

## Original Article

# Post-donation SARS-CoV-2 identification among Thai blood donors

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### Abstract:

**Introduction:** Asymptomatic and mildly symptomatic individuals with COVID-19 may inadvertently donate blood because the COVID-19 screening test is not a prerequisite for blood donation. Although previous studies suggested that the risk of transfusion-transmitted COVID-19 is minimal, monitoring and evaluating the likelihood of SARS-CoV-2 transmission from transfusion remain important. **Objective:** To determine the potential risk of transfusion-transmitted SARS-CoV-2 infection. **Materials and Methods:** During the peak circulation of the SARS-CoV-2 Delta variant in Thailand from April to December 2021, the National Blood Centre collected blood from 448,025 donors; 158 donors (0.035%) self-reported a COVID-19 positive diagnosis either by the antigen test kit or by PCR within 7 days post-donation. Only 88 donor plasma samples available for testing were subjected to viral RNA detection by using the COBAS SARS-CoV-2 RNA assay. Further confirmatory testing of the positive samples with additional real-time reverse-transcription polymerase chain reaction (rRT-PCR) for the viral genome and sub-genome was performed. **Results:** One sample consistently tested positive for the ORF1a/b and the E gene on the COBAS, while four other samples were positive for either gene. All five samples (from donors 27-60 years of age) were negative upon re-testing with other assays for the viral genome and sub-genome. Two patients were uneventfully transfused with the blood components derived from this donor. **Conclusion:** Available data to date, including our study, suggested that SARS-CoV-2 transmission through transfusion was unlikely.

