## Recommendation A

**We recommend the use of saliva drool/spit and oral saliva specimens as an alternative to nasopharyngeal swab for RT-PCR diagnosis of COVID-19 in the following situations:**

- **Symptomatic and asymptomatic patients with suspected COVID-19**
- **Hospital and community/outpatient settings**

Quality of Evidence: Moderate
Strength of Recommendation: Strong

## Recommendation B

**We suggest the use of saliva swab and posterior oropharyngeal saliva specimens as an alternative for RT-PCR diagnosis of COVID-19 in the following situations:**

- **Symptomatic and asymptomatic patients with suspected COVID-19**
- **Hospital and community/outpatient settings**

Quality of Evidence: Low
Strength of Recommendation: Conditional

# EVIDENCE SUMMARY

## *Should RT-PCR of saliva samples be used for diagnosis of COVID-19?*

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### Key Findings

Based on a meta-analysis of 51 studies, RT-PCR of saliva specimens demonstrated an overall pooled sensitivity and specificity across all studies of 84% (95% CI 0.80, 0.88) and 96% (95% CI 0.94, 0.98) respectively. Subgroup analysis yielded similar pooled sensitivity and specificity to the overall estimates across patients with different COVID-19 status, symptom presence, and settings. Subgroup analysis of confirmed COVID-19 patients yielded similar sensitivity but lower specificity of 65% (95% CI 0.42, 0.83).

### Introduction

The current reference standard for establishing the presence of SARS-CoV-2 infection is reverse transcription polymerase chain reaction (RT-PCR) of nasopharyngeal and oropharyngeal swab specimens. However, there are several drawbacks to sample collection, such as pain and discomfort for the patient and a risk of aerosol generation from coughing or sneezing. These

limitations can increase the risk of nosocomial infection and hinder its use in serial monitoring and mass testing programs [1].

Saliva has been suggested as an alternative specimen for SARS-CoV-2 diagnostic testing. SARS-CoV-2 can be present in saliva through at least three possible routes: 1) from the upper respiratory tract to the oral cavity via liquid droplets; 2) from the bloodstream to the oral cavity via exudates from the extracellular fluid and serum; and 3) from infected salivary glands to the oral cavity through the salivary ducts [2]. The use of saliva as a diagnostic specimen has several advantages. Sampling is non-invasive and can be collected with minimal or no healthcare worker assistance, allowing for self-collection and serial sampling. It causes no pain or discomfort, making it suitable for children, the elderly, and the disabled. It is easy to handle and cheap to store and transport, potentially allowing for large-scale population screening. Protocols and kits are also available for extraction of DNA, RNA, and proteins, providing good performance regardless of sampling technique [3,4].

## Review Methods

This review involved a literature search for published or preprint studies available on or before December 26, 2020 on MEDLINE, the Cochrane COVID-19 Study Register, and the COVID-19 Living Evidence Database [5]. Assessment for methodological quality was done using the criteria for appraising validity of diagnostic studies published by Dans, Dans, and Silvestre [6]. Diagnostic performance data from each study was extracted to produce 2x2 pooled tables, from which the overall pooled sensitivity and specificity was generated using a bivariate mixed-effects regression model [7]. Pooled sensitivity and specificity data were stratified by COVID-19 diagnostic status (confirmed, suspected, convalescent), presence of COVID-19 symptoms (symptomatic, asymptomatic), setting (hospital, community/outpatient), saliva collection method (drool/spit, swab), saliva collection location (oral saliva, posterior oropharyngeal saliva), and RT-PCR diagnostic kit. Studies that were included in the overall assessment were not included in the subgroup analysis if presenting with incomplete diagnostic accuracy data for that subgroup.

## Results

*Characteristics of included studies*

The database search yielded 1194 results (869 unique), from which 52 studies [9-60] were included in the systematic review and fifty-one [9-59] in the meta-analysis (**Appendix Figure 1**). A total of 22,698 (median=200, range 12-2884) patients were enrolled in the included studies (**Appendix Tables 1 and 2**), from which 19,347 (median = 155, range 16-2884) paired saliva and nasopharyngeal specimens were included in the review. These studies included both pediatric and adult patients, but no study specific to children was included. Since this review did not attempt to discriminate in terms of setting or sample collection, there is a wide variety of included studies (**Appendix Table 3**).

*Methodological quality*

According to the parameters of the quality assessment in this review, none of the studies showed a high risk of bias, while 80.8% (42/52) of the included studies had a moderate risk and 19.2% (10/52) of the studies had low risk (**Appendix Figure 2**). The acceptability of the reference standard and definition of the index test and reference standard were adequate for all studies, but

most did not report whether the interpretation of the tests was done independently (i.e., simultaneously or immediately after sample collection).

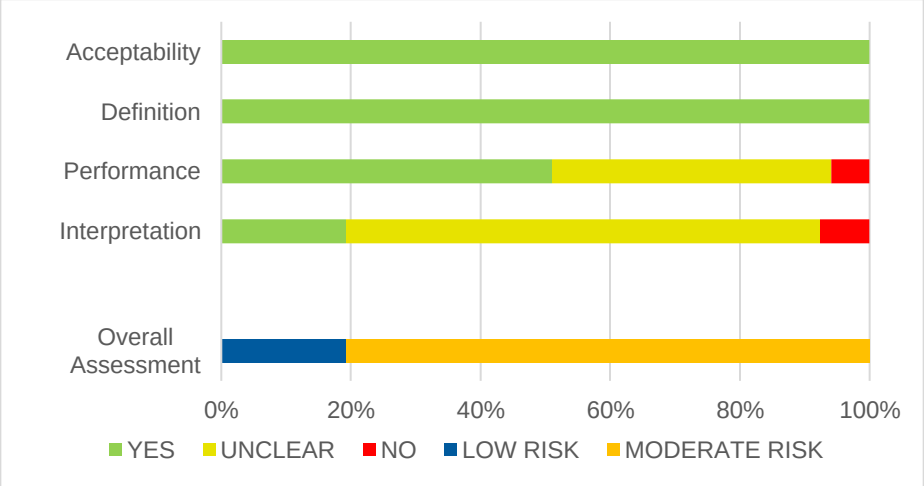


**Figure 1.** Risk of bias assessment for included studies (n = 52).

*Diagnostic accuracy*

The pooled sensitivity of saliva RT-PCR using nasopharyngeal with or without oropharyngeal swab RT-PCR as the gold standard is 84% (95% CI 0.80, 0.88), while its pooled specificity is 96% (95% CI 0.94, 0.98) (**Figure 1**).

These results are consistent with those of other recently published meta-analyses. A meta-analysis of 14 studies (n=1118) reported pooled sensitivity of 83.4% and a specificity of 97.7% [61]. Another meta-analysis of 37 studies (n=7822) reported an overall pooled sensitivity of 86.9%. It also stratified the studies according to confirmed COVID-19, symptomatic vs. asymptomatic patients, and inpatient and outpatient settings, with sensitivity ranging from 85.3% to 87.9% across these subgroups [62]. Another meta-analysis of 16 studies (n=5922) reported an overall pooled sensitivity of 83.2% and specificity of 99.2%, with a post hoc meta-analysis yielding a sensitivity of 84.6% and specificity of 99.0% for ambulatory patients [63].

The lower sensitivity of saliva relative to nasopharyngeal PCR may be explained by earlier findings documenting lower SARS-CoV-2 viral load in saliva especially in patients with longer duration of infection [64,65], which may result in a higher rate of false negatives. The variety of populations, sample sizes, and settings of the included studies contributed to the substantial heterogeneity (sensitivity $p<0.001$, $I^2=90.13\%$; specificity $p<0.001$, $I^2=98.14\%$) present in this analysis. These studies also had significant differences in terms of timing and method of collection, use of viral transport medium, and extraction method.

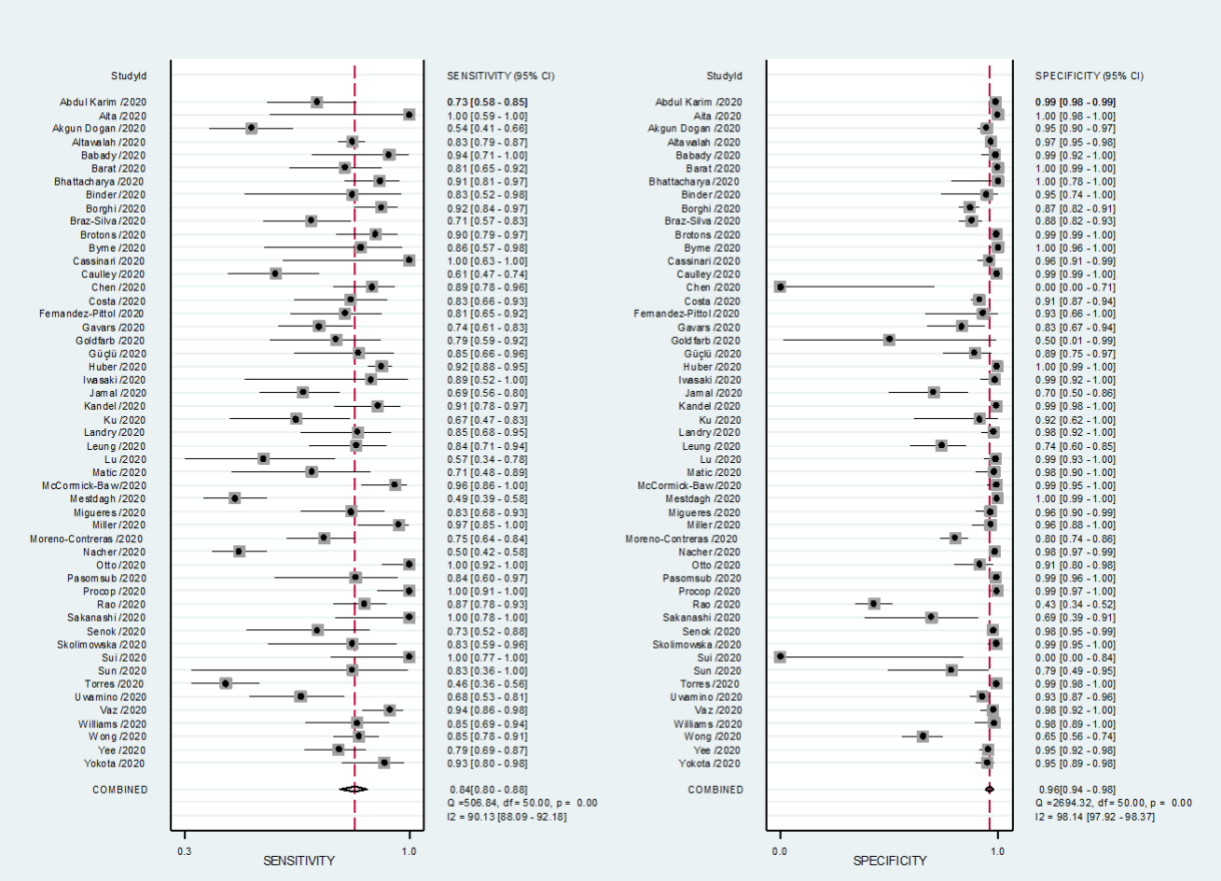


**Figure 1.** Overall pooled sensitivity and specificity of saliva RT-PCR.

*Subgroup analysis*

Subgroup analysis was done in anticipation of the expected heterogeneity among the wide range of studies. (**Table 1; Appendix Figures 2-11**). Pooled sensitivity for each subgroup ranged from 71% to 89% (median=0.83, IQR 0.80-0.85), while pooled specificity ranged from 65% to 98% (median=0.96, IQR 0.885-0.97). All subgroups exhibited substantial heterogeneity (p<0.10).

