**Abstract.** Emergence of SARS-CoV-2 in dengue virus (DENV)—endemic areas complicates the diagnosis of both infections. COVID-19 cases may be misdiagnosed as dengue, particularly when relying on DENV IgM, which can remain positive months after infection. To estimate the extent of this problem, we evaluated sera from 42 confirmed COVID-19 patients for evidence of DENV infection. No cases of SARS-CoV-2 and DENV coinfection were identified. However, recent DENV infection, indicated by the presence of DENV IgM and/or high level of IgG antibodies, was found in seven patients. Dengue virus IgM and/or high IgG titer should not exclude COVID-19. SARS-CoV-2 reverse transcription polymerase chain reaction (RT-PCR) testing is appropriate when dengue nonstructural protein 1 (NS1) or RT-PCR is negative. Given the possibility of coinfection, testing for both DENV and SARS-CoV-2 is merited in the setting of the current pandemic.
having a fever before acute COVID-19 illness, suggesting asymptomatic or mild dengue, the most common presentation of DENV infection.7

In four patients, DENV IgM was detected but did not increase in follow-up samples, DENV IgG was only detected by ELISA, and DENV RT-PCR was negative, suggesting that DENV infection occurred less recently than in the three patients described earlier. Detection of IgM is plausible as it may be detected until 1 year postinfection.9 Most patients (33, 78.6%) only had DENV IgG antibodies, implying past DENV infection. This is consistent with previous studies conducted in Indonesia, which demonstrated that more than 90% of adults aged >18 years had been infected by DENV.5 No evidence of DENV infection was identified in two (4.8%) patients. The distribution of dengue diagnostic results is shown in Table 1.

Despite concurrent high incidence of COVID-19 and dengue in Indonesia, acute coinfection with DENV was not detected in this cohort of patients identified to have COVID-19. This may be because of SARS-CoV-2 and DENV testing practices, which focus on symptomatic cases. It is likely that coinfection is occurring but is often asymptomatic. It is also possible that some patients had already been infected with current circulating DENV serotypes and thus had immunity, as indicated by high prevalence of patients with IgG antibodies.

Identification of seven (16.7%) COVID-19 cases with DENV IgM in our cohort may be related to the occurrence of COVID-19 during the yearly dengue season. This finding is concerning, particularly because clinicians frequently diagnose dengue based only on DENV IgM, which may persist for months after resolution of infection. Our study demonstrates that adding NS1 to the diagnostic algorithm may reduce dengue overdiagnosis attributable to reliance on IgM. Missed diagnosis of acute COVID-19 due to presumption of dengue can result in inadvertent omission of targeted precautions, which could lead to transmission to contacts, including family, colocated patients, and healthcare workers. A missed diagnosis could also delay the receipt of standard of care COVID-19 treatment. Missed diagnoses have been reported in Singapore due to false-positive DENV IgM RDT results3 versus persistence of DENV IgM. In the setting of the current pandemic and in light of overlapping symptomatology, clinicians should test for both DENV and SARS-CoV-2.

It is notable that one of the patients may have contracted SARS-CoV-2 during hospitalization a week prior. In resource-limited settings, adequate infection control practices are difficult to implement. Hence, nosocomial infection should be considered in the setting of recent contact with the healthcare system, including due to dengue. SARS-CoV-2 infection control strategies for resource-limited settings are needed.

Findings from our study should be interpreted with caution. The study population was small and from only one hospital at Tangerang district, during March 2020 and April 2020. Therefore, results have limited generalizability as they reflect the epidemiology of COVID-19 and dengue in that area during the study period. Furthermore, as the assays were qualitative (RDT) or semi-quantitative (ELISA), increasing antibody titer was only measured by the index value, which may be inaccurate. To reduce inaccuracy, we tested acute and follow-up specimens simultaneously.

In conclusion, our study reaffirms challenges associated with diagnosing COVID-19 in areas hyperendemic for tropical infections with overlapping presentations such as dengue. The known potential for repeat dengue infections and the possibility for repeat SARS-CoV-2 infections add further complication. When molecular diagnostic testing for DENV is not available, we recommend the use of a validated NS1 and IgM/IgG RDT. Addition of NS1 will improve the specificity of identifying acute dengue cases.9 Detection of DENV IgM and/or high IgG titer should not be considered an exclusion of COVID-19. Past infection with DENV with acute COVID-19 or even acute DENV and SARS-CoV-2 coinfection would remain possibilities.10 Hence, evaluation for COVID-19 should be conducted when dengue NS1 or RT-PCR (when available) is negative.

Table 1

| Patients (N = 42) | RT-PCR/NS1 antigen | IgM RDT or ELISA | IgG RDT | IgG ELISA | Interpretation |
|------------------|---------------------|------------------|---------|-----------|----------------|
| 2                | NS1 negative        | Negative          | Negative| Negative  | Never infected by DENV |
|                  |                     |                  |         |           | Past infection by DENV |
| 33*              | NS1 negative        | Negative          | Negative| Positive  | Recent secondary DENV infection |
|                  |                     |                  |         |           | |
| 4                | RT-PCR and NS1 negative | Positive (no follow-up IV increase) | Negative| Positive  | Very recent secondary DENV infection, with high-titer IgG |
|                  | #1: 4.8 to 4.1 #2: 2.8 to 0.5 #3: 1.6 to 0.8 #4: 3.7 to 1.6 | | | | |
|                  | #1: 9.5 to 9.2 #2: 8.5 to 8.1 #3: 4.8 to 6.4 #4: 10.2 to 9.5 | | | | |
| 3                | RT-PCR and NS1 negative | Positive (no follow-up IV increase) | Positive | Positive | Very recent secondary DENV infection, with high-titer IgG |
|                  | #1: 3.8 to 3.8 #2: 2.5 to 1.1 #3: 1.6 to 1.5 | | | | |
|                  | #1: 17.1 to 16.6 #2: 12.3 to 11.5 #3: 12.5 to 12.3 | | | | |

**DENV** = dengue virus; **IV** = index value; **RDT** = rapid diagnostic test.

* Ten patients in this group did not have follow-up sera. For patients with positive IgM and IgG, admission and follow-up IV are shown. Changes in both IgM and IgG interpretation were not noted in follow-up sera. There were no cases of current dengue coinfection.
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