77% were repeat donors, donated blood may be sold (27).

Two proportions:

$$n = \frac{p_1(1-p_1)+p_2(1-p_2)}{(p_1-p_2)(p_1-p_2)} (z\alpha + z\beta)^2$$

n = sample size

$z\alpha = 1.96$; fix value when using level of significance of 5%

$z\beta = 0.84$; fix value when using power of 80%

p_1 = Expected proportion of exposure in cases (expert opinion)

p_2 = Proportion of exposure in controls (previous study)

$$n = \frac{0.58(1-0.58)+0.42(1-0.42)}{(0.58-0.42)(0.58-0.42)} (1.96 + 0.84)^2$$

$$= 149 + 10\% \text{ drop out}$$

$$= 164 \times 2 = 328$$

For this objective, a minimum sample size of 328 is required.

Conclusion of Sample Size

Largest sample size was from objective 3 = 328, including a 10% drop out (at 95% CI with an expected 5% precision). A total of 350 respondents were included in this study, as we analysed all blood donors who agreed to participate in answering the questionnaire after being approached by the researcher.

3.7 Sampling method and subject recruitment

Non-probability sampling method using convenience sampling was applied to recruit blood donors at the donation centre and mobile blood donation programs. During COVID-19 pandemic, we found difficulties performing random sampling in blood donation setting in view of movement limitation and significantly reduced number of blood donors. The investigator gave a briefing to the recruitment team each session regarding the flow of distributing the questionnaires. Donors who met the inclusion criteria were invited to participate in the study during the refreshment period following their blood donation, in order to prevent any disruptions during the blood donation process.

A questionnaire was given to the respondents after explained about this study to them by the investigator and after they had signed the informed consent form. This questionnaire was self-administered by a donor. Completed questionnaire submitted and checked by researcher. For any missing data, the researcher approached back the donor to complete the questionnaire. Investigator then numbered and classified the donor type (new donor, regular or lapsed donor) in the questionnaire form. Respondents may opt out at any point during the data collection process if they intended to discontinue this study.

3.8 Research tool

Data was collected using a self-administered questionnaire adapted from Sayedahmed et al., 2020. Cronbach's alpha value from the previous study was 0.782. Adaptation of validated questionnaire had been consented by Mr. Ahmed Mahmoud Sayed Sayedahmed (author of the study) on 22nd January 2021. See Appendix M.

Before starting the actual study, a series of steps were implemented for validation the Malay language version of research questionnaire to accommodate distribution in either English or Malay language, depending on the participant's preference. This includes forward and backward translation of questionnaire, content validity, face validity and reliability testing.

The translation process of adapted questionnaire was carried out by Pusat Pengajian Bahasa, Literasi & Terjemahan Universiti Sains Malaysia, Kampus Kesihatan, Kubang Kerian, Kota Bharu, Kelantan.

Content validation was conducted by ten expert panels, consist of four Transfusion Medicine Specialists from Advanced Medical and Dental Institute (AMDI) and National Blood Centre (NBC), Kuala Lumpur, three Haematopathologists from Hospital USM, one Family Medicine Specialist, and two statisticians from AMDI. See Appendix G. Expert's Assessment of Content Validity form was sent to each expert panel to review the 32 items of the questionnaire (Section B, C and D). After completed reviewing, the expert panels sent back the form to the investigator for analysis.

Content validity was measured using Content Validity Index (CVI) for each parameter. CVI was calculated using the Item (I-CVI) and Scale (S-CVI). I-CVI was computed as the proportion of experts who were giving a score of 3 or 4 for the components 'Relevant', 'Clarity', 'Simplicity', and 'Ambiguity' (RCSA), divided by total number of experts. This calculation indicated the proportion of experts who agreed with each item.

Prior to calculation of CVI, the components RCSA were recoded as 'relevant' for scale

of 3 and 4 and 'not relevant' for scale of 1 and 2. S-CVI was calculated using S-CVI/Ave, in which average of I-CVI scores for all items on scale were calculated (28). The content validity results showed all 32 items had S-CVI/Ave average between 0.92-1.0, which $S-CVI/Ave \geq 0.9$ represent excellent content validity index (28).

Face validity was conducted during a pilot study at Hospital Sultanah Aminah Johor Bahru, Johor, using Face Validity Form distributed to 30 blood donors (29). For the face validity results, all items in acceptable range for FVI > 0.8 (28). The collected data were analysed for reliability using Cronbach's alpha test. For motivation factor questions, Cronbach's alpha value was 0.662, while for potential barrier questions the value of Cronbach's alpha was 0.901. The values of Cronbach's alpha for all sections are generally above 0.60, which indicated acceptable internal consistency reliability (30).

A questionnaire was given to eligible subjects based on the specified inclusion and exclusion criteria. The respondents will be requested to answer the structured questionnaire that consists of four sections with a total of 38 questions. For section A, the questions focused on donor socio-demographic characteristics, with a total of six questions. For section B, it contained nine questions focusing on motivation factors for blood donation during COVID-19. Section C focused on potential barriers for blood donation which consisted of 13 questions. For section D, it consisted of ten questions focusing on improvements for donors to donate blood during pandemic. Five scales of answer using Likert scales are used for section B until section D. The options of answers various from strongly disagree, disagree, not sure, agree and strongly agree. See Appendix K. The participant information sheet, and consent form were used to provide information regarding the study to the participants. See Appendix J.