**Table 1.** Pooled sensitivity and specificity per subgroup.

| SUBGROUP | NO. OF STUDIES (SAMPLE SIZE) | SENSITIVITY (95% CI) | SPECIFICITY (95% CI) |
|---|---|---|---|
| **COVID-19 diagnostic status** | | | |
| Confirmed COVID-19 | 14 (903) | 0.81 (0.74, 0.87) | 0.65 (0.42, 0.83) |
| Suspected COVID-19 | 6 (1699) | 0.74 (0.62, 0.82) | 0.96 (0.92, 0.98) |
| Convalescent COVID-19 | 2 (61) | n/a (inadequate number of observations) | |
| **Presence of symptoms** | | | |
| Symptomatic | 17 (3169) | 0.85 (0.76, 0.91) | 0.97 (0.90, 0.99) |
| Asymptomatic | 6 (3462) | 0.89 (0.83, 0.93) | 0.93 (0.73, 0.99) |
| **Setting** | | | |
| Hospital setting | 24 (3573) | 0.86 (0.81, 0.90) | 0.94 (0.88, 0.97) |
| Community or outpatient | 18 (12637) | 0.78 (0.66, 0.86) | 0.98 (0.97, 0.99) |
| **Saliva collection method** | | | |
| Saliva drool/spit | 44 (16779) | 0.83 (0.78, 0.97) | 0.97 (0.94, 0.98) |
| Saliva swab | 6 (3895) | 0.71 (0.46, 0.87) | 0.98 (0.90, 1.00) |
| **Saliva collection location** | | | |
| Oral saliva | 42 (17309) | 0.82 (0.77, 0.86) | 0.97 (0.96, 0.98) |
| Posterior oropharyngeal saliva | 7 (829) | 0.89 (0.83, 0.93) | 0.79 (0.50, 0.93) |
| **RT-PCR kit brand*** | | | |
| Xpert Xpress SARS-CoV-2 test(Cepheid) | 3 (243) | 0.95 (0.91, 0.99) | 0.99 (0.95, 1.00) |
| OneStep/COVID-19 Kit (BIOMOL) | 1 (122) | 0.94 (0.86, 0.98) | 0.96 (0.87, 1.00) |
| Thunderbird Probe One-step qRT-PCR Kit (Toyobo) | 1 (161) | 0.93 (0.80, 0.98) | 0.95 (0.89, 0.98) |
| Cobas SARS-CoV-2 Assay (Roche) | 1 (1187) | 0.92 (0.88, 0.95) | 1.00 (0.99, 1.00) |
| SalivaDirect (Yale University) | 1 (301) | 0.92 (0.84, 0.97) | 0.87 (0.82, 0.91) |
| Real-Q 2019-nCoV detection kit (Biosewoom) | 1 (217) | 0.87 (0.78, 0.93) | 0.43 (0.34, 0.52) |
| Coronavirus Typing (8-well) Assay (AusDiagnostics) | 1 (406) | 0.85 (0.69, 0.94) | 1.00 (0.98, 1.00) |
| LightMix Modular SARS & Wuhan CoV E-gene kit (TIB-MOLBIOL) | 3 (398) | 0.84 (0.79, 0.89) | 0.80 (0.66, 1.00) |
| SARS-CoV-2 Nucleic Acid Diagnostic Kit (Sansure) | 1 (110) | 0.84 (0.60, 0.97) | 0.98 (0.91, 1.00) |
| Panther Fusion SARS-CoV-2 Assay (Hologic) | 1 (121) | 0.83 (0.68, 0.93) | 0.96 (0.90, 0.99) |
| TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific) | 3 (4075) | 0.80 (0.73, 0.86) | 0.97 (0.95, 1.00) |

*Only test kits that demonstrated > 80% sensitivity are shown in this table.

The diagnostic accuracy figures for saliva RT-PCR in symptomatic patients, asymptomatic patients, hospital, samples and community/outpatient samples are simila to those found in recently published literature [62,63]. Neither differences in setting nor differences in patient symptom status seem to affect the accuracy of saliva tests.

The different kits used in the study ranged in sensitivity from 49% to 95%, and specificity from 43% to 100% (**Appendix Table 4**). Among kits used in more than one study, the Xpert Xpress SARS-CoV-2 assay (Cepheid) was the most sensitive at 95% (95% CI 0.91, 0.99), followed by LightMix Modular SARS and Wuhan CoV E-gene kit (TIB-MOLBIOL) at 84% (95% CI 0.79, 0.89). For specificity, Genesig RT-PCR SARS-CoV-2 kit (Primerdesign) was the most specific at 98% (95% CI 0.96, 1.00), followed by TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific) at 97% (95% CI 0.95, 1.00). The Allplex assay was found to be the most suitable assay by one study [60] when compared to the Xpert and Simplexa assays in terms of sensitivity, ease of use, and accuracy relative to nasopharyngeal swabs. Notably, SalivaDirect (Yale University), a direct detection RT-PCR kit not requiring RNA extraction [67], had a sensitivity of 92% (95% CI 0.84, 0.97) and specificity of 87% (95% CI 0.82, 0.91) based on one study [42]; more studies will be needed for confirmation of its diagnostic accuracy.

## Recommendations from other groups

European CDC guidelines consider saliva as an alternative specimen for testing if a nasopharyngeal or throat specimen cannot be taken [68]. American CDC interim guidelines also consider saliva specimens to be acceptable for RT-PCR tests depending on the authorized viral test used [69]. Also, on January 25, 2021, Philippine Red Cross officially launched its saliva RT-PCR testing after receiving the approval of the Department of Health [70]. The results of their pilot study have yet to be published.

## Research gaps

Further research is needed to confirm the accuracy of saliva RT-PCR in diagnosis of SARS-CoV-2 infection in convalescent patients. To further elucidate the diagnostic accuracy of saliva, there are four clinical trials (**Appendix Table 5**) listed on ClinicalTrials.org as currently ongoing as of January 25, 2021.

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## Appendix

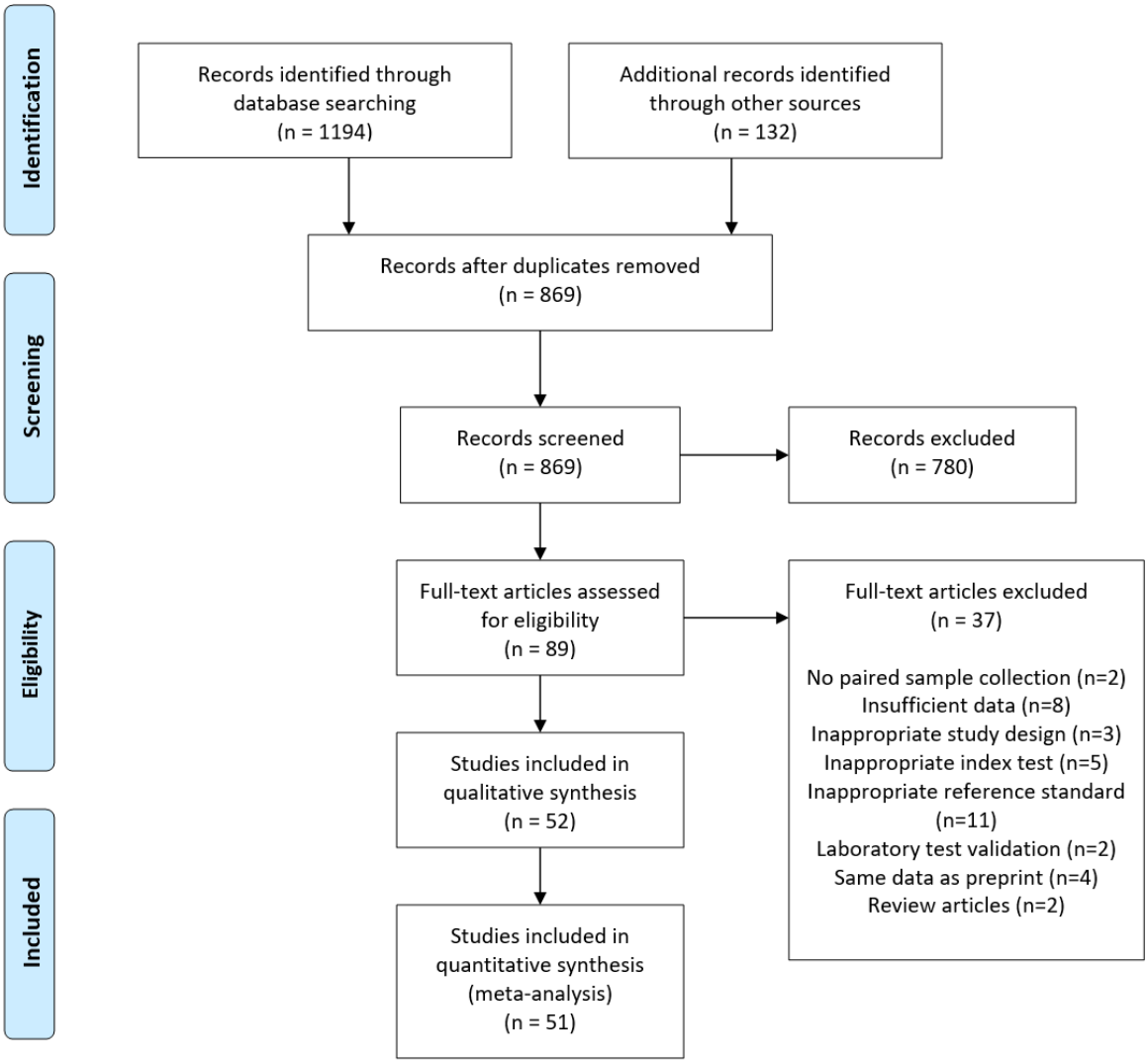


**Figure 1.** PRISMA study flow diagram.

**Table 1.** Characteristics of included studies.

| Study ID | Setting | Index Test | Index Test Specimen | Population | Sample Size | Reference Standard Test | Reference Standard Specimen |
|---|---|---|---|---|---|---|---|
| Abdul Karim 2020 | Bahrain<br><br>Single-center cross-sectional study | Real-time RT-PCR (Thermo Fisher) | Oral saliva, spit<br><br>No transport medium | Cases presenting to a COVID-19 hospital clinic; symptomatic individuals, staff, close contacts, pre-operation patients (n=1009) | 1019 | Real-time RT-PCR (Thermo Fisher) | Nasopharyngeal swab |
| Aita 2020 | Italy<br><br>Single-center cross-sectional study | Inpatients:<br>Real-time RT-PCR, digital droplet PCR (ddPCR)<br>One-Step RT-ddPCR Advanced Kit for Probes (BioRad)<br><br>Screening patients:<br>Real-time RT-PCR | Oral saliva, swab<br>Salivette tubes (Sarstedt)<br>No transport medium | Adult inpatients with COVID-19 (n=43);<br>Screening patients (n=326) | 369 | Inpatients:<br>Real-time RT-PCR, digital droplet PCR (ddPCR)<br>One-Step RT-ddPCR Advanced Kit for Probes (BioRad)<br><br>Screening patients:<br>Real-time RT-PCR | Nasopharyngeal swab |
| Akgun Dogan 2020 | Turkey<br><br>Single-center cross-sectional study | RT-PCR<br><br>Direct Detection of SARS-CoV-2 Detection Kit (Coyote Bioscience)<br>Ct ≤ 29 | Oral saliva, drool<br>Viral transport medium (Innomed) | Adult inpatients with possible COVID-19 and moderate-severe disease (n=200) | 200 | RT-PCR<br><br>Direct Detection of SARS-CoV-2 Detection Kit (Coyote Bioscience)<br>Ct ≤ 29 | Nasopharyngeal and oropharyngeal swabs |
| Altawalah 2020 | Kuwait<br><br>Multi-center cross-sectional study | Multiplex real-time RT-PCR<br><br>TaqPath COVID-19 Combo Kit (Thermo Fisher)<br>Ct < 37 | Saliva following deep cough<br>Viral transport medium | Admitted patients with suspected COVID-19 (n=891) | 891 | Multiplex real-time RT-PCR<br><br>TaqPath COVID-19 Combo Kit (Thermo Fisher)<br>Ct < 37 | Nasopharyngeal swab |
| Babady 2020 | USA<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>CDC 2019 nCoV Real-Time RT-PCR Diagnostic Panel<br>Xpert Xpress SARS-CoV-2 (Cepheid)<br>Cobas SARS-CoV-2 test (Roche) | Posterior oropharyngeal saliva, spit<br>Oral rinse<br><br>No transport medium | Employees with COVID-19 symptoms or exposure to a COVID-19 case (n=275) | 87 | Real-time RT-PCR<br><br>CDC 2019 nCoV Real-Time RT-PCR Diagnostic Panel<br>Xpert SARS-CoV-2 test (Cepheid)<br>Cobas SARS-CoV-2 test (Roche) | Nasopharyngeal and oropharyngeal swabs |