**Keywords :** ● SARS-CoV-2 RNA ● Blood donors ● COVID-19

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## นิพนธ์ต้นฉบับ

# การตรวจหาเชื้อไวรัส SARS-CoV2- หลังการบริจาคโลหิตในผู้บริจาคโลหิตคนไทย

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## บทคัดย่อ

**บทนำ** ผู้ป่วยโรคโควิด-19 บางรายอาจไม่แสดงอาการหรือมีอาการเพียงเล็กน้อยจึงทำให้ไม่ทราบว่าตนติดเชื้อและสามารถผ่านเข้าสู่กระบวนการบริจาคโลหิตได้ ซึ่งในปัจจุบันการตรวจคัดกรองการติดเชื้อก่อโรคโควิด 19 มิได้เป็นข้อกำหนดที่ต้องตรวจก่อนการบริจาคโลหิต อย่างไรก็ตาม แม้ว่าการศึกษาก่อนหน้านี้จะพบความเสี่ยงของการติดเชื้อก่อโรคโควิด-19 ผ่านทางการให้เลือดจะมีน้อยมาก แต่การติดตามเฝ้าระวังและการประเมินความเสี่ยงของการติดเชื้อ SARS-CoV-2 ผ่านทางการให้เลือดยังคงมีความสำคัญต่อานบริการโลหิต **วัตถุประสงค์** เพื่อศึกษาการติดเชื้อไวรัส SARS-CoV-2 ทางกรให้เลือดในผู้บริจาคโลหิตคนไทย **วัสดุและวิธีการ** ตั้งแต่เดือนเมษายน ถึงธันวาคม พ.ศ. 2564 เป็นช่วงที่พบการระบาดของเชื้อ SARS-CoV-2 สายพันธุ์เดลต้า มีผู้บริจาคโลหิต ณ ศูนย์บริการโลหิตแห่งชาติ สภากาชาดไทย จำนวน 448,025 ราย ในจำนวนนี้มีผู้บริจาคโลหิต 158 ราย (0.035%) ได้รายงานผลการตรวจติดเชื้อ SARS-CoV-2 กลับมายังศูนย์บริการโลหิตแห่งชาติ ซึ่งเป็นการตรวจด้วยชุดตรวจแอนติเจนหรือการตรวจเชื้อด้วยวิธีพีซีอาร์ ภายใน 7 วันหลังบริจาคโลหิต โดยมีผลasmaของผู้บริจาคโลหิต จำนวน 88 ตัวอย่างเท่านั้น ที่ได้นำไปทดสอบเพื่อตรวจหาเชื้อ SARS-CoV-2 ด้วยเครื่องตรวจอัตโนมัติ COBAS system นอกจากนี้ตัวอย่างที่ให้ผลตรวจเป็นบวกได้นำไปทดสอบด้วยวิธี real-time reverse-transcription polymerase chain reaction (rRT-PCR) สำหรับตรวจหาสารพันธุกรรมของเชื้อ SARS-CoV-2 ทั้ง genome และ sub-genome เพื่อเป็นการตรวจยืนยันการพบเชื้อ **ผลการศึกษา** พบว่ามี 5 ตัวอย่างที่พบผลบวกต่อการตรวจหา RNA ของเชื้อ SARS-CoV-2 ด้วยเครื่องตรวจอัตโนมัติ COBAS system ซึ่งทั้งหมดเป็นตัวอย่างจากผู้บริจาคโลหิตที่อยู่ในช่วงอายุ 27 ถึง 60 ปี ทั้งนี้มี 1 ตัวอย่างที่ยังคงตรวจพบชิ้นส่วนของทั้งยีน ORF1a/b และ E ของเชื้อ SARS-CoV-2 ส่วนอีก 4 ตัวอย่างที่เหลือพบเพียงยีนใดยีนหนึ่งของเชื้อ SARS-CoV-2 และเมื่อทำการทดสอบซ้ำพบว่าให้ผลเป็นลบ ทั้ง 5 ตัวอย่าง ให้ผลเป็นลบด้วยวิธี real-time RT-PCR สำหรับตรวจหาสารพันธุกรรมของเชื้อไวรัสทั้ง genome และ sub-genome และเมื่อติดตามไปยังผู้ป่วยที่รับเลือดจากตัวอย่างที่ให้ผลบวกนั้นพบว่าผู้ป่วยสองรายที่ได้รับส่วนประกอบของเลือดจากผู้บริจาคโลหิตรายนี้แต่ไม่พบอาการของโรคโควิด-19 หลังการรับเลือด **สรุป** เท่าที่มีการศึกษาจนถึงปัจจุบันนี้รวมถึงการศึกษารั้งนี้แสดงให้เห็นว่ายังไม่พบรายงานการติดเชื้อไวรัส SARS-CoV-2 ผ่านทางการให้เลือด

**คำสำคัญ :** ● SARS-CoV-2 RNA ● ผู้บริจาคโลหิต ● โรคโควิด-19

**วารสารโลหิตวิทยาและเวชศาสตร์บริการโลหิต. 2566;33:251-9.**

## Introduction

In 2019, the global pandemic of coronavirus disease 2019 (COVID-19) posed a major challenge to public health and sustaining the blood supply for patients.<sup>1</sup> The causative agent was identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with its first confirmed case in China before spreading globally. WHO later declared the pandemic a Public Health Emergency of International Concern (PHEIC)<sup>2</sup>, suggesting the urgent implementation of preventive strategies. As for Thailand, a total of 5 waves of infections, including the 1<sup>st</sup> wave that originated in Wuhan, China (January-November 2020), the 2<sup>nd</sup> (December 2020-March 2021), the 3<sup>rd</sup> (Alpha variant, April-May 2021), and the 4<sup>th</sup> (Delta variant, June-November 2021), have passed, and the country is currently experiencing the fifth wave with the Omicron strain (January-March 2022).<sup>3,4</sup>