3.9 Data collection method

After completing the blood donation process, all donors who met the inclusion criteria were invited to participate in this study. The purpose, procedure, and their privileges involved in this study were explained by the researcher. The respondent signed an informed consent form upon agreeing to take part in the study. This was a self-administered questionnaire, but the respondent was allowed to ask researcher to clarify any unsure questions or instructions. Following that, the researcher collected and reviewed each completed questionnaire. The participants were recontacted in order to provide any missing details in their questionnaire. An honorarium was given to all the participants.

At any point during the data collection process, respondents were allowed to withdraw if they intended to. Once the respondents declined or chose not to answer the questions that they were uncomfortable answering, they were eliminated from the study without impacting their capacity to donate blood for current donation or future blood donation to the respondents. The completed questionnaire and consent form were kept in a locked cabinet, and the electronic data used for analysis was kept on a hard drive with a password for 10 years after the study was finished. The research data will be permanently deleted once the retention period has passed.

3.10 Statistical analysis

Data entry and analysis were done using Statistical Package for the Social Sciences (SPSS) version 26.0 for Windows software (SPSS, Chicago, Illinois, USA). A number had been provided to each participant for entry of data. Descriptive analysis was used to describe categorical variables on donor socio-demographic characteristics, motivation

factors, and potential barriers during COVID-19. The association between donor socio-demographic characteristics with motivation factors and potential barriers were determined using simple logistic regression in univariable analysis. Factors with a p-value less than 0.250 at univariable 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, and the overall percentage of the classification table. A p-value of less than 0.050 was considered statistically significant. The findings need to be interpreted with caution in view of using non-probability data.

3.11 List of variables

Independent variables:

- i. Gender
- ii. Ethnicity
- iii. Age
- iv. Marital status
- v. Level of education
- vi. Donor status

Dependent variables:

- i. Motivation factors
- ii. Potential barriers

3.12 Variables definition

Table 3.1: Variables definition

| Variables | Definition | Scale of Measurement |
|-----------|---|---|
| Gender | Gender of the blood donors | Male Female |
| Ethnicity | According to Blood Donor Registry Form, Blood Transfusion Service, Ministry of Health Malaysia (6) | Malay Chinese Indian Others |
| Age | <p>As per Malaysian blood donor eligibility criteria, donors are eligible to donate blood between age of 17 to 70 years old (6)</p> <p>However, for donors aged 17 years old, written parental/guardian's consent is compulsory and for regular blood donors who are more than 60 years old, they must have annual medical check-up or letter from physician stating that donor is fit to donate (6)</p> <p>In this study, age between 18-60 years old were selected to avoid extra procedure as mentioned above for donors those who are eligible to participate in this study</p> | Years |
| Education | <p>A process of teaching, training, and learning, especially in schools, colleges or universities, to improve knowledge and develop skills</p> <p>(Oxford Learner's Dictionaries)</p> | No formal education Primary school Secondary school College/University |

| | | |
|-------------------|--|--|
| New donor | A blood donor donated for the first time (6) | None |
| Regular donor | A blood donor who has donated a minimum of two times within 24 months in the same blood centre (6) | None |
| Lapsed donor | A blood donor who has donated before but the last donation was more than 24 months in the same blood centre (6) | None |
| Motivation factor | The feeling of wanting to do something, especially something that involves hard work and effort (Oxford Learner's Dictionaries) | Strongly disagree Disagree Not sure Agree Strongly agree |
| Potential barrier | A problem, rule or situation that prevents somebody from doing something, or that makes something impossible (Oxford Learner's Dictionaries) | Strongly disagree Disagree Not sure Agree Strongly agree |

3.13 Ethical issue

Ethical approval was obtained from Ministry of Health Malaysia (NMRR-21-449-58119 (IIR)) in conjunction with the USM Research and Ethical Committee (USM/JEPeM/21030219). Individual formal consent was obtained from each participant before data collection.

a) Privacy and Confidentiality

No identifiable personal information about the study participants will be obtained or recorded in protecting their privacy and confidentiality. All the forms were confidential and subsequently entered into the SPSS software. Only the researcher and supervisors who are granted access to the data. The researcher secured all written research documents, including study data. The data obtained from the study shall be deleted following the designated storage duration.

b) Conflict of Interest

There was no conflict of interest in this study.

c) Subject Vulnerability

The individuals participated in this study were blood donors who were donated in Transfusion Medicine Unit, Hospital USM, and various places of mobile blood donation programs. The donation process was not interrupted by this study at any stage. The subjects were identified during blood donation registration. The researcher approached the donors who were interested in participating in this study after the blood donation process was completed. All participants were explained regarding the study objective and

the process. The donors were advised that their participation in the study was entirely optional and that they might opt out at any point, for any cause, and without consequence.

d) Risk

There was no risk to the respondents' ability to current blood donation or in the future because of this study. The questions were not socially sensitive and would not cause social stigma.

Honorarium

All participants, including those who withdrew, received honorarium.