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| Barat 2020 | USA<br><br>Prospective cross-sectional study | Real-time RT-PCR<br><br>NIH samples:<br>Panther Fusion SARS-CoV-2 Assay (Hologic)<br>Cobas SARS-CoV-2 real-time RT-PCR test (Roche)<br>Ct < 40<br><br>ED samples:<br>BioGX Sars-CoV-2 Reagents for BD MAX System (BD)<br>Xpert Xpress SARS-CoV-2 (Cepheid)<br>Molecular Simplexa COVID-19 Direct (DiaSorin)<br>Ct < 40 | Oral saliva, drool<br>No transport medium | Adult NIH employees with COVID-19 symptoms or high-risk exposure (n=390)<br>Adult emergency patients with COVID-19 symptoms or high-risk exposure (n=69) | 459 | Real-time RT-PCR<br><br>NIH samples:<br>Panther Fusion SARS-CoV-2 Assay (Hologic)<br>Cobas SARS-CoV-2 real-time RT-PCR test (Roche)<br>Ct < 40<br><br>ED samples:<br>BioGX Sars-CoV-2 Reagents for BD MAX System (BD)<br>Xpert Xpress SARS-CoV-2 (Cepheid)<br>Molecular Simplexa COVID-19 Direct (DiaSorin)<br>Ct <40 | Nasopharyngeal swab |
| Bhattacharya 2020 | India<br><br>Multi-center cross-sectional study | Real-time RT-PCR<br><br>Cobas 6800 instrument (Roche Molecular Diagnostics) | Oral saliva, spit, 48 hrs after symptom onset | Suspected COVID-19 hospitalized patients having mild-to-moderate symptoms (n=74) | 74 | Real-time RT-PCR<br><br>Cobas 6800 instrument (Roche Molecular Diagnostics) | Nasopharyngeal swab, taken 48h after symptom onset |
| Binder 2020 | USA<br><br>Single-center case series | Real-time RT-PCR<br><br>SuperScript III Platinum One-Step Real-Time RT-PCR Kit (Invitrogen)<br>CDC 2019-nCoV real-time RT-PCR assay<br>Ct < 40 | Oral saliva, drool<br><br>No transport medium | Adult COVID-19 inpatients (n=20)<br>Adult (n=4) and pediatric (n=2) close contacts of COVID-19 inpatients | 31 | Real-time RT-PCR<br><br>SuperScript III Platinum One-Step Real-Time RT-PCR Kit (Invitrogen)<br>CDC 2019-nCoV real-time RT-PCR assay<br>Ct < 40 | Nasopharyngeal swab |
| Borghi 2020 | Italy<br><br>Single-center cross-sectional study | Direct real-time RT-PCR<br><br>SalivaDirect (Yale University)<br>Ct < 40 | Oral saliva, swab<br><br>No transport medium | Adults (aged 18-85, n=192)<br>Asymptomatic adults (n=80)<br>Pediatric patients (aged 0-17, n=109) | 301 | Real-time RT-PCR<br><br>SalivaDirect (Yale University)<br>Ct < 40 | Nasopharyngeal swab |
| Braz-Silva 2020 | Brazil<br><br>Community cross-sectional study | Real-time RT-PCR<br><br>RealStar® SARS-CoV-2 RT-PCR Kit 1.0<br>(Altona)<br>Ct < 40 | Saliva, swab<br>Salivette (Sarstedt)<br><br>Morning collection | Patients aged 12 years and older with symptoms and suspected COVID-19 (n=201) | 201 | Real-time RT-PCR<br><br>Altona RealStar® SARS-CoV -2 RT-PCR Kit 1.0<br>(Altona)<br>Ct < 40 | Naso-oropharyngeal swab |

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| Brotons 2020 | Spain<br><br>Single-center prospective cohort study | Real-time RT-PCR<br>Direct RT-PCR<br><br>GeneFinder COVID-19 Plus RealAmp kit (Elitech)<br>TaqPath COVID-19 RT-PCR kit (Thermo Fisher) | Oral saliva, spit<br><br>No transport medium | Asymptomatic children and adults (n=173);<br>Asymptomatic volunteer health workers and staff (n=2709) | 2709 | Real-time RT-PCR<br>Direct RT-PCR<br><br>GeneFinder COVID-19 Plus RealAmp kit (Elitech)<br>TaqPath COVID-19 RT-PCR kit (Thermo Fisher) | Nasopharyngeal swab |
| Byrne 2020 | UK<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>Genesig Real-Time Coronavirus COVID-19 PCR assay (Primerdesign)<br>Ct < 40 | Oral saliva, drool<br><br>No transport medium | Symptomatic adult emergency patients with suspected COVID-19 (n=110) | 110 | Real-time RT-PCR<br><br>Genesig Real-Time Coronavirus COVID-19 PCR assay (Primerdesign) | Nasopharyngeal swab |
| Cassinari 2020 | France<br><br>Single-center cross-sectional study | Real-time RT-PCR<br>Direct detection RT-PCR<br><br>RealTime SARS-CoV-2 test (Abbott)<br>RealStar® SARS-CoV-2 RT-PCR Kit 1.0<br>(Altona)<br>One-Step RT-ddPCR Advanced Kit for Probes (BioRad) | Oral saliva, drool<br><br>No transport medium | Ambulatory patients with COVID-19 symptoms (n=130) | 130 | Real-time RT-PCR<br>Direct detection RT-PCR<br><br>RealTime SARS-CoV-2 test (Abbott)<br>RealStar® SARS-CoV-2 RT-PCR Kit 1.0<br>(Altona)<br>One-Step RT-ddPCR Advanced Kit for Probes (BioRad) | Nasopharyngeal swab |
| Caulley 2020 | Canada<br><br>Community cross-sectional study | Real-time RT-PCR<br><br>Allplex 2019-nCoV assay (Seegene)<br>Ct < 37 | Oral saliva, drool<br>OMNIgene•ORAL OM-505 (DNA Genotek) | Asymptomatic high-risk adults or adults with mild COVID-19 symptoms (n=1939) | 1939 | Real-time RT-PCR<br><br>Allplex 2019-nCoV assay (Seegene)<br>Ct < 37 | Nasopharyngeal or oropharyngeal swab |
| Chen 2020 | Hong Kong<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>In-house SARS-CoV-2 RdRp/Hel real-time RT-PCR assay<br>Xpert Xpress SARS-CoV-2 (Cepheid)<br>CT < 46 | Posterior oropharyngeal saliva, spit<br><br>Viral transport medium | COVID-19 positive inpatients (n=58) | 58 | Real-time RT-PCR<br><br>In-house SARS-CoV-2 RdRp/Hel real-time RT-PCR assay<br>Xpert Xpress SARS-CoV-2 (Cepheid)<br>CT < 46 | Nasopharyngeal swab |
| Costa 2020 | France<br><br>Single-center cross-sectional study | Real time RT-PCR<br><br>Laboratory-developed test<br>Ct < 35 | Oral saliva, swab<br>Salivette (Sarstedt) | Adults admitted to the hospital for routine SARS-CoV-2 diagnosis (n=303) | 303 | Real time RT-PCR<br><br>Laboratory-developed test<br>Ct < 35 | Nasopharyngeal swab |

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| Delaney 2020 | USA<br><br>Single-center cross-sectional study<br>. | Real-time RT-PCR<br>Direct real-time RT-PCR<br><br>AllPlex 2019-nCoV Assay (Seegene; Ct < 40)<br>ePlex SARS-CoV-2 Test (GenMark)<br>Xpert Xpress SARS-Cov-2 (Cepheid; Ct < 45)<br>Simplexa COVID-19 Direct assay (DiaSorin) | Oral saliva, drool, no transport medium<br><br>Oral saliva, drool, SpectrumDNA saliva collection kit, with buffer solution | Pediatric and adult patients admitted to the emergency department (n=526) | 526 | Real-time RT-PCR<br>Direct real-time RT-PCR<br><br>AllPlex 2019-nCoV Assay (Seegene; Ct < 40)<br>ePlex SARS-CoV-2 Test (GenMark)<br>Xpert Xpress SARS-Cov-2 (Cepheid; Ct < 45)<br>Simplexa COVID-19 Direct assay (DiaSorin) | Nasopharyngeal swab |
| Fernandez-Pittol 2020 | Spain<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>RNA Process Control Kit (Roche) | Posterior oropharyngeal saliva, spit<br><br>No transport medium | Emergency department patients with suspected COVID-19 (n=51) | 51 | Real-time RT-PCR<br><br>RNA Process Control Kit (Roche) | Nasopharyngeal and oropharyngeal swabs |
| Gavars 2020 | Latvia<br><br>Community cross-sectional study | Real-time RT-PCR<br><br>In-house testing kit | Oral saliva, spit<br><br>No transport medium | Pediatric (n=125) and adult (n=306) ambulatory patients undergoing SARS-CoV-2 testing | 104 | Real-time RT-PCR<br><br>In-house testing kit | Nasopharyngeal swab |
| Goldfarb 2020 | Canada<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>Laboratory-developed test; Xpert Xpress SARS-CoV-2 assay (Cepheid)<br>Ct < 40 | Oral saliva, spit; Mouth rinse/gargle<br><br>No transport medium | Outpatients with known prior positive SARS-CoV-2 tests (n=40), Children 4-12 years with symptoms or household contact with COVID-19 (n=16) | 31 | Real-time RT-PCR<br><br>Laboratory-developed test; Xpert Xpress SARS-CoV-2 assay (Cepheid)<br>Ct < 40 | Nasopharyngeal swab |
| Güçlü 2020 | Turkey<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>Genesig RT-PCR SARS-CoV-2 kit (Primerdesign)<br>CT < 45 | Oral saliva, spit<br><br>No transport medium | Inpatients with confirmed COVID-19 (n=30)<br>Inpatients with CT findings compatible with COVID-19 but with negative RT-PCR (n=15)<br>Emergency department patients with COVID-19 symptoms (n=19) | 64 | Real-time RT-PCR<br><br>Genesig RT-PCR SARS-CoV-2 kit (Primerdesign)<br>CT < 45 | Nasopharyngeal and oropharyngeal swabs |

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| Huber 2020 | Switzerland<br><br>Multi-center cross-sectional study | Real-time RT-PCR<br><br>Cobas SARS-CoV-2 assay (Roche)<br>Ct < 40 | <u>Study arm 1 (basic):</u><br>Oral saliva, spit<br>Viral transport medium<br>N=835<br><br><u>Study arm 2 (enhanced):</u><br>Oral and posterior oropharyngeal saliva, spit<br>Viral transport medium<br>N=352 | Adults and children (N = 1187) with COVID-19 symptoms or exposure to an index case | 1187 | Real-time RT-PCR<br><br>Cobas SARS-CoV-2 IVD test (Roche)<br>Ct < 40 | Nasopharyngeal swab |
| Iwasaki 2020 | Japan<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>tepOnePlus Real-time PCR System (Thermo Fisher Scientific) | Oral saliva, spit<br><br>No transport medium | Adult patients with COVID-19 diagnosis (n=10)<br>Patients with suspected COVID-19 (n=66) | 76 | Real-time RT-PCR<br><br>tepOnePlus Real-time PCR System (Thermo Fisher Scientific) | Nasopharyngeal swab |
| Jamal 2020 | Canada<br><br>Multi-center cross-sectional study | Real-time RT-PCR<br><br>Allplex 2019-nCoV assay (Seegene) | Oral saliva, spit<br><br>No transport medium | Adult inpatients with confirmed SARS-CoV-2 infection (n=91) | 91 | Real-time RT-PCR<br><br>Allplex 2019-nCoV assay (Seegene) | Nasopharyngeal swab |
| Kandel 2020 | Canada<br><br>Multi-center cross-sectional study | Real-time RT-PCR<br><br>Cobas SARS-CoV-2 assay (Roche)<br>TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific; Ct < 37) | Oral saliva, drool<br><br>No transport medium | All adults presenting for SARS-CoV-2 testing at three assessment centers (n=432) | 432 | Real-time RT-PCR<br><br>Cobas SARS-CoV-2 assay (Roche)<br>TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific; Ct < 37) | Nasopharyngeal swab |
| Ku 2020 | Singapore<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>In-house method | Oral saliva, spit (n=42);<br>Buccal swab (n=42)<br><br>No transport medium | Adult inpatients with confirmed SARS-CoV-2 infection (n=42) | 84 | Real-time RT-PCR<br><br>In-house method | Nasopharyngeal swab |
| Landry 2020 | United States<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>Laboratory-developed assay<br>Ct < 40 | Oral saliva, spit<br><br>No transport medium | Symptomatic outpatients suspected of having COVID-19 (n=124) | 124 | Real-time RT-PCR<br><br>Laboratory-developed assay<br>Ct < 40 | Nasopharyngeal swab |