SARS-CoV-2 is an enveloped, positive-sense, single-stranded RNA virus of the *Betacoronavirus* genus in the *Coronaviridae* family with a 79% genomic similarity to SARS-CoV.<sup>5</sup> Currently, genomic regions targeting SARS-CoV-2, including ORF1ab as well as envelope (E), nucleocapsid (N), spike (S), and RdRP genes, have been designed and employed as primers and probes to detect SARS-CoV-2.<sup>6</sup> The two-target system was recommended for use to detect SARS-CoV-2 infection; the first primer set identified the diverse Coronaviruses, and the second primer set was specified for only SARS-CoV-2 in clinical specimens. It is highly infectious primarily due to efficient transmission via aerosolized respiratory fluids, of which saliva and nasopharyngeal swab samples remain the recommended sample types for detection.<sup>7</sup> After an incubation period, infection causes respiratory symptoms with clinical features ranging from mild to severe, such as fever, cough, and dyspnea, and put individuals at higher risk of developing severe SARS-CoV-2 infection in the older age group or being asymptomatic in some individuals.<sup>8-10</sup>

During the global pandemic, the blood supply was affected as a result of the decreased donation rate and the

perceived potential for transfusion-transmitted infection with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in recipients. This concern caused a problem in sustaining a blood supply for patients who needed transfusions.<sup>1</sup> Questions were raised about whether SARS-CoV-2 could be transmitted by blood donations and whether urgent implementation of preventive actions was warranted to ensure the safety of donated blood. The detection of viral RNA in plasma has been reported from infected individuals in some countries, raising concerns for transfusion-transmitted infection in recipients from asymptomatic blood donors. However, this data from Thai blood donors remains limited.<sup>11-13</sup> SARS-CoV-2 testing is not routinely performed when screening donated blood for blood-borne pathogens, and COVID-19 screening among potential donors is often done only by a pre-donation questionnaire. If donors developed COVID-19 post-donation, they were requested to report back to the donation center for an immediate product recall. This study aimed to evaluate the risk of SARS-CoV-2 transmission from blood donations at the National Blood Centre, Thai Red Cross Society (NBC-TRCS), and to summarize the donors who developed COVID-19 within 7 days post-donation, including their status of SARS-CoV-2 RNAemia, and conduct viral RNA screening in residual samples from blood donor testing to determine the potential risk of transfusion-transmitted SARS-CoV-2 infection.

## Materials and Methods

### Subjects

This study was approved by the Research Ethics Committee of the National Blood Centre, Thai Red Cross Society (COA No. 16/2021). From April to December 2021, a total of 448,025 individuals donated blood at the NBC-TRCS. All donors received a self-screening questionnaire to assess the risks of COVID-19 virus transmission and determine whether they had any signs of COVID-19 infection before and after blood donation (Figure 1). Subsequently, donors who self-reported

## ขอความร่วมมือตอบแบบสอบถามตามความจริง เพื่อป้องกันการแพร่กระจายเชื้อ

Please answer the questionnaire truthfully to prevent the spread of infection

### แบบคัดกรองตนเองเพื่อประเมินความเสี่ยงในการแพร่เชื้อไวรัส COVID-19

Self – screening to assess the risks of COVID-19 virus transmission

1. เพศ / Gender ☐ ชาย / Male ☐ หญิง / Female
2. อายุ / Age ..... ปี / yrs.
3. ท่านมีอาการดังต่อไปนี้หรือไม่ ? Do you have any of these symptoms?
 

