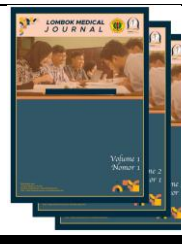
Original Article

LMJ 6(1) (2027)

Lombok Medical Journal

http://journal.unram.ac.id/index.php/LMJ



SARS-CoV-2 IgM and IgG Antibody Positivity Among Patients with Respiratory Symptoms in Wasit, Iraq: A Cross-Sectional Study

Muhamed Ali Al Kabe[1*]

[1]Medical Microbiology, College of Medicine, Wasit University, Kut, Iraq

DOI: https://doi.org/10.29303/hk1szg16

Article Info
Received : **22 September 2026**
Revised : **28 October 2026**
Accepted : **30 October 2026**

Abstract: Serological assays detect antibodies following SARS-CoV-2 exposure; however, antibody positivity alone cannot confirm active infection. This study described SARS-CoV-2 IgM and IgG antibody positivity among patients presenting with respiratory symptoms in Wasit, Iraq, and examined their associations with selected demographic characteristics. This cross-sectional study included 300 patients with respiratory symptoms who attended Al-Karama Hospital, Wasit Governorate, Iraq, between September and November 2020. SARS-CoV-2 IgM and IgG antibodies were assessed using the Panbio™ COVID-19 IgG/IgM Rapid Test Device (Abbott, USA) according to the manufacturer's instructions. IgM and IgG results were analyzed separately as qualitative outcomes. Associations with sex, age group, and residence were assessed using Pearson's chi-square tests, and crude odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Overall, IgM was positive in 77 of 300 participants (25.7%; 95% CI, 21.1–30.9%), and IgG was positive in 78 of 300 participants (26.0%; 95% CI, 21.4–31.2%). Of the participants, 173 (57.7%) were male and 127 (42.3%) were female; the mean age was 32.49 ± 19.19 years. IgM positivity was significantly associated with sex (P = 0.025) and age group (P = 0.003), but not with residence (P = 0.133). IgG positivity was significantly associated with sex (P = 0.017), but not with residence (P = 0.544) or age group (P = 0.388). IgM and IgG antibody positivity was observed in approximately one quarter of symptomatic patients. IgM positivity was associated with sex and age group, whereas IgG positivity was associated with sex only. These cross-sectional findings describe antibody status and do not establish active infection, causality, or diagnostic accuracy.

Keywords: COVID-19; SARS-CoV-2; IgM; IgG; antibody positivity; seroprevalence; respiratory symptoms; cross-sectional study.

Citation: Al Kabe, M. A. (2027). SARS-CoV-2 IgM and IgG antibody positivity among patients with respiratory symptoms in Wasit, Iraq: A cross-sectional study. *Lombok Medical Journal*, 6(1), 34-40. https://doi.org/10.29303/hk1szg16

Introduction

SARS-CoV-2 serological testing detects antibodies produced in response to infection, particularly IgM and IgG. Both laboratory-based immunoassays and rapid diagnostic tests can be used for this purpose. Rapid antibody tests are simple to perform, do not require complex laboratory infrastructure, and provide results within a short time. However, their diagnostic performance depends on the assay used and the timing of specimen collection relative to symptom onset (Portilho et al., 2026)).

Email: Malkaabi@uowasit.edu.iq*(*Corresponding Author)*

Copyright © 2027, The Author(s).
This article is distributed under a Lisensi Creative Commons Atribusi 4.0 Internasional.

Because serological tests are generally less accurate than molecular tests for diagnosing acute infection, a diagnosis of active SARS-CoV-2 infection should not be based on serological results alone. Serological findings should be interpreted in the context of symptom onset, clinical presentation, and available molecular or antigen test results. The Infectious Diseases Society of America does not recommend serological testing for the diagnosis of acute infection during the first two weeks after symptom onset, because IgM and IgG may not yet be detectable early in the illness. Therefore, a negative antibody result early in the disease course does not exclude recent infection. In contrast, molecular and antigen tests remain more suitable for confirming current SARS-CoV-2 infection (Hayden et al., 2024; Dinnes et al., 2021).

SARS-CoV-2 diagnostic methods include molecular tests, antigen tests, and serological tests. Molecular and antigen tests primarily detect active infection, whereas serological tests detect antibodies following exposure and may provide evidence of past infection in appropriate clinical and epidemiological settings (Xue et al., 2026).