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| Leung 2020 | Hong Kong<br><br>Single-center retrospective study | Real-time RT-PCR<br><br>lightMix Modular SARS-CoV E-gene detection kit (TIB Molbiol) | Posterior oropharyngeal saliva, spit<br><br>Viral transport medium | Inpatients with confirmed COVID-19 infection (n=29); Inpatients negative for COVID-19 (n=33) | 95 | Real-time RT-PCR<br><br>lightMix Modular SARS-CoV E-gene detection kit (TIB Molbiol) | Nasopharyngeal swab |
| Lu 2020 | USA<br><br>Multi-center cross-sectional study | Multiplex RT-PCR<br><br>Genesig RT-PCR SARS-CoV-2 kit (Primerdesign)<br>TaqPath Multiplex RT-PCR COVID-19 Kit (Thermo) | Oral saliva, spit, with kit<br>Oragene OGD-610 (DNA Genotek)<br>Spectrum S-1000 (Spectrum Solutions) | Symptomatic outpatients meeting CDC criteria for COVID-19 testing (n=88)<br>Convalescent COVID-19 patients (n=26) | 101 | Multiplex RT-PCR<br><br>Genesig RT-PCR SARS-CoV-2 kit (Primerdesign)<br>TaqPath Multiplex RT-PCR COVID-19 Kit (Thermo) | Nasopharyngeal swab |
| Matic 2020 | Canada<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>LightMix® ModularDx SARS-CoV E-gene assay (TIB Molbiol) | Oral saliva, spit<br><br>No transport medium | Patients under investigation for COVID-19: symptomatic inpatients (n=13), residents of long-term care (LTC) facilities (n=20), healthcare workers (n=28), mildly symptomatic outpatients and household contacts (n=13) | 74 | Real-time RT-PCR<br><br>LightMix® ModularDx SARS-CoV E-gene assay (TIB Molbiol)<br>Cobas® SARS-CoV-2 Test (Roche) | Nasopharyngeal swab |
| McCormick-Baw 2020 | USA<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>Xpert Xpress SARS-CoV-2 assay (Cepheid) | Oral saliva, spit<br><br>No transport medium | Emergency department patients with suspected COVID-19; COVID-19 ward inpatients not requiring mechanical ventilation (n=156) | 156 | Real-time RT-PCR<br><br>Xpert Xpress SARS-CoV-2 assay (Cepheid) | Nasopharyngeal swab |
| Mestdagh 2020 | Belgium<br><br>National multi-center cross-sectional study | <u>Lab 1:</u><br>Duplex real-time RT-PCR Charite E gene assay (FAM)<br><br><u>Lab 2</u>:<br>Multiplex real-time RT-PCR TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific) | Oral saliva, spitting (Norgen)<br>Oral saliva, swab (DNA Genotek) | Ambulatory patients undergoing SARS-CoV-2 testing in triage centers (n=2884) | 2884 | <u>Lab 1:</u><br>Duplex real-time RT-PCR Charite E gene assay (FAM)<br><br><u>Lab 2</u>:<br>Multiplex real-time RT-PCR TaqPath COVID-19 Combo Kit (Applied Biosystems) | Nasopharyngeal swab |

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| Migueres 2020 | France<br><br>Single-center consecutive case series | Real-time RT-PCR<br><br>Panther Fusion SARS-CoV-2 Assay (Hologic) | Oral saliva<br><br>No transport medium | Hospitalized and ambulatory COVID-19-positive patients (n=123) | 123 | Real-time RT-PCR<br><br>Panther Fusion SARS-CoV-2 Assay (Hologic) | Nasopharyngeal swab |
| Miller 2020 | USA<br><br>Single-center consecutive case series | Real-time RT-PCR<br><br>In-house real-time RT-PCR test | Oral saliva, spit, kit<br>Oragene·Dx (OGD-510, Orasure) | Symptomatic adults with positive RT-qPCR NP swab within previous 5 days or undergoing testing on day of enrollment;<br>Asymptomatic patients undergoing nasopharyngeal swab RT-PCR (total n=91) | 91 | Real-time RT-PCR<br><br>In-house real-time RT-PCR test | Nasopharyngeal swab |
| Moreno-Contreras 2020 | Mexico<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>StarQ One-Step RT-qPCR (Genes 2 Life)<br>CT ≤ 38 | Oral saliva, spit<br><br>No transport medium | Ambulatory patients (n=250) or hospitalized patients (n=3) undergoing SARS-CoV-2 testing in hospital triage | 253 | Real-time RT-PCR<br><br>StarQ One-Step RT-qPCR (Genes 2 Life)<br>CT ≤ 38 | Nasopharyngeal or oropharyngeal swab |
| Nacher 2020 | French Guiana<br><br>Community cross-sectional study | Real-time RT-PCR<br><br>French national center RT-PCR assay | Oral saliva, spit<br><br>No transport medium | Persons age 3 or older with mild symptoms suggestive of COVID-19 (n=473);<br>High-risk asymptomatic persons or close contacts (n=303) | 776 | Real-time RT-PCR<br><br>French national center RT-PCR assay | Nasopharyngeal swab |
| Otto 2020 | France<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>GenoXtract (Biocentric) | Posterior oropharyngeal saliva, spit<br><br>Viral transport medium | Outpatients with symptoms consistent with COVID-19 but without cough (n=92) | 92 | Real-time RT-PCR<br><br>GenoXtract (Biocentric) | Nasopharyngeal swab |
| Pasomsub 2020 | Thailand<br><br>Single-center cross-sectional study | Real-time RT-PCR<br>SARS-CoV-2 Nucleic Acid Diagnostic Kit (Sansure)<br>Ct ≤ 38 | Oral saliva, spit<br><br>Viral transport medium (COPAN) | Adults with COVID-19 symptoms and positive travel or exposure history (n=200) | 200 | Real-time RT-PCR<br>SARS-CoV-2 Nucleic Acid Diagnostic Kit (Sansure)<br>Ct ≤ 38 | Nasopharyngeal and throat swabs |
| Procop 2020 | USA<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>CDC nCoV Real-Time RT-PCR Diagnostic Panel | Oral saliva, spit, with nasopharyngeal secretions<br><br>No transport medium | Outpatients with symptoms consistent with COVID-19 (n=216) | 216 | Real-time RT-PCR<br><br>CDC nCoV Real-Time RT-PCR Diagnostic Panel | Nasopharyngeal swab |

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| Rao 2020 | Malaysia<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>Real-Q 2019-nCoV detection kit (Biosewoom)<br>Ct < 38 | Deep throat saliva, spit, morning sample<br><br>No transport medium | Asymptomatic adult males with prior positive SARS-CoV-2 tests undergoing quarantine (n=217) | 217 | Real-time RT-PCR<br><br>Real-Q 2019-nCoV detection kit (Biosewoom)<br>Ct < 38 | Nasopharyngeal swab |
| Sakanashi 2020 | Japan<br><br>Single-center prospective cohort study | Real-time RT-PCR<br><br>BD MAX open system (BD)<br>N gene | Oral saliva, drool<br><br>No transport medium | Inpatients with positive SARS-CoV-2 infection (n=5)<br>Outpatients with symptoms consistent with COVID-19 (n=7) | 28 | Real-time RT-PCR<br><br>BD MAX open system (BD)<br>N gene | Nasopharyngeal swab |
| Senok 2020 | UAE<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>Neoplex COVID-19 kit (GeneMatrix)<br>Ct ≤ 40 | Oral saliva, drool<br><br>No transport medium | Adults undergoing COVID-19 testing (n=401) | 401 | Real-time RT-PCR<br><br>Neoplex COVID-19 kit (GeneMatrix)<br>Ct ≤ 40 | Nasopharyngeal swab |
| Skolimowska 2020 | UK<br><br>Single-center cross-sectional study | Multiplex tandem RT-PCR (Roche, AusDiagonstics, Thermo Fisher, or Abbott) | Oral saliva, drool | Symptomatic healthcare workers and household contacts (n=132) | 132 | Multiplex tandem RT-PCR (Roche, AusDiagonstics, Thermo Fisher, or Abbott) | Nasopharyngeal swab |
| Sui 2020 | China<br><br>Single-center cross-sectional study | RT-digital PCR | Oral saliva | Recovered asymptomatic COVID-19 inpatients with long-term nucleic acid in the respiratory tract (n=35) | 27 | RT-digital PCR | Nasopharyngeal or oropharyngeal swab |
| Sun 2020 | USA<br><br>Single-center cross-sectional study | Multiplex real-time RT-PCR<br><br>QuantiVirus SARS-CoV-2 Multiplex Test (DiaCarta) | Oral saliva, spit<br>QuantiVirus Saliva Collection Kit (DiaCarta)<br><br>Viral transport medium | Patients with previous positive SARS-CoV-2 test (n=20)<br>Asymptomatic adults (n=389) | 20 | Multiplex real-time RT-PCR<br><br>QuantiVirus SARS-CoV-2 Multiplex Test | Nasopharyngeal/or opharyngeal swab |
| Torres 2020 | USA<br><br>Community cross-sectional study | Real-time RT-PCR<br><br>CDC 2019 nCoV Real-Time RT-PCR Diagnostic Panel One Step PrimerScriptTM III RT-PCR Kit (Takara Bio) | Oral saliva, spit<br>SDNA-1000 saliva collection device (Spectrum Solutions) | Mildly symptomatic<br>or asymptomatic adults at two community testing sites (n=943) | 943 | Real-time RT-PCR<br><br>CDC 2019 nCoV Real-Time RT-PCR Diagnostic Panel One Step PrimerScriptTM III RT-PCR Kit (Takara Bio) | Nasopharyngeal swab |

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| Uwamino 2020 | Japan<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>2019 Novel Coronavirus Detection Kit (Shimadzu)<br>N gene<br>Ct < 40 | Oral saliva, drool<br><br>No transport medium | Admitted patients with confirmed COVID-19 (n=32)<br>Symptomatic university staff (n=115) | 196 | Real-time RT-PCR<br><br>2019 Novel Coronavirus Detection Kit (Shimadzu)<br>N gene<br>Ct < 40 | Nasopharyngeal swab |
| Vaz 2020 | Brazil<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>OneStep/COVID-19 Kit (BIOMOL)<br>Ct ≤ 40 | Oral saliva, spit<br><br>No transport medium | COVID ward patients (n=67);<br>Symptomatic healthcare workers (n=82) | 155 | Real-time RT-PCR<br><br>OneStep/COVID-19 Kit (BIOMOL)<br>Ct ≤ 40 | Nasopharyngeal and/or oropharyngeal swab |
| Williams 2020 | Australia<br><br>Single-center cross-sectional study | Multiplex RT-PCR<br><br>Qiagen EZ1 Platform (Qiagen) Coronavirus Typing (8-well) assay (AusDiagnostics) | Oral saliva, drool<br><br>Liquid Amies media | Ambulatory patients undergoing COVID-19 testing (n=622) | 89 | Multiplex RT-PCR<br><br>Qiagen EZ1 Platform (Qiagen) Coronavirus Typing (8-well) assay (AusDiagnostics) | Nasopharyngeal swab |
| Wong 2020 | Hong Kong<br><br>Multi-center retrospective case series | Real-time RT-PCR<br><br>LightMix Modular SARS and Wuhan CoV E-gene kit (TIB-MOLBIOL)<br>Ct ≤ 40 | Posterior oropharyngeal saliva, spit<br><br>Viral transport medium (inpatients)<br>No transport medium (outpatients) | Symptomatic COVID-19 patients (n=51)<br>Asymptomatic COVID-19 patients (n=7)<br>Ambulatory patients testing for COVID-19 (n=37) | 229 | Real-time RT-PCR<br><br>LightMix Modular SARS and Wuhan CoV E-gene kit (TIB-MOLBIOL)<br>Ct ≤ 40 | Nasopharyngeal swab/aspirate ± throat swab |
| Yee 2020 | USA<br><br>Single-center cross-sectional study | Real-time RT-PCR<br><br>TaqPath COVID-19 Combo Kit (Thermo Fisher)<br>Ct < 40 | Oral saliva, drool<br><br>No transport medium | Inpatients, outpatients, household members of diagnosed COVID-19 patients (n=300) | 300 | Real-time RT-PCR<br><br>TaqPath COVID-19 Combo Kit (Thermo Fisher)<br>Ct < 40 | Nasopharyngeal swab |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Yokota 2020 | Japan<br><br>Community cross-sectional study | Real-time RT-PCR<br><br><u>CT cohort:</u><br>Thunderbird Probe One-step qRT-PCR Kit (Toyobo)<br>Loopamp 2019-SARS-CoV-2 Detection Reagent Kit (Eiken Chemical) | Oral saliva, spit<br><br>No transport medium | <u>CT cohort:</u> asymptomatic persons in close contact with confirmed COVID-19 patients (n=161)<br><br><u>AQ cohort:</u><br>Asymptomatic travellers entering Japan (n=1763) | 161 | Real-time RT-PCR<br><br><u>CT cohort:</u><br>Thunderbird Probe One-step qRT-PCR Kit (Toyobo)<br><br><u>AQ cohort:</u><br>Thunderbird Probe One-step qRT-PCR Kit (Toyobo)<br>Loopamp 2019-SARS-CoV-2 Detection Reagent Kit (Eiken Chemical) | Nasopharyngeal swab |