|                                                          |                                                                      |
|----------------------------------------------------------|----------------------------------------------------------------------|
| <input type="checkbox"/> ไข้ / Fever                     | <input type="checkbox"/> น้ำมูกไหล / Runny nose                      |
| <input type="checkbox"/> จมูกไม่ได้กลิ่น / Loss of smell | <input type="checkbox"/> ลิ้นไม่รับรส / Loss of taste                |
| <input type="checkbox"/> ไอ / Cough                      | <input type="checkbox"/> หายใจเหนื่อยหอบ / Shortness of breath       |
| <input type="checkbox"/> เจ็บคอ / Sore throats           | <input type="checkbox"/> ไม่มีอาการเหล่านี้ / None of these symptoms |
4. ท่านเดินทางมาจาก / ผ่านประเทศ ที่มีการระบาดของไวรัส COVID-19 ในช่วงเวลา 4 สัปดาห์ หรือ ไม่ ?  
 Did you travel from / transit countries which have COVID-19 outbreak within the past 4 weeks?  
☐ ใช่ / yes ☐ ไม่ใช่ / No  
 จากประเทศ / from .....  
 พักอยู่ในประเทศนั้นกี่วัน How long did you stay? ..... day (s)  
 เดินทางกลับมานานกี่วัน How long have you left there? ..... day (s)
5. ท่านได้ไปยังสถานที่ที่มีความเสี่ยงต่อการติดเชื้อ ภายใน 4 สัปดาห์ ที่ผ่านมาหรือไม่ ?  
 (สถานบันเทิง สถานที่ออกกำลังกาย สนามกีฬา บ่อนการพนัน สถานที่แออัด เป็นต้น)  
 Have you ever been at the following places within the past 4 weeks?  
 (Entertainment venue, Casino, Fitness, Football club, Mass community etc.)  
☐ ใช่ / yes ☐ ไม่ใช่ / No
6. ท่านได้สัมผัสใกล้ชิดกับผู้สงสัยหรือป่วยเป็นโรคโควิด 19 ภายใน 4 สัปดาห์ ที่ผ่านมาหรือไม่ ?  
 Did you contact with suspected or confirmed COVID 19 cases within the past 4 weeks?  
☐ ใช่ / yes ☐ ไม่ใช่ / No
7. ท่านเพิ่งหายจากโรคโควิด 19 / Have you recovered from COVID-19 infection?  
☐ ใช่ / yes ☐ ไม่ใช่ / No  
 เป็นเวลา / for ..... สัปดาห์ / weeks

ขอขอบคุณในความร่วมมือ – Thank you for your cooperation

ศูนย์บริการโลหิตแห่งชาติ สภากาชาดไทย

25 พฤศจิกายน 2564

**Figure 1** Self-screening questionnaire for assessing the risks of COVID-19 virus transmission in blood donors

positive COVID-19 results by antigen test kit (ATK) or PCR testing directly reported them to the NBC-TRCS staff. The retrieved samples that remained in stock at NBC-TRCS were qualitatively evaluated for SARS-CoV-2 RNA by using the fully automated COBAS 6800/8800 system implemented according to the manufacturer's instructions (Roche Molecular Systems, Rotkreuz, Switzerland). Consistently positive samples were further tested for SARS-CoV-2 sub-genomic RNA and culture-based virus isolation.

## Methods

### COBAS SARS-CoV-2 testing

The COBAS 6800/8800 system with the COBAS SARS-CoV-2 kit was designed for the SARS-CoV-2 qualitative detection assay (Roche Molecular Systems, Rotkreuz, Switzerland). This platform tests individual blood plasma residuals of 0.6 mL by real-time reverse-transcription polymerase chain reaction (rRT-PCR) for two target genes: the open reading frames 1a and 1b (ORF1a/b) non-structural protein gene and the conserved pan-Sarbecovirus E gene region. The interpretation of the test result was determined by the included software of the system. According to the instructions, if there is a detection of ORF1 a/b and/or E gene within the cycle threshold (Ct) values, indicated the presence of SARS-CoV-2 RNA, and the sample was considered as positive. In the case of only E gene is detected, the result was considered as presumptive positive, whereas neither ORF1 a/b nor E gene were detected, the result was considered as not detected or negative. The limits of detection are 0.007 TCID<sub>50</sub>/ml (95%CI: 0.005-0.036) for the ORF1a/b gene and 0.004 TCID<sub>50</sub>/mL (95%CI: 0.002-0.009) for the E gene.