Although several studies have examined SARS-CoV-2 serological testing, the prevalence of IgM and IgG antibody positivity may vary according to the time since symptom onset and demographic characteristics. Local data from Wasit Province, Iraq, particularly during the early phase of the COVID-19 pandemic, remain limited. Therefore, this study aimed to determine the positivity of SARS-CoV-2 IgM and IgG antibodies among patients presenting with respiratory symptoms at Al-Karama Hospital in Wasit, Iraq, and to assess their associations with age, sex, and place of residence.

Materials and Methods

Study Design and Setting: A cross-sectional study was conducted at Al-Karama Hospital, Wasit Governorate, Iraq, from September to November 2020. A total of 300 patients presenting with respiratory symptoms were enrolled using convenience sampling. The available records did not include a formal sample-size calculation or a complete recruitment flow, including the number of patients approached, excluded, and the reasons for exclusion.

Study Population and Data Collection: Participants were patients presenting with respiratory symptoms, including cough, difficulty breathing, or loss of smell. Written informed consent was obtained from all participants. Age, sex, and place of residence were recorded for each participant.

The interval between symptom onset and specimen collection was not systematically documented; therefore, analysis of antibody positivity according to symptom duration could not be performed. In addition, the overlap between IgM and IgG results could not be reconstructed from the separate totals available in the original records.

Inclusion and Exclusion Criteria:

Inclusion criteria: Patients of both sexes and all age groups who presented with respiratory symptoms, including cough, difficulty breathing, or loss of smell, and who agreed to participate in the study by providing written informed consent were included.

Exclusion criteria: Patients who refused to participate, did not provide written informed consent, or had incomplete demographic or laboratory data were excluded from the study.

Laboratory Procedure: Blood samples were tested for SARS-CoV-2-specific IgM and IgG antibodies using the Panbio™ COVID-19 IgG/IgM Rapid Test Device (Abbott, USA), a qualitative rapid immunochromatographic assay, according to the manufacturer's instructions. IgM and IgG results were read and recorded independently as positive or negative. Thus, a participant could be positive for IgM only, IgG only, both, or neither.

The available records did not include the catalogue number, lot number, specimen volume, exact reading time, or detailed quality-control records; these details were not inferred. Because the assay was qualitative, results are described as antibody positivity or antibody status rather than antibody levels.

Statistical Analysis: Categorical variables were summarized as frequencies and percentages. Pearson's chi-square test was used to assess associations between antibody status and sex, age group, and residence. Crude odds ratios (ORs) and 95% confidence intervals (CIs) were calculated from the displayed cell counts, using male sex, rural residence, and age <18 years as reference categories. Overall IgM and IgG positivity proportions were reported with 95% CIs calculated using the Wilson score method. A P value <0.05 was considered statistically significant.

Because the original individual-level dataset was unavailable, the calculations could not be verified against source data, and adjusted multivariable analyses could not be performed.

Ethical Considerations: This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the relevant institutional review committee before the study began. Written informed consent was obtained from all participants, and the confidentiality of participants' information was maintained throughout the study.

Result and Discussion

Results:

Demographic Characteristics: A total of 300 patients with respiratory symptoms were included. Of these, 173 (57.7%) were male and 127 (42.3%) were female. The mean age was 32.49 ± 19.19 years. There were 66 participants (22.0%) aged <18 years, 165 (55.0%) aged 18–50 years, and 69 (23.0%) aged >50 years. Most participants lived in urban areas (235; 78.3%), whereas 65 (21.7%) lived in rural areas (Table 1).

Overall, IgM was positive in 77 of 300 participants (25.7%; 95% CI, 21.1–30.9%), and IgG was positive in 78 of 300 participants (26.0%; 95% CI, 21.4–31.2%). Because IgM and IgG results were interpreted independently, these separate totals do not indicate how many participants were positive for both antibody classes.

Table 1. Demographic characteristics of the study participants (n = 300).

Variable	Category	n	%
Sex	Male	173	57.7
	Female	127	42.3
Age group (years)	< 18	66	22.0
	18 - 50	165	55.0
	> 50	69	23.0
Residence	Urban	235	78.3
	Rural	65	21.7
Total		300	100.0

IgM Antibody Positivity: IgM positivity was significantly associated with sex (Pearson $\chi^2 = 5.054$, P = 0.025) and age group (Pearson $\chi^2 = 11.488$, P = 0.003), but not with residence (Pearson $\chi^2 = 2.258$, P = 0.133). Female participants had significantly higher IgM positivity than male participants (OR = 1.81; 95% CI, 1.08–3.06). Compared with participants aged <18 years, IgM positivity was significantly higher among those aged 18–50 years (OR = 3.99; 95% CI, 1.71–9.32) and those aged >50 years (OR = 2.76; 95% CI, 1.06–7.17). The detailed results are presented in Table 2.