**Table 2.** Diagnostic accuracy data for included studies.

| STUDY ID | TRUE POSITIVE | FALSE POSITIVE | FALSE NEGATIVE | TRUE NEGATIVE |
|---|---|---|---|---|
| **Abdul Karim 2020** | 35 | 12 | 13 | 949 |
| **Aita 2020** | 7 | 1 | 0 | 361 |
| **Akgun Dogan 2020** | 37 | 10 | 32 | 176 |
| **Altawalah 2020** | 287 | 18 | 57 | 529 |
| **Babady 2020** | 16 | 1 | 1 | 69 |
| **Barat 2020** | 30 | 1 | 7 | 421 |
| **Bhattacharya 2020** | 53 | 0 | 5 | 15 |
| **Binder 2020** | 10 | 1 | 2 | 18 |
| **Borghi 2020** | 79 | 28 | 7 | 187 |
| **Braz-Silva 2020** | 37 | 18 | 15 | 131 |
| **Brotons 2020** | 46 | 23 | 5 | 2914 |
| **Byrne 2020** | 12 | 0 | 2 | 96 |
| **Cassinari 2020** | 8 | 5 | 0 | 116 |
| **Caulley 2020** | 34 | 14 | 22 | 1869 |
| **Chen 2020** | 49 | 3 | 6 | 0 |
| **Costa 2020** | 29 | 23 | 6 | 245 |
| **Fernandez-Pittol 2020** | 30 | 1 | 7 | 13 |
| **Gavars 2020** | 50 | 6 | 18 | 30 |
| **Goldfarb 2020** | 22 | 1 | 6 | 1 |
| **Güçlü 2020** | 23 | 4 | 4 | 33 |
| **Huber 2020** | 228 | 4 | 20 | 935 |
| **Iwasaki 2020** | 8 | 1 | 1 | 66 |
| **Jamal 2020** | 44 | 8 | 20 | 19 |
| **Kandel 2020** | 39 | 3 | 4 | 383 |
| **Ku 2020** | 20 | 1 | 10 | 11 |
| **Landry 2020** | 28 | 2 | 5 | 89 |
| **Leung 2020** | 38 | 13 | 7 | 37 |
| **Lu 2020** | 12 | 1 | 9 | 79 |
| **Matic 2020** | 15 | 1 | 6 | 52 |
| **McCormick-Baw 2020** | 47 | 1 | 2 | 105 |
| **Mestdagh 2020** | 57 | 12 | 60 | 2755 |
| **Migueres 2020** | 34 | 3 | 7 | 79 |
| **Miller 2020** | 33 | 2 | 1 | 55 |
| **Moreno-Contreras 2020** | 60 | 34 | 20 | 139 |
| **Nacher 2020** | 76 | 10 | 76 | 614 |
| **Otto 2020** | 45 | 4 | 0 | 43 |
| **Pasomsub 2020** | 16 | 2 | 3 | 179 |
| **Procop 2020** | 38 | 1 | 0 | 177 |
| **Rao 2020** | 73 | 76 | 11 | 57 |
| **Sakanashi 2020** | 15 | 4 | 0 | 9 |
| **Senok 2020** | 19 | 9 | 7 | 366 |
| **Skolimowska 2020** | 15 | 1 | 3 | 112 |
| **Sui 2020** | 14 | 2 | 0 | 0 |
| **Sun 2020** | 5 | 3 | 1 | 11 |
| **Torres 2020** | 46 | 8 | 54 | 835 |
| **Uwamino 2020** | 32 | 11 | 15 | 138 |
| **Vaz 2020** | 67 | 2 | 4 | 82 |
| **Williams 2020** | 33 | 1 | 6 | 49 |
| **Wong 2020** | 104 | 37 | 18 | 70 |
| **Yee 2020** | 69 | 10 | 18 | 203 |
| **Yokota 2020** | 38 | 6 | 3 | 114 |

**Appendix Table 3.** Definitions of and included studies within subgroups.

| SUBGROUP | DEFINITION | NUMBER OF STUDIES (SAMPLE SIZE) | REFERENCES |
|---|---|---|---|
| **Confirmed COVID-19** | Patients with known COVID-19 infection or SARS-CoV-2 positive test at the time of study enrollment | 14 (903) | [9-23] |
| **Suspected COVID-19** | Patients with symptoms consistent with COVID-19 AND exposure to a known COVID-19 case OR travel history to a location with COVID-19 at the time of study enrollment<br>OR<br>Patients meeting local criteria for suspected COVID-19 at the time of study enrollment | 6 (1699) | [10, 24-28] |
| **Convalescent COVID-19** | Patients described as convalescent or recovered at the time of study enrollment | 2 (61) | [27,30] |
| **Symptomatic** | Patients who have symptoms consistent with COVID-19 infection but with unknown COVID-19 status at the time of study enrollment | 17 (3169) | [10,14,20,24-25,27-28,31-41] |
| **Asymptomatic** | Patients with unknown COVID-19 status and are asymptomatic at the time of enrollment | 6 (3462) | [9,11,19,36,41-45] |
| **Hospital setting** | Studies recruiting patients admitted to the hospital or emergency room at the time of enrollment<br>OR<br>Studies with sample collection done in hospitals | 24 (3573) | [9-12,14-18,20,22,24,26,28,31-33,38,47,50-54] |
| **Community/outpatient setting** | Studies recruiting outpatients, ambulatory patients, or community members at the time of enrollment<br>OR<br>Studies with sample collection done in outpatient clinics, by mobile field teams, or at home | 18 (12637) | [9,25,27,31,34-35,37,39,40-41,43-46,55-58] |
| **Saliva drool/spit** | Studies involving collection of saliva drool or spit into a vessel | 44 (16779) | [10,11-16,18-24,26-41,43-46,48-55,57-58] |
| **Saliva swab** | Studies involving the use of a swab to collect saliva | 6 (3895) | [9,17,25,42,47,56] |
| **Oral saliva** | Studies involving collection of saliva from the oral cavity only | 42 (17309) | [10-11,14-17,20-21,23-25,27-37,39-49,51-58] |
| **Posterior oropharyngeal saliva** | Studies involving collection of saliva from the posterior oropharyngeal area | 9 (3028) | [12,18,19,22,26,38,50] |
| **Viral transport medium** | Studies involving addition of viral transport medium to the collected saliva sample* | 7 (829) | [9,12,18,21-22,24,28,45,59] |
| **Morning collection** | Studies involving morning saliva collection* | 4 (705) | [12,19,22,25] |

*not included in meta-analysis

**Appendix Table 4.** Pooled sensitivity and specificity per RT-PCR kit brand.

| BRAND | STUDIES (SAMPLE SIZE) | SENSITIVITY (95% CI) | SPECIFICITY (95% CI) |
|---|---|---|---|
| Xpert Xpress SARS-CoV-2 test (Cepheid) | 3 (243) | 0.95 (0.91, 0.99) | 0.99 (0.95, 1.00) |
| OneStep/COVID-19 Kit (BIOMOL) | 1 (122) | 0.94 (0.86, 0.98) | 0.96 (0.87, 1.00) |
| Thunderbird Probe One-step qRT-PCR Kit (Toyobo) | 1 (161) | 0.93 (0.80, 0.98) | 0.95 (0.89, 0.98) |
| Cobas SARS-CoV-2 Assay (Roche) | 1 (1187) | 0.92 (0.88, 0.95) | 1.00 (0.99, 1.00) |
| SalivaDirect (Yale University) | 1 (301) | 0.92 (0.84, 0.97) | 0.87 (0.82, 0.91) |
| Real-Q 2019-nCoV detection kit (Biosewoom) | 1 (217) | 0.87 (0.78, 0.93) | 0.43 (0.34, 0.52) |
| Coronavirus Typing (8-well) Assay (AusDiagnostics) | 1 (406) | 0.85 (0.69, 0.94) | 1.00 (0.98, 1.00) |
| LightMix Modular SARS and Wuhan CoV E-gene kit (TIB-MOLBIOL) | 3 (398) | 0.84 (0.79, 0.89) | 0.80 (0.66, 1.00) |
| SARS-CoV-2 Nucleic Acid Diagnostic Kit (Sansure) | 1 (110) | 0.84 (0.60, 0.97) | 0.98 (0.91, 1.00) |
| Panther Fusion SARS-CoV-2 Assay (Hologic) | 1 (121) | 0.83 (0.68, 0.93) | 0.96 (0.90, 0.99) |
| TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific) | 3 (4075) | 0.80 (0.73, 0.86) | 0.97 (0.95, 1.00) |
| Genesig RT-PCR SARS-coV-2 Kit (Primerdesign) | 3 (275) | 0.77 (0.61, 0.94) | 0.98 (0.96, 1.00) |
| Neoplex COVID-19 Kit (GeneMatrix) | 1 (92) | 0.73 (0.52, 0.88) | 0.86 (0.76, 0.94) |
| RealStar SARS-CoV-2 RT-PCR Kit 1.0 (Altona) | 1 (201) | 0.71 (0.57, 0.83) | 0.88, 0.82, 0.93) |
| Allplex 2019-nCoV Assay (Seegene) | 2 (2030) | 0.65 (0.57, 0.74) | 0.99 (0.99, 1.00) |
| QuantiVirus SARS-CoV-2 Multiplex Test (DiaCarta) | 1 (104) | 0.57 (0.34, 0.78) | 0.99 (0.93, 1.00) |
| Charite E-gene Assay (FAM) | 1 (308) | 0.49 (0.39, 0.58) | 0.94 (0.89, 0.97) |
| Direct Detection of SARS-CoV-2 Detection Kit (Coyote Bioscience) | 1 (255) | 0.54 (0.41, 0.66) | 0.95 (0.90, 0.97) |