### One step real-time PCR

To confirm the COBAS results, positive samples were subjected to a manual in-house rRT-PCR assay to detect two regions (N1 and N2) of the SARS-CoV-2 nucleocapsid gene, which was routinely used by the U.S. Centers for Disease Control (CDC) during the pandemic.<sup>14</sup> The rRT-PCR assay was performed using the

QuantiNova probe RT-PCR kit (Qiagen, Hilden, Germany), which contained the reaction mixture according to the manufacturer's recommendations and then added the TaqMan probe, primer set, and RNA template. The conditions of thermal cycling comprised 45°C for 10 min (the RT step), followed by 95°C for 5 min for the initial denaturation step, 40 cycles of 95°C, 5 seconds for denaturation at 60°C, and then 30 seconds for the annealing and extension processes. The results were reported as detectable (cycle threshold number, Ct values < 36); the intermediate range (36-40) was repeated and was considered positive or undetectable (Ct values > 40). The limit of detection was 10 copies per microliter for SARS-CoV-2 nucleocapsid gene.

### SARS-CoV-2 Sub-genomic RNA testing

A positive plasma sample from real-time PCR was further evaluated using a qualitative rRT-PCR assay to detect the SARS-CoV-2 sub-genomic RNA (sgRNA) on the ViiA™ 7 Real-Time PCR System (Applied Biosystems, Foster City, CA) in order to evaluate active viral replication. A forward primer (5'CGATCTCTTG-TAGATCTGTTCTC3'), a reverse primer (5'ATATTGCAG-CAGTACGCACACA3'), and a fluorescent-labeled probe (5'FAM-ACACTAGCCATCCTTACTGCGCTTCG-BBQ3') binding to the E gene on the sub-genome were used.<sup>11</sup> The rRT-PCR was performed on a LightCycler 480 II Real-Time PCR System (Roche) with cycle threshold (Ct) values ≤ 38 considered positive. The limit of detection was 100 copies per microliter for sub-genomic E gene.

### Detection of SARS-CoV-2 infectious virus

VeroE6 cells that express the transmembrane serine protease TMPRSS2 were cultured at 37°C in a 5% CO<sub>2</sub> incubator. The cells were maintained and plated in Dulbecco's Modified Eagle Medium (DMEM) supplemented with 10% fetal bovine serum (FBS), 1 mg/mL G418, 100 U/mL penicillin, and 0.1 mg/mL streptomycin. The cells were washed with phosphate-buffered saline (PBS), and then 100 µL of plasma samples diluted at a 1:5 ratio were added to the cells. Each sample was duplicated on a 96-well microtiter plate. The plate was incubated

at 37°C in a 5% CO<sub>2</sub> incubator for 2 hours. After the 2-hour adsorption, the cells were washed twice with PBS. Subsequently, DMEM supplemented with 2% FBS, 100 U/mL of penicillin, and 0.1 mg/mL of streptomycin was added to the cells. The plate was then incubated at 37°C in a 5% CO<sub>2</sub> incubator for 7 days. Following the 7-day incubation period, the supernatant was collected from the wells to check the presence of viral output by one-step RT-PCR. A cell-based ELISA assay was employed to detect the presence of the SARS-CoV-2 viral nucleoprotein in the infected cells, as described in previous studies.<sup>15</sup>

### Statistical Analysis

The data were accumulated and summarized as frequencies and percentages using Microsoft Excel.

### Results

Regarding the data included in this study, there were 448,025 blood donors who visited the NBC-TRCS. Among them, 233,518 donors were male (52.1%), and 214,507 were female (47.9%). Their ages ranged from 36 to 55 years old. Of these, 158 donors (0.035%) reported experiencing symptoms of COVID-19 within 7 days after blood donation, which included fever, runny nose, congestion, sore throat, myalgia, and malaise. These donors reportedly tested positive for COVID-19 with either the self-purchased commercial rapid antigen test kit or by PCR at a healthcare provider. All individuals who reported back were found to consist of 61 males (38.6%) and 97 females (61.4%), with ages ranging between 31 and 40 years. The number of days elapsed after blood donation for each participant was considered, with a requirement for notification within one week after the donation, and blood samples are available in the Blood Testing Department at the NBC-TRCS.

A total of 88 samples were included according to the inclusion criteria of this study, representing 55.7% of the available samples. There were also residual samples at the Blood Testing Department for further analysis.

Five samples showed positive results for one or both of the initial target regions (Table 1). Specifically, one sample (RC2) tested positive for both the ORF1a/b and E genes, indicating the presence of SARS-CoV-2 RNA. Two samples (RC1 and RC3) exhibited a positive result for only the ORF1a/b gene, but they were negative for the E gene, indicating a sample with concentrations near or below the limit of detection or a mutation in the E gene region. Additionally, another two samples (RC4 and RC5) tested positive for only the E gene, which led to their interpretation as SARS-CoV-2 presumptive positive cases, following the instructions of the package insert. In these cases, further confirmatory testing may be performed if necessary. This additional testing is conducted to distinguish between SARS-CoV-2 and other Sarbecovirus. Then, the retesting was conducted in one replicate due to the limited availability of residual samples to determine the detectability of SARS-CoV-2 RNA on the COBAS system. After retesting the RNA-positive samples, it was found that only one sample retained detectable levels of SARS-CoV-2 RNA (Table 2).

However, none of the samples tested positive for the nucleocapsid gene by using one-step real-time PCR in this study. We also performed SARS-CoV-2 sub-genomic RNA testing on all samples to assess active viral replication. The results showed negative findings in all samples, indicating non-detectable sub-genomic RNA and no evidence of active viral replication (Table 2). Additionally, upon inoculating all samples onto Vero E6/TMPRSS2 cells, the investigation revealed no recovery of SARS-CoV-2. This lack of recovery remained whether using cell-based ELISA or rRT-PCR to assess the viral output on the seventh day post-incubation (data not shown). Patients who received blood products from these blood donors were closely monitored to assess the risk of a blood transfusion-related COVID-19 infection. Interestingly, two recipients who received the blood products did not show any respiratory symptoms indicative of a COVID-19 infection after the transfusion.

**Table 1** The observed initial results on blood donors who reported being real-time PCR-reactive for SARS-CoV-2

| No. | Sex | Age (years) | Date of donation | Reported date after donation | COBAS SARS-CoV-2 test (Ct value) |          | SARS-CoV-2 RNA interpretation |
|-----|-----|-------------|------------------|------------------------------|----------------------------------|----------|-------------------------------|
|     |     |             |                  |                              | ORF 1 a/b gene                   | E gene   |                               |
| RC1 | M   | 31          | 26 Apr 2021      | 30 Apr 2021                  | 36.13                            | Negative | Detected                      |
| RC2 | F   | 60          | 22 Jun 2021      | 28 Jun 2021                  | 33.34                            | 34.96    | Detected                      |
| RC3 | F   | 51          | 24 Jun 2021      | 29 Jun 2021                  | 36.29                            | Negative | Detected                      |
| RC4 | M   | 49          | 5 Aug 2021       | 10 Aug 2021                  | Negative                         | 38.49    | Presumptive positive          |
| RC5 | M   | 27          | 3 Oct 2021       | 7 Oct 2021                   | Negative                         | 37.81    | Presumptive positive          |

**Table 2** The confirmatory results on initial positive samples for SARS-CoV-2 detection

| No. | Repeated COBAS test (Ct value) |          | Manual in-house rRT-PCR method validated by the US CDC |          |          |          | SARS-CoV-2 sub-genomic RNA test |          | Interpretation |
|-----|--------------------------------|----------|--------------------------------------------------------|----------|----------|----------|---------------------------------|----------|----------------|
|     | ORF 1 a/b gene                 | E gene   | N gene 1                                               |          | N gene 2 |          |                                 |          |                |
|     |                                |          |                                                        |          |          |          |                                 |          |                |
| RC1 | Negative                       | Negative | Negative                                               | Negative | Negative | Negative | Negative                        | Negative |                |
| RC2 | 33.23                          | 35.38    | Negative                                               | Negative | Negative | Negative | Negative                        | Negative |                |
| RC3 | Negative                       | Negative | Negative                                               | Negative | Negative | Negative | Negative                        | Negative |                |
| RC4 | Negative                       | Negative | Negative                                               | Negative | Negative | Negative | Negative                        | Negative |                |
| RC5 | Negative                       | Negative | Negative                                               | Negative | Negative | Negative | Negative                        | Negative |                |

## Discussion

This study was conducted on blood donations obtained in 2021 during the upsurge of the COVID-19 Delta variant in Thailand. At the time, as many as > 20,000 COVID-19-infected Thais were officially recorded daily by the Ministry of Public Health.<sup>16</sup> This situation posed a significant concern among blood component recipients and healthcare workers due to the unknown risk of potential blood-borne SARS-CoV-2 transmission. Although COVID-19 vaccination began in Thailand in the second quarter of 2021, only the inactivated whole-cell CoronaVac (Sinovac) and the adenoviral vectored Vaxzevria (AstraZeneca) were available at the time, and vaccines were often inaccessible due to limited availability.

Even though the COBAS test yielded several RNA-positive samples, the results were not reproducible when subsequently retested or subjected to the in-house rRT-PCR assay. It is possible that the COBAS platform used for high-throughput screening of blood-borne pathogens heavily relies on sensitivity at the expense of specificity. The median Ct value for any SARS-CoV-2 gene detected using the COBAS was 36.21 (33.34-38.49), suggesting a low viral RNA concentration in the plasma consistent with previous findings.<sup>17,18</sup> In addition, the SARS-CoV-2 RNA testing using the one-step real-time PCR method validated by the US CDC was used for additional tests after the COBAS test. This N gene-based rRT-PCR method demonstrated more sensitivity in detecting SARS-CoV-2 in clinical specimens compared to the open reading frame 1 (ORF1) assay.<sup>18</sup> For further investigation, testing for SARS-CoV-2 sub-genomic RNA yielded negative results, which indicates the lack of viral replication capabilities. Therefore, this strongly suggests that the detected SARS-CoV-2 RNA in the

blood samples is unlikely to be transmissible through blood transfusion. This conclusion is consistent with previous research conducted by Cho HJ et al. in Korea.<sup>20</sup>

Furthermore, undetectable sgRNA in RC2 and its lack of cytopathic effect or viral RNA in cell culture are consistent with non-infectious individuals.<sup>21</sup> Taken together, these results are consistent with current evidence that any trace of SARS-CoV-2 RNA found in the blood is unlikely to be transmissible.<sup>21-23</sup> A report on the successful bone marrow transplantation and the lack of any complications involving a SARS-CoV-2-positive donor in a beta-thalassemia/Hb E Thai patient further suggests a low risk of COVID-19 transmission for hematopoietic stem cell recipient.<sup>24</sup>

Despite involving a large number of blood donations, this study had some limitations. COVID-19 symptoms were voluntarily self-reported by donors, and not all had their infections laboratory-confirmed. Under-reporting was highly likely given the reality that the SARS-CoV-2 Delta variant swept through Thailand between June and December 2021.<sup>16</sup> Not all of the donations whose donors reported COVID-19 were tested. Testing of plasma on the COBAS has not been validated by the manufacturer and is not a typical sample for the detection of SARS-CoV-2 by most commercially available viral assays. Consequently, donor plasma with relatively low viremia may have missed the scrutiny.

## Conclusion

Regarding this study, there was no evidence to suggest an increased risk of SARS-CoV-2 transmission from donated blood products during the COVID-19 pandemic in Thailand. Transfusion-related transmission of the SARS-CoV-2 infection was not established even when suspected blood products were given to recipients.

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