Table 2. Associations between demographic characteristics and SARS-CoV-2 IgM positivity (n = 300).

Variable	Category	IgM positive, n (%)	IgM negative, n (%)	Crude OR (95% CI)	Pearson χ^2	P value
Sex	Male	36 (20.8)	137 (79.2)	1.00 (reference)	5.054	0.025*
	Female	41 (32.3)	86 (67.7)	1.81 (1.08–3.06)		
Residence	Rural	12 (18.5)	53 (81.5)	1.00 (reference)	2.258	0.133
	Urban	65 (27.7)	170 (72.3)	1.69 (0.85–3.36)		
Age group (years)	< 18	7 (10.6)	59 (89.4)	1.00 (reference)	11.488	0.003*
	18 - 50	53 (32.1)	112 (67.9)	3.99 (1.71–9.32)		
	> 50	17 (24.6)	52 (75.4)	2.76 (1.06–7.17)		
Total		77 (25.7)	223 (74.3)			

Percentages are row percentages. OR, crude (unadjusted) odds ratio; CI, confidence interval; χ^2, Pearson chi-square test.
*Statistically significant at P < 0.05.

IgG Antibody Positivity: IgG positivity was significantly associated with sex (Pearson $\chi^2 = 5.72$, P = 0.017). Female participants had significantly higher IgG positivity than male participants (OR = 1.88; 95% CI, 1.12–3.17). No statistically significant association was found between IgG positivity and residence (P = 0.544) or age group (P = 0.388). The detailed results are presented in Table 3.

Table 3. Associations between demographic characteristics and SARS-CoV-2 IgG positivity (n = 300).

Variable	Category	IgG positive, n (%)	IgG negative, n (%)	Crude OR (95% CI)	Pearson χ^2	P value
Sex	Male	36 (20.8)	137 (79.2)	1.00 (reference)	5.720	0.017*
	Female	42 (33.1)	85 (66.9)	1.88 (1.12–3.17)		
Residence	Rural	15 (23.1)	50 (76.9)	1.00 (reference)	0.369	0.544
	Urban	63 (26.8)	172 (73.2)	1.22 (0.64–2.33)		
Age group (years)	< 18	13 (19.7)	53 (80.3)	1.00 (reference)	1.893	0.388
	18 - 50	47 (28.5)	118 (71.5)	1.62 (0.81–3.25)		
	> 50	18 (26.1)	51 (73.9)	1.44 (0.64–3.24)		
Total		78 (26.0)	222 (74.0)			

Percentages are row percentages. OR, crude (unadjusted) odds ratio; CI, confidence interval; χ^2, Pearson chi-square test.
*Statistically significant at P < 0.05.

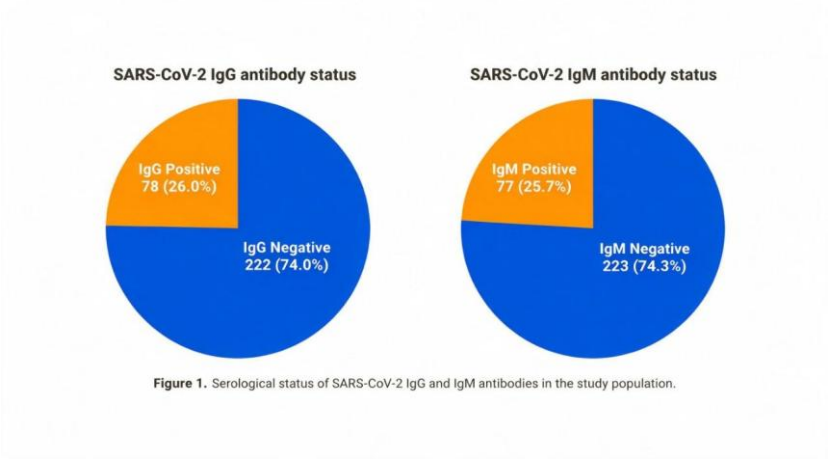


Figure 1. Serological status of SARS Cov-2 IgG and IgM antibodies in the study population

Discussion:

This study described SARS-CoV-2 IgM and IgG antibody positivity among 300 patients with respiratory symptoms attending Al-Karama Hospital in Wasit, Iraq, between September and November 2020. Serological findings should be interpreted according to assay characteristics and the timing of specimen collection; antibody positivity alone does not confirm active SARS-CoV-2 infection.