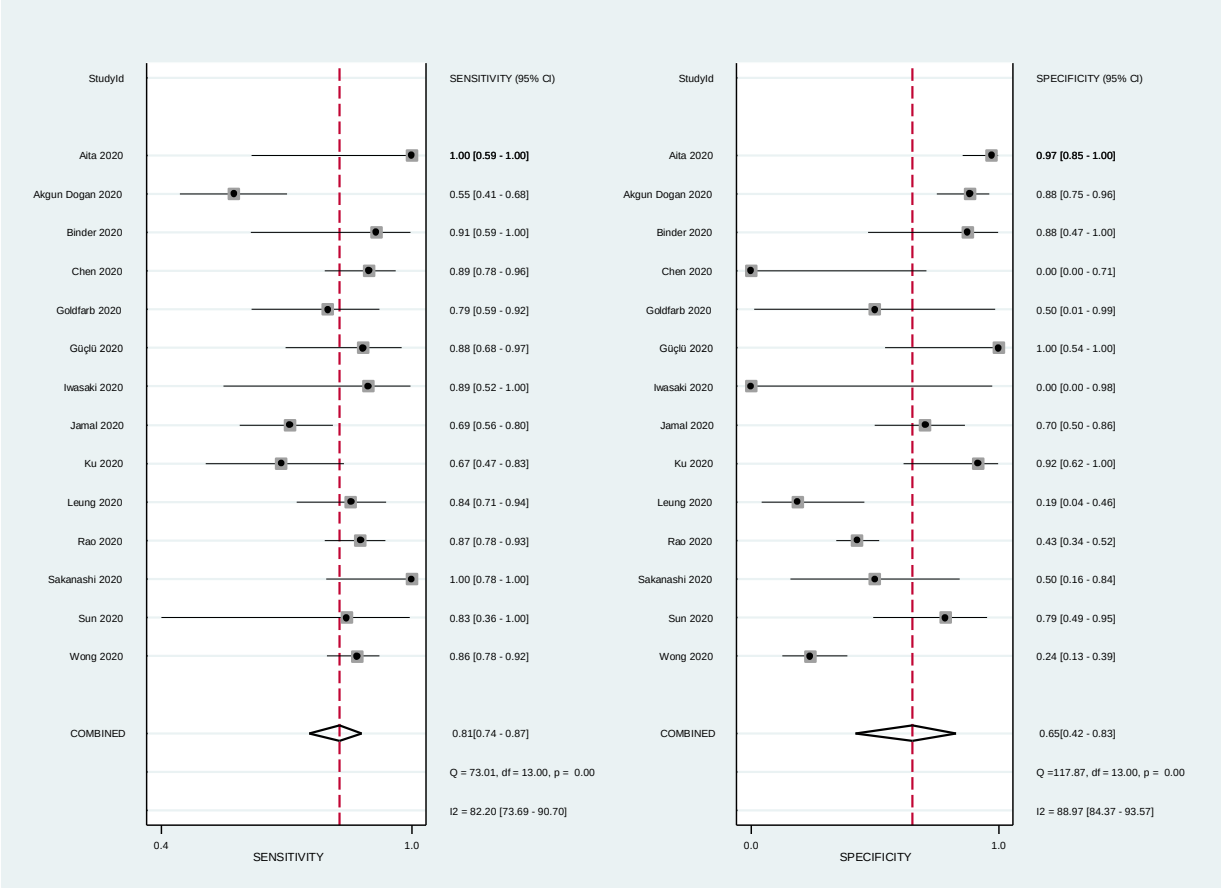


**Figure 2.** Forest plot of diagnostic accuracy data for confirmed COVID-19 patients.

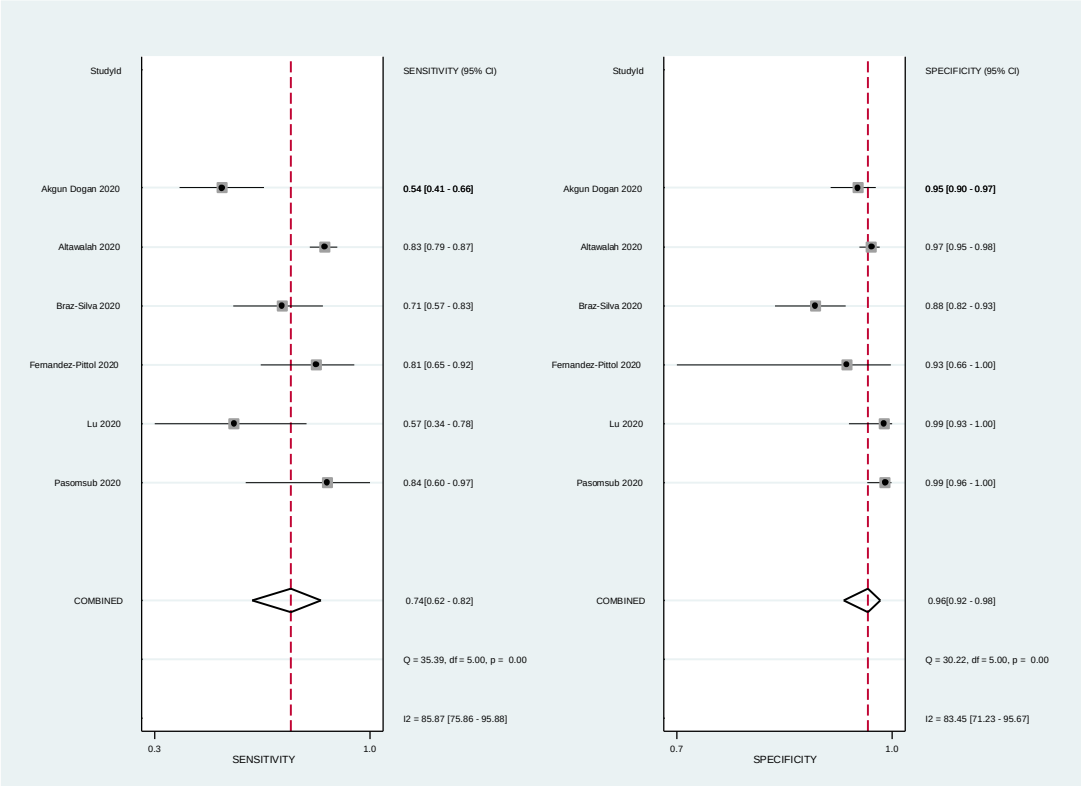


**Figure 3.** Forest plot of diagnostic accuracy data for suspected COVID-19 patients.

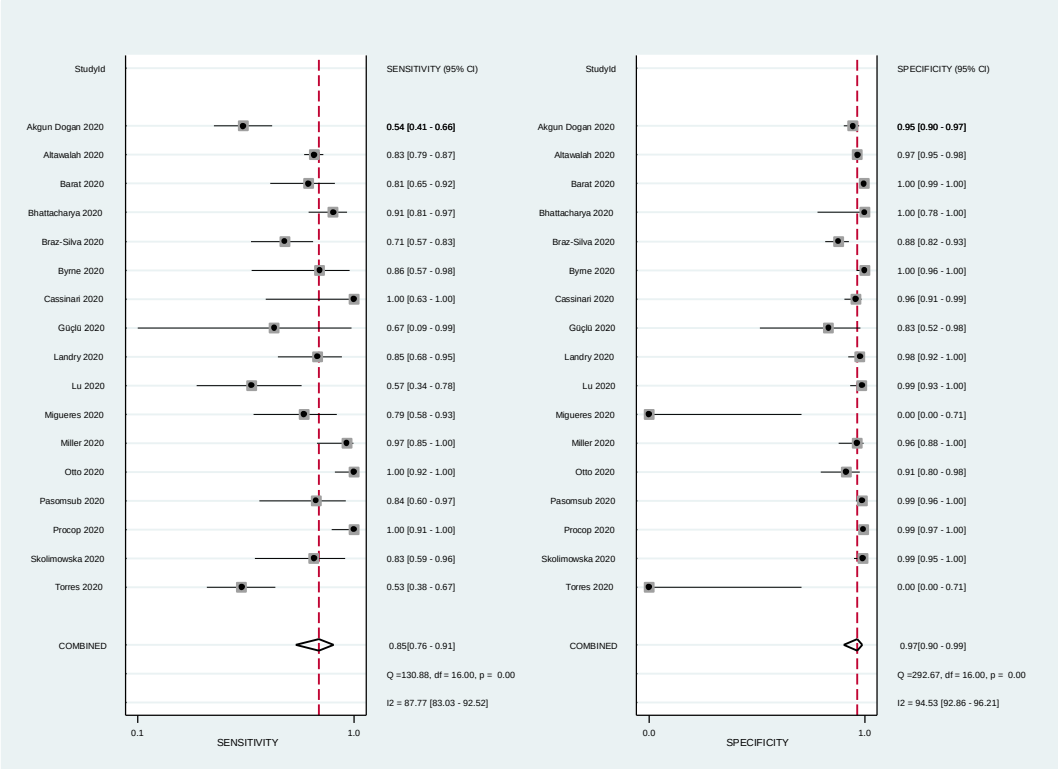


**Figure 4.** Forest plot of diagnostic accuracy data for symptomatic COVID-19 patients.

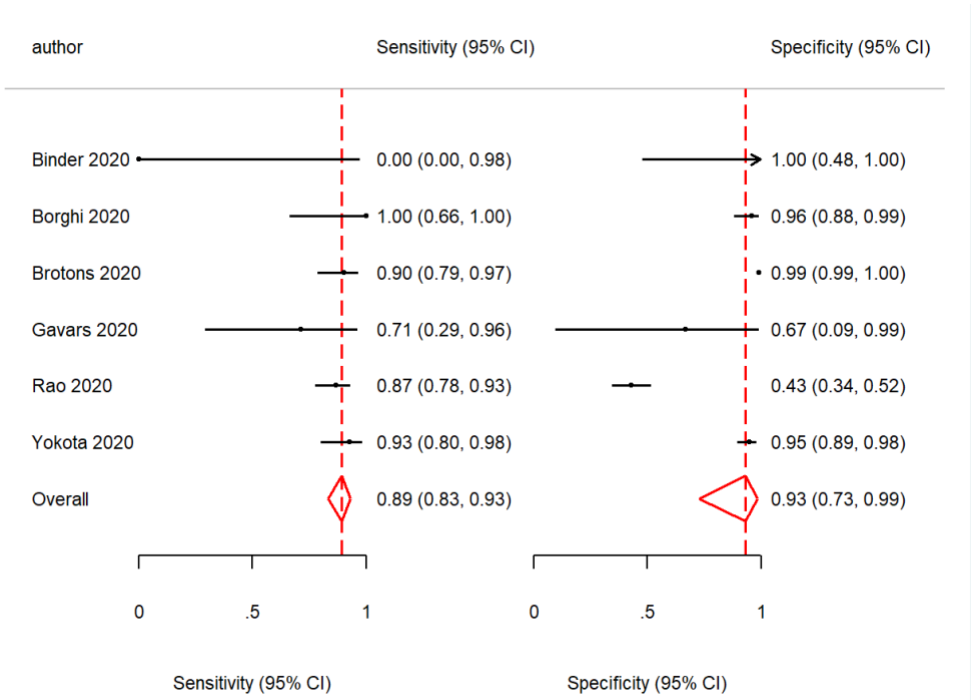


**Figure 5.** Forest plot of diagnostic accuracy data for asymptomatic COVID-19 patients. Heterogeneity – sensitivity p<0.001, $I^2$=0.53%; specificity p<0.001, $I^2$=19.61%.

