SEROPREVALENCE OF CHIKUNGUNYA VIRUS AND THE RISK OF TRANSFUSION TRANSMITTED AMONG BLOOD DONORS IN SULAWESI-INDONESIA

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SUMMARY

MOHAMMED AHMED JALLOH. Seroprevalence of Chikungunya Virus and the Risk of Transfusion Transmitted Among Blood Donors in Sulawesi-Indonesia. Supervised by I MADE ARTIKA and KHIN SAW AYE MYINT.

Chikungunya (CHIK) is an arthritogenic alphavirus in the *Togaviridae* family of arboviruses with an enveloped RNA containing a positive single-stranded 11.8 kb genome. Transmission occurs through the bite of infected Aedes mosquitoes, which are commonly found in tropical and temperate regions. Primary vertebrate hosts include monkeys and humans, in whom this virus replicates efficiently (Diallo *et al.* 1999). Chikungunya virus (CHIKV) is known for causing acute illness, manifesting with fever, rash, and arthralgia known as Chikungunya fever (Horwood dan Buchy 2015).

Despite the high number of Chikungunya cases in Indonesia, comprehensive data are lacking in CHIKV seroprevalence. Previous studies reported the median seroprevalence of anti-CHIKV antibodies in all situations 18.5%, ranging from 0.0 – 73.% (Harapan *et al.,* 2019). However, the gap in epidemiological data of CHIKV in many regions of Indonesia including Sulawesi, is noteworthy. The objective of this study was to determine the seroprevalence of CHIKV infection among healthy individuals from North and South Sulawesi using archive samples.

Additionally, an asymptomatic course of CHIKV infection and the high pre-symptomatic viral load as 10^8pfu/mL (Appassakij *et al*. 2013) suggest that the infection can threaten blood transfusion safety. Evidence of CHIKV infection among blood donors (Simmons *et al*. 2016) indicates transfusion-transmitted is probable, although it has not been documented (Petersen dan Epstein 2014). Our study also aimed to test the archive blood donor specimens from North Sulawesi for CHIKV IgM and viremia to determine blood safety in endemic areas.

Samples were screened for anti-CHIKV IgG antibodies to determine exposure to CHIKV using an in-house IgG ELISA as previously described (Kosasih *et al*. 2013) with minor modifications. CHIKV IgM, a marker for recent infection and endemicity, was tested in 303 samples randomly selected from IgG-positive samples using a Euroimmun anti-CHIKV IgM ELISA kit (Luebeck, Germany) following the manufacturer's instructions. CHIKV RNA detection was carried out using one-step-qRT-PCR. The data generated were analyzed with IBM-SPSS v20 (IBM Corporation, USA). Chi-square ($\chi 2$) test to determine significant differences between categorical variables, and a p-value less than 0.05 was considered statistically significant.

As many as 1092 serum and plasma samples were analyzed, with CHIK IgG seropositivity at 53.48% (584/1092). The results also show a statistically significant difference in the seropositive rates based on gender (58.8% male and 48.5% female) and region (53.9% South Sulawesi versus 48.7% North Sulawesi). Seropositivity increased with age; approximately half of adults between their 40s and 60s had seroconverted. Most of the participants, 304 (27.8%), were between 21-30 years. The age groups with the least participants were those >60 years and <20 years, with 93 participants each (8.5%), followed by the 51–60-years age group with 142 (13.0%) participants.

In addition to IgG, the overall anti-CHIKV IgM seropositivity comprised 12.9% (39/303). A Chi-square analysis shows a statistical significance of anti-CHIKV IgM seropositivity based on gender and region with p-values (p=0.047 and p=0.038, respectively). On the contrary, there was no significant difference in anti-CHIK IgM based on age. The age group with the most participants was the 21-30 years with 19.3% (16/83), while those with the least participants were those >60 years. The current study recorded two positive signals for chikungunya virus RNA by qRT-PCR with low viremia. As is widely observed, the detection of chikungunya viral RNA is from the day of infection or onset of symptoms to day 7, after which acute infection detection is limited (Dash *et al*. 2011).

The current study recorded two positive low viremia blood donor samples by qRT-PCR without positive IgM response, presumably from the initial phase of viremia and likely to be infectious. Although transfusion related CHIKV infection has not been documented, further studies using sensitive viral nucleic acid detection and IgM assays are required to assess transfusion safety threats during outbreaks and in highly endemic areas. We found evidence of higher rates of CHIKV infection in Sulawesi than had been found earlier. There was evidence for disparate risk based on gender, domicile, and age. Especially concerning is the risk of asymptomatic blood donors.

Keywords: Chikungunya, Serosurvey, Sulawesi, Blood donors, ELISA, qRT-PCR.

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