IgM positivity was significantly associated with sex and age group, but not with residence. Female participants had higher IgM positivity than males, and IgM positivity was higher among participants aged 18–50 years and >50 years than among those aged <18 years. This pattern may reflect differences in the timing and nature of the humoral immune response. IgM is typically among the first antibodies detected during the early humoral immune response; however, the time of detection may vary between individuals and according to the interval between symptom onset and specimen collection (Uwamino et al., 2021).

IgG positivity was significantly higher among female participants than male participants, whereas no significant associations were observed with age group or residence. This finding may reflect differences in the development, duration, or magnitude of the humoral immune response following SARS-CoV-2 exposure (Hayden et al., 2026; Xue et al., 2026; Uwamino et al., 2021).

Differences between IgM and IgG findings may be explained by the kinetics of the humoral immune response. IgM and IgG positivity reflect different stages of the immune response, and the detection of either antibody class depends largely on the time elapsed between infection or symptom onset and specimen collection (Uwamino et al., 2021). In addition, the diagnostic performance of IgM and IgG assays may differ substantially across testing platforms (Zhao et al., 2024).

Importantly, SARS-CoV-2 antibody tests should not be used as a substitute for the diagnosis of active infection. Molecular testing, particularly RT-PCR, remains the preferred method for confirming active SARS-CoV-2 infection, whereas serological testing is more useful for assessing prior exposure and humoral immune response in appropriate clinical and

epidemiological contexts (Hayden et al., 2026; Dinnes et al., 2021; Colgrove et al., 2023).

The relatively high proportion of antibody-negative participants with respiratory symptoms may have several possible explanations. Respiratory symptoms may have been caused by pathogens other than SARS-CoV-2, although the etiology of symptoms was not investigated in this study. Negative results may also reflect specimen collection before seroconversion, declining antibody levels before sampling, or limitations in the sensitivity of the rapid assay used. Variations in the sensitivity and specificity of rapid serological assays across platforms and collection times may further affect the interpretation of results (Ma et al., 2022; Kahya & Mahmood, 2022).

The observed associations between IgM positivity and sex and age group should be interpreted as statistical associations rather than causal relationships. Several potential confounders, including disease severity, underlying medical conditions, previous SARS-CoV-2 infection, vaccination history, and symptom duration, were not assessed in this study. These factors may influence antibody responses and should be considered in future studies.

Antibodies against SARS-CoV-2 have previously been detected in different populations in Iraq. A study conducted among patients with COVID-19 in Mosul, Iraq, reported measurable IgG and IgM responses (Kahya & Mahmood, 2022). Another study of recovered COVID-19 patients in Iraq reported changes in IgM and IgG antibody status after recovery (Muslim Dawood & Khudhur Al Joofy, 2022). In addition, anti-SARS-CoV-2 IgG and IgM have been documented in the Iraqi general population, supporting the potential value of serology in assessing prior exposure and humoral immunity (Alobaidi et al., 2023).

These findings should also be interpreted in the context of international variation in SARS-CoV-2 seroprevalence. A systematic review and meta-analysis reported substantial heterogeneity in seroprevalence estimates, which may be attributed to differences in epidemiological circumstances, prior infection, vaccination, and testing methods (Azami et al., 2022).

This study has several strengths, including the provision of local serological data from symptomatic patients in Wasit, Iraq. However, several limitations should be considered. The cross-sectional design does not allow temporal or causal relationships to be established. Convenience sampling at a single healthcare facility may have introduced selection bias and limits the generalizability of the findings. Furthermore, antibody results were not compared with RT-PCR or another molecular reference test; therefore, diagnostic accuracy could not be estimated. The interval between symptom onset and specimen collection was not systematically documented, preventing analysis of antibody positivity by symptom duration. In addition, information on previous infection, vaccination status, and disease severity was limited. Finally, because all participants were symptomatic, this study could not compare antibody positivity between symptomatic and asymptomatic individuals.