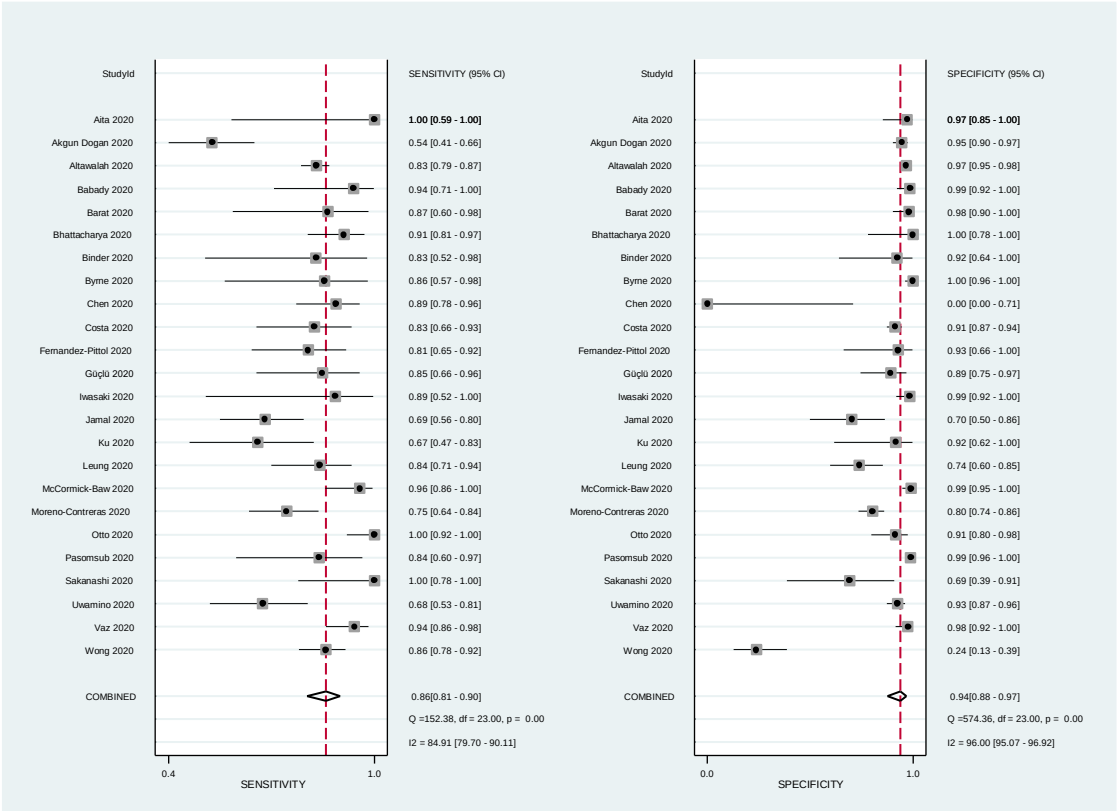


**Figure 6.** Forest plot of diagnostic accuracy data for hospital setting.

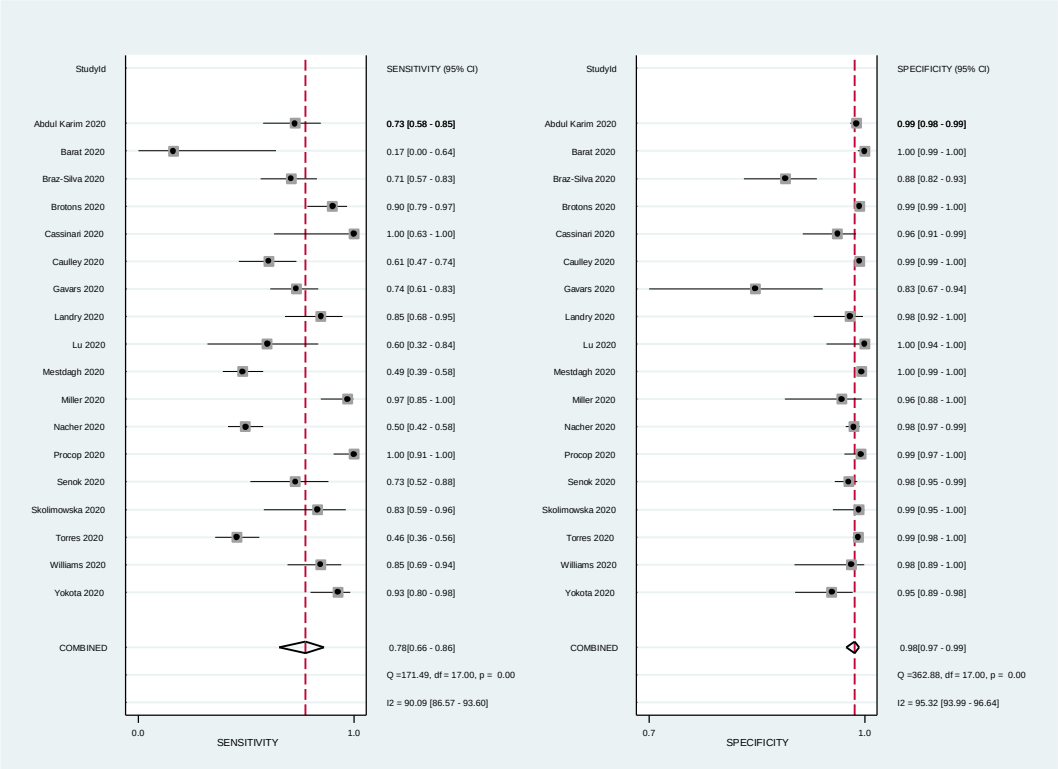


**Figure 7.** Forest plot of diagnostic accuracy data for community/outpatient setting.

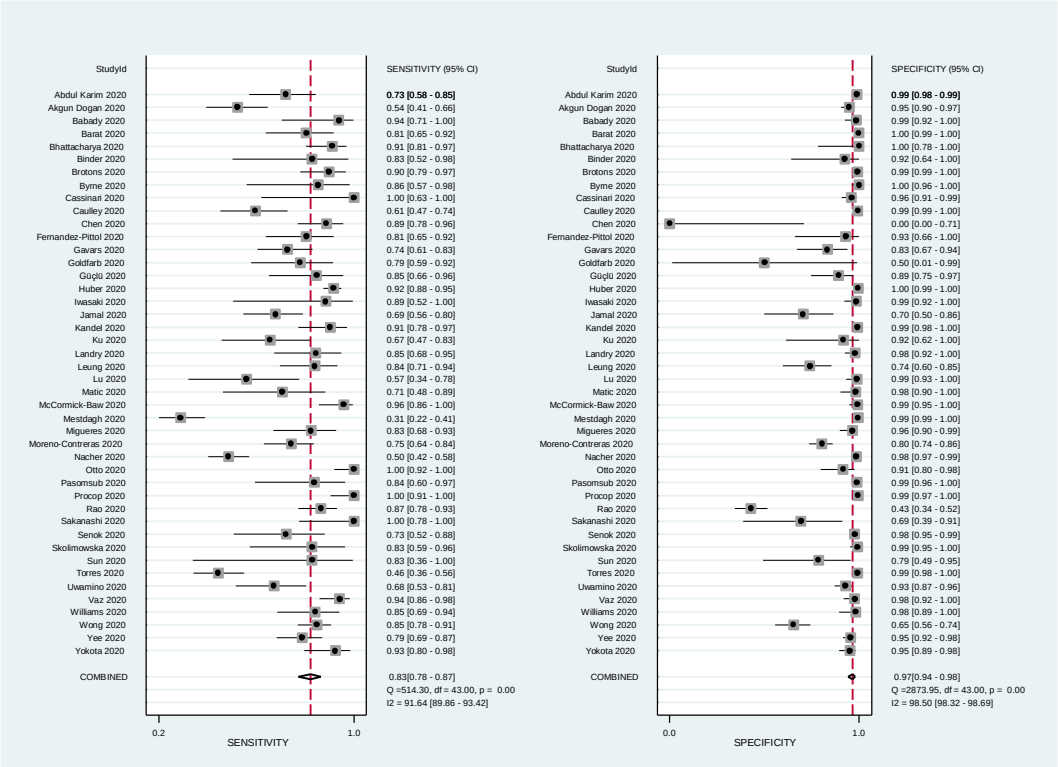


**Figure 8.** Forest plot of diagnostic accuracy data for saliva drool/spit sample.

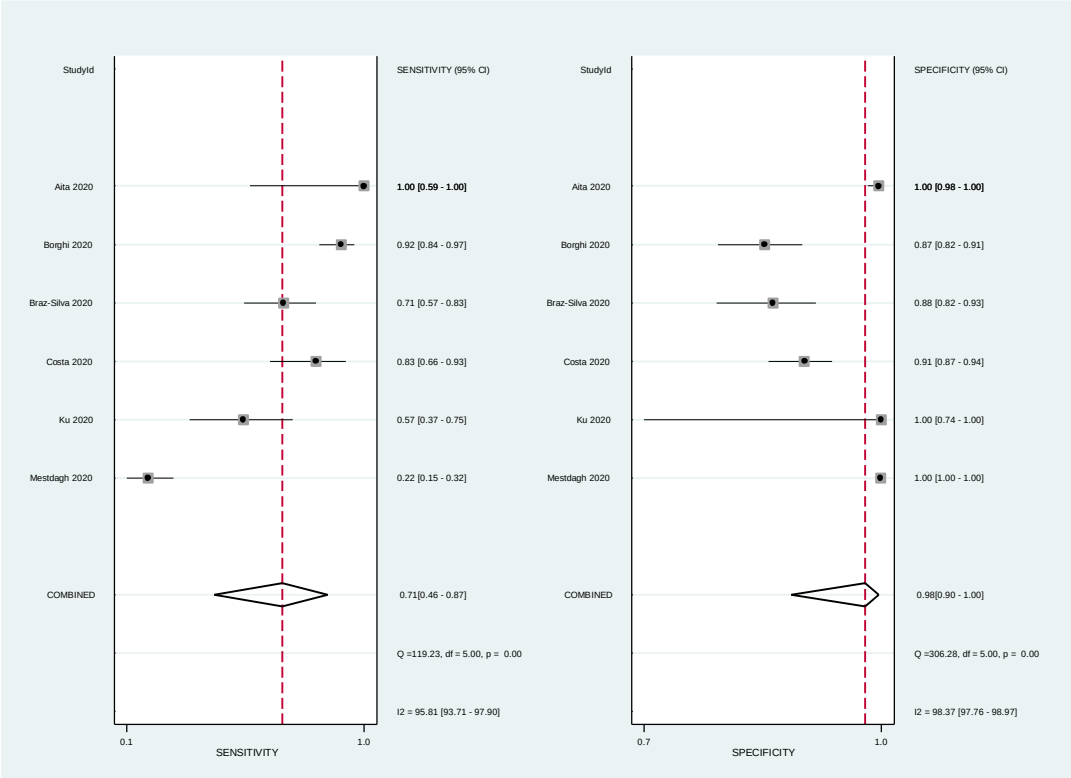


**Figure 9.** Forest plot of diagnostic accuracy data for saliva swab sample.

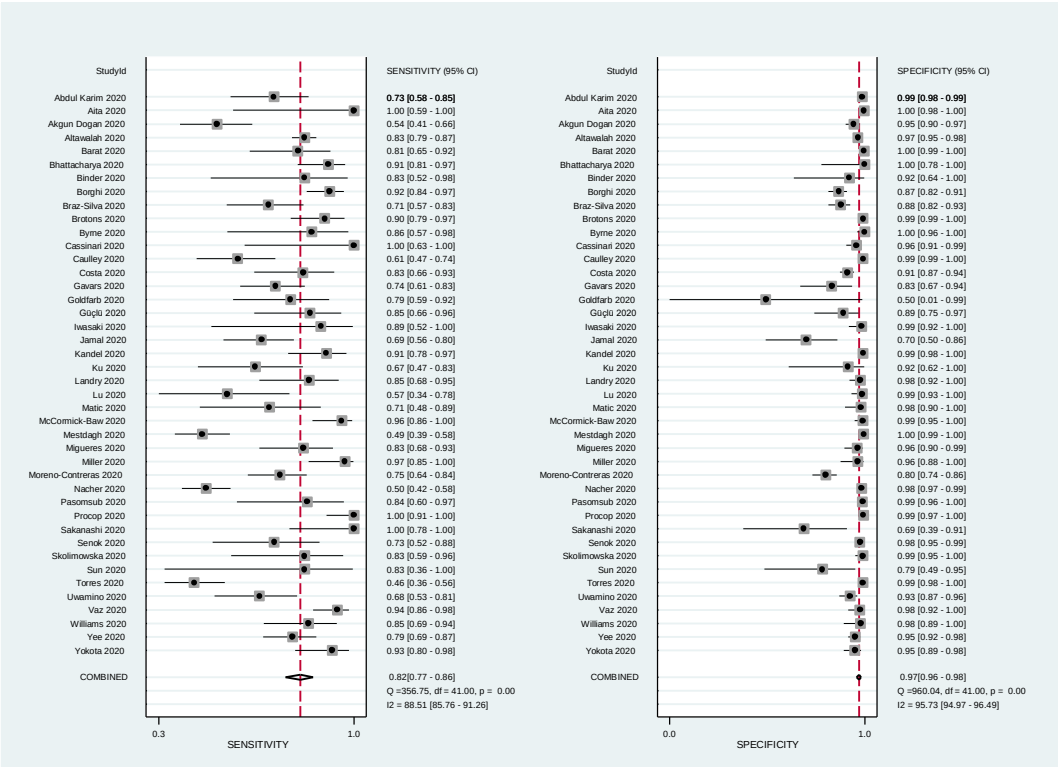


**Figure 10.** Forest plot of diagnostic accuracy data for oral saliva sample.

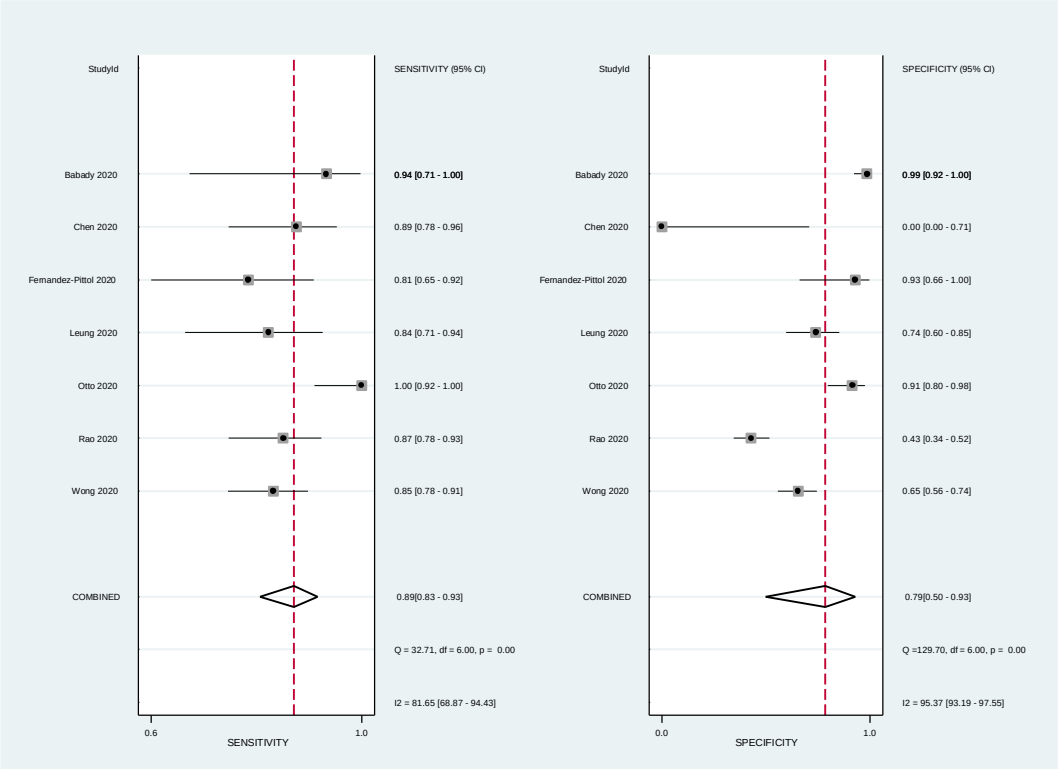


**Figure 11.** Forest plot of diagnostic accuracy data for posterior oropharyngeal saliva sample.


**Figure 12.** Forest plots of sensitivity (left) and specificity (right) of RT-PCR diagnostic kits.

**Table 5.** Characteristics of ongoing saliva RT-PCR trials.

| Clinical Trial Identifier (Location) | Official Title | Methodology | Outcome Measures | Population | Estimated Date of Completion |
|---|---|---|---|---|---|
| **NCT04715607** Denmark | COVID-19: SARS-CoV-2 Detection in Saliva, Oropharyngeal and Nasopharyngeal Specimens | Interventional diagnostic study Randomized Double-blind Parallel assignment | SARS-CoV-2 detection rates for oropharyngeal swabs (OPS) compared with nasopharyngeal swabs and saliva collection; SARS-CoV-2 RT-PCR cycle threshold (Ct) values; OPS, NPS and saliva test discomfort and likelihood to get retested; Ratio of mutations in SARS-CoV-2 | n=22000 16 years and older | February 10, 2021 |
| **NCT04604145** United States | Evaluation of Self Collected Saliva Samples Without Viral Transport Media for SARS-CoV-2 Testing Via RT-PCR | Interventional diagnostic study Non-randomized Open label Parallel assignment | Percent positive agreement between self-collected saliva samples and healthcare-worker collected nasopharyngeal samples; Percent negative agreement between self-collected saliva samples and healthcare-worker collected nasopharyngeal samples; Percent overall agreement between self-collected saliva samples and healthcare-worker collected nasopharyngeal sample | n=600 18 years and older | February 2021 |
| **NCT04567953** United States | COVID-19 Tests With Saliva Specimens | Interventional screening study Open label Single group assignment | The clinical evaluation of saliva as specimen for COVID-19 molecular test | n=2000 18 years and older | June 27, 2021 |
| **NCT04424446** United States | Saliva as a Source of Detection for SARS-CoV-2 | Observational cross-sectional study | Saliva SARS-CoV-2 RTPCR test results Saliva and midturbinate swab SARS-CoV-2 RTPCR test result | n=5000 18 years and older | June 1, 2021 |

**Question**: Should saliva RT-PCR be used to diagnose SARS-CoV-2 infection in the general population?

| | |
|---|---|
| Sensitivity | 0.84 (95% CI: 0.80 to 0.88) |
| Specificity | 0.96 (95% CI: 0.94 to 0.98) |

| | |
|---|---|
| Prevalences | 4.0671% |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 4.0671% | |
| **True positives** (patients with SARS-CoV-2 infection) | 51 studies 2705 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 34 (33 to 36) | ⨁⨁⨁◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-CoV-2 infection) | | | | | | | | 7 (5 to 8) | |
| **True negatives** (patients without SARS-CoV-2 infection) | 51 studies 16602 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 921 (902 to 940) | ⨁⨁⨁◯ MODERATE |
| **False positives** (patients incorrectly classified as having SARS-CoV-2 infection) | | | | | | | | 38 (19 to 57) | |

**Explanations**

a. Substantial heterogeneity across all studies (p=0.00, I^2=90.13%)

**Figure 13.** Summary of evidence table for saliva RT-PCR diagnosis in the general population.

**Question**: Should saliva RT-PCR be used to diagnose SARS-CoV-2 infection in patients with confirmed COVID-19?

| | |
|---|---|
| Sensitivity | 0.81 (95% CI: 0.74 to 0.87) |
| Specificity | 0.65 (95% CI: 0.42 to 0.83) |

| | | | |
|---|---|---|---|
| Prevalences | 55% | | |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 55% | |
| **True positives** (patients with SARS-CoV-2 infection) | 14 studies 548 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 446 (407 to 479) | ⊕⊕⊕◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-CoV-2 infection) | | | | | | | | 104 (71 to 143) | |
| **True negatives** (patients without SARS-CoV-2 infection) | 14 studies 355 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | serious [b] | none | 293 (189 to 373) | ⊕⊕◯◯ LOW |
| **False positives** (patients incorrectly classified as having SARS-CoV-2 infection) | | | | | | | | 157 (77 to 261) | |

**Explanations**

a. Substantial heterogeneity ($p<0.10$, $I^2>75\%$)

b. Wide confidence interval

**Figure 14.** Summary of evidence table for saliva RT-PCR monitoring in patients with confirmed COVID-19.

**Question**: Should saliva RT-PCR be used to diagnose SARS-CoV-2 infection in patients with suspected COVID-19?

| | |
|---|---|
| Sensitivity | 0.74 (95% CI: 0.62 to 0.82) |
| Specificity | 0.96 (95% CI: 0.92 to 0.98) |

| | |
|---|---|
| Prevalences | 31.9% |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 31.9% | |
| **True positives** (patients with SARS-CoV-2 infection) | 6 studies 469 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 236 (198 to 262) | ⊕⊕⊕◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-CoV-2 infection) | | | | | | | | 83 (57 to 121) | |
| **True negatives** (patients without SARS-CoV-2 infection) | 6 studies 1230 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 654 (627 to 667) | ⊕⊕⊕◯ MODERATE |
| **False positives** (patients incorrectly classified as having SARS-CoV-2 infection) | | | | | | | | 27 (14 to 54) | |

**Explanations**

a. Substantial heterogeneity (p<0.10, I^2>75%)

**Figure 15.** Summary of evidence table for saliva RT-PCR diagnosis in patients with suspected COVID-19.

**Question**: Should saliva RT-PCR be used to diagnose SARS-CoV-2 infection in patients with COVID-19 symptoms?

| | |
|---|---|
| Sensitivity | 0.85 (95% CI: 0.76 to 0.91) |
| Specificity | 0.97 (95% CI: 0.90 to 0.99) |

| | | | |
|---|---|---|---|
| Prevalences | 35.8% | 0% | 0% |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | | | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 35.8% | pre-test probability of 0% | pre-test probability of 0% | |
| **True positives** (patients with SARS-CoV-2 infection) | 17 studies 772 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 304 (272 to 326) | 0 (0 to 0) | 0 (0 to 0) | ⨁⨁⨁◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-CoV-2 infection) | | | | | | | | 54 (32 to 86) | 0 (0 to 0) | 0 (0 to 0) | |
| **True negatives** (patients without SARS-CoV-2 infection) | 17 studies 3169 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 623 (578 to 636) | 970 (900 to 990) | 970 (900 to 990) | ⨁⨁⨁◯ MODERATE |
| **False positives** (patients incorrectly classified as having SARS-CoV-2 infection) | | | | | | | | 19 (6 to 64) | 30 (10 to 100) | 30 (10 to 100) | |

**Explanations**

a. Substantial heterogeneity (p<0.10, I^2>75%)

**Figure 16.** Summary of evidence table for saliva RT-PCR diagnosis in symptomatic patients.

**Question**: Should saliva RT-PCR be used to diagnose SARS-CoV-2 infection in asymptomatic patients?

| | |
|---|---|
| Sensitivity | 0.89 (95% CI: 0.83 to 0.93) |
| Specificity | 0.93 (95% CI: 0.73 to 0.99) |

| | | | |
|---|---|---|---|
| Prevalences | 28.25% | 0% | 0% |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | | | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 28.25% | pre-test probability of 0% | pre-test probability of 0% | |
| **True positives** (patients with SARS-CoV-2 infection) | 6 studies 280 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 251 (234 to 263) | 0 (0 to 0) | 0 (0 to 0) | ⨁⨁⨁◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-CoV-2 infection) | | | | | | | | 32 (20 to 49) | 0 (0 to 0) | 0 (0 to 0) | |
| **True negatives** (patients without SARS-CoV-2 infection) | 6 studies 3182 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 669 (524 to 710) | 933 (730 to 990) | 933 (730 to 990) | ⨁⨁⨁◯ MODERATE |
| **False positives** (patients incorrectly classified as having SARS-CoV-2 infection) | | | | | | | | 49 (8 to 194) | 67 (10 to 270) | 67 (10 to 270) | |

**Explanations**

a. Substantial heterogeneity (p<0.10)

**Figure 17.** Summary of evidence table for saliva RT-PCR diagnosis in asymptomatic patients.

**Question**: Should saliva RT-PCR be used to diagnose SARS-CoV-2 infection in the hospital setting?

| | |
|---|---|
| Sensitivity | 0.86 (95% CI: 0.81 to 0.90) |
| Specificity | 0.94 (95% CI: 0.88 to 0.97) |

| | | | |
|---|---|---|---|
| Prevalences | 45.12% | 0% | 0% |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | | | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 45.12% | pre-test probability of 0% | pre-test probability of 0% | |
| **True positives** (patients with SARS-CoV-2 infection) | 24 studies 1236 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 388 (365 to 406) | 0 (0 to 0) | 0 (0 to 0) | ⨁⨁⨁◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-CoV-2 infection) | | | | | | | | 63 (45 to 86) | 0 (0 to 0) | 0 (0 to 0) | |
| **True negatives** (patients without SARS-CoV-2 infection) | 24 studies 2337 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 516 (483 to 532) | 940 (880 to 970) | 940 (880 to 970) | ⨁⨁⨁◯ MODERATE |
| **False positives** (patients incorrectly classified as having SARS-CoV-2 infection) | | | | | | | | 33 (17 to 66) | 60 (30 to 120) | 60 (30 to 120) | |

**Explanations**

a. Substantial heterogeneity (p<0.10, I^2>75%)

**Figure 18.** Summary of evidence table for saliva RT-PCR diagnosis in the hospital setting.

**Question**: Should saliva RT-PCR be used to diagnose SARS-CoV-2 infection in the community/outpatient setting?

| | |
|---|---|
| Sensitivity | 0.78 (95% CI: 0.66 to 0.86) |
| Specificity | 0.98 (95% CI: 0.97 to 0.99) |

| | | | |
|---|---|---|---|
| Prevalences | 20.3% | 0% | 0% |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | | | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 20.3% | pre-test probability of 0% | pre-test probability of 0% | |
| **True positives** (patients with SARS-CoV-2 infection) | 18 studies 733 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 158 (134 to 175) | 0 (0 to 0) | 0 (0 to 0) | ⨁⨁⨁◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-CoV-2 infection) | | | | | | | | 45 (28 to 69) | 0 (0 to 0) | 0 (0 to 0) | |
| **True negatives** (patients without SARS-CoV-2 infection) | 18 studies 11904 patients | cross-sectional (cohort type accuracy study) | not serious | not serious | serious [a] | not serious | none | 781 (773 to 789) | 980 (970 to 990) | 980 (970 to 990) | ⨁⨁⨁◯ MODERATE |
| **False positives** (patients incorrectly classified