Differences in serological assays should also be considered when comparing findings across studies. Commercial SARS-CoV-2 antibody assays vary in viral antigens, assay technology, and reporting systems. Independent evaluations have demonstrated inter-platform variability in antibody detection, and comparisons of multiple assays have shown differences in performance (Pinto et al., 2022; Lau et al., 2025). The use of international reference standards and standardized measurement approaches is therefore important to improve comparability between studies and laboratories (Hempel et al., 2024).

Conclusion

Among 300 patients with respiratory symptoms in Wasit, Iraq, SARS-CoV-2 IgM and IgG antibody positivity was 25.7% and 26.0%, respectively. IgM positivity was significantly associated with female sex and older age groups, whereas IgG positivity was significantly associated with female sex but not with age group or residence. These findings describe SARS-CoV-2 IgM and IgG antibody positivity in a convenience sample of symptomatic patients and should not be interpreted as evidence of active infection, causality, or diagnostic accuracy.

Limitations

This study has several limitations. First, the cross-sectional design does not allow temporal or causal relationships to be established. Second, convenience sampling at a single healthcare facility may have introduced selection bias and limits the generalizability of the findings. Third, all participants were symptomatic; therefore, antibody positivity could not be compared between symptomatic and asymptomatic individuals. Fourth, antibody results were not compared with RT-PCR or another molecular reference test; therefore, diagnostic accuracy could not be estimated. Fifth, the interval between symptom onset and specimen collection was not systematically documented, preventing analysis of antibody positivity by symptom duration. Sixth, information on previous SARS-CoV-2 infection, vaccination status, and disease severity was limited. Finally, the study was conducted at a single healthcare facility over a limited period, and the

available records did not permit assessment of the overlap between IgM and IgG results.

Conflict of Interest

The author declares that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements

The author thanks the staff of Al-Karama Hospital and the laboratory team for their assistance with sample collection and testing.

References

Alobaidi, A. H., Mustafa, H. I., Salih, A. M., & Alsamarai, A. M. (2023). Anti- SARS-CoV-2 IgG and IgM levels in Iraqi general population. *Anti-inflammatory & anti-allergy agents in medicinal chemistry*, *22*(2), 113–129. https://doi.org/10.2174/0118715230269593230928095153

Azami, M., Moradi, Y., Moradkhani, A., & Aghaei, A. (2022). SARS-CoV-2 seroprevalence around the world: an updated systematic review and meta-analysis. *European journal of medical research*, *27*(1), 81. https://doi.org/10.1186/s40001-022-00710-2

Colgrove, R., Bruno-Murtha, L. A., Chastain, C. A., Hanson, K. E., Lee, F., Odom John, A. R., & Humphries, R. (2023). Tale of the titers: serologic testing for SARS-CoV-2 - yes, no, and maybe, with clinical examples from the IDSA diagnostics committee. *Open Forum Infectious Diseases*, *10*(1), Article ofac674. https://doi.org/10.1093/ofid/ofac674

Dinnes, J., Deeks, J. J., Berhane, S., Taylor, M., Adriano, A., Davenport, C., Dittrich, S., Emperador, D., Takwoingi, Y., Cunningham, J., Beese, S., Domen, J., Dretzke, J., Ferrante di Ruffano, L., Harris, I. M., Price, M. J., Taylor-Phillips, S., Hooft, L., Leeflang, M. M., McInnes, M. D., … Cochrane COVID-19 Diagnostic Test Accuracy Group (2021). Rapid, point-of-care antigen and molecular-based tests for diagnosis of SARS-CoV-2 infection. *The Cochrane database of systematic reviews*, *3*(3), CD013705. https://doi.org/10.1002/14651858.CD013705.pub2

Hayden, M. K., El Mikati, I. K., Hanson, K. E., Englund, J. A., Humphries, R. M., Lee, F., Loeb, M., Morgan, D. J., Patel, R., Al Ta'ani, O., Nazzal, J., Iqneibi, S., Amarin, J. Z., Sultan, S., Falck-Ytter, Y., Morgan, R. L., Murad, M. H., Bhimraj, A., & Mustafa, R. A. (2024). Infectious diseases society of America guidelines on the giagnosis of COVID-19: serologic testing. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*, ciae121. Advance online publication. https://doi.org/10.1093/cid/ciae121

Hempel, H., Page, M., Kemp, T., Semper, A., Brooks, T., & Pinto, L. A. (2024). The importance of using WHO International Standards to harmonise SARS-CoV-2 serological assays. *The Lancet. Microbe*, *5*(3), e301–e305. https://doi.org/10.1016/S2666-5247(23)00258-6

Kahya, H. F. H., & Mahmood, M. T. (2022). Detection of IgG and IgM levels in patients with COVID-19 in Mosul Province, Iraq. *J Pure Appl Microbiol*, 16(1):167-173. https://doi.org/10.22207/JPAM.16.1.05

Lau, R., Senthilkumaran, C., Chong, J., Qi, F., Pulikkottil, R. S., Ma, J., Ogbulafor, K., Gabe, L., Manguiat, K., Robinson, A., Wood, H., Li, A. X., Mozafarihashjin, M., Campigotto, A., McGeer, A. J., Mubareka, S., Gubbay, J. B., Kus, J. V., Bolotin, S., Richard-Greenblatt, M., … Tran, V. (2025). Comparison of six COVID-19 serology assays for detection of antibodies from patients infected with ancestral and a spectrum of SARS-CoV-2 variants. *Access microbiology*, *7*(7), 000974.v3. https://doi.org/10.1099/acmi.0.000974.v3

Ma, X., Li, Z., Whelan, M. G., Kim, D., Cao, C., Yanes-Lane, M., Yan, T., Jaenisch, T., Chu, M., Clifton, D. A., Subissi, L., Bobrovitz, N., & Arora, R. K. (2022). Serology assays used in SARS-CoV-2 seroprevalence surveys worldwide: a systematic review and meta-analysis of assay features, testing algorithms, and performance. *Vaccines*, *10*(12), 2000. https://doi.org/10.3390/vaccines10122000

Muslim Dawood, S., & Khudhur Al Joofy, I. (2022). Evaluation of IgM and IgG in COVID-19 recovered patients in Iraq. *Archives of Razi*

Institute, *77*(3), 1191–1197. https://doi.org/10.22092/ARI.2022.357515.2054

Pinto, L. A., Shawar, R. M., O'Leary, B., Kemp, T. J., Cherry, J., Thornburg, N., Miller, C. N., Gallagher, P. S., Stenzel, T., Schuck, B., Owen, S. M., Kondratovich, M., Satheshkumar, P. S., Schuh, A., Lester, S., Cassetti, M. C., Sharpless, N. E., Gitterman, S., & Lowy, D. R. (2022). A Trans-governmental collaboration to independently ivaluate SARS-CoV-2 serology assays. *Microbiology spectrum*, *10*(1), e0156421. https://doi.org/10.1128/spectrum.01564-21

Portilho, M. M., de Oliveira Tosta, S. F., Pellizzaro, M., Dos Anjos, R. O., de Oliveira, E. C., de Santana, P. D. S. N., Dos Santos Moreira, P. S., Jacob-Nascimento, L. C., da Silva Souza, M. M., Mothé, D. B., Brodskyn, C., Reis, M. G., Cardoso, C. W., & Ribeiro, G. S. (2026). Performance of three commercial rapid diagnostic tests for detection of IgM and IgG antibodiesa against SARS-CoV-2. *Immunity, inflammation and disease*, *14*(4), e70441. https://doi.org/10.1002/iid3.70441

Uwamino, Y., Wakui, M., Aoki, W., Kurafuji, T., Yanagita, E., Morita, M., Nagata, M., Inose, R., Noguchi, M., Yokota, H., Hasegawa, N., Saya, H., Murata, M., & Keio Donner Project Team (2021). Evaluation of the usability of various rapid antibody tests in the diagnostic application for COVID-19. *Annals of clinical biochemistry*, *58*(3), 174–180. https://doi.org/10.1177/0004563220984827

Xue, H., Haynesworth, K., Hempel, H. A., Kemp, T. J., & Pinto, L. A. (2026). Measuring humoral immune responses to SARS-CoV-2: a comprehensive review of serological assays. *Vaccines*, *14*(5), 395. https://doi.org/10.3390/vaccines14050395

Zhao, Y., Zhang, M., Liang, W., & Fang, L. (2024). Diagnostic efficacy of 11 SARS-CoV-2 serological assays for COVID-19: a meta-analysis and adjusted indirect comparison of diagnostic test accuracy. *Immunity, inflammation and disease*, *12*(12), e70114. https://doi.org/10.1002/iid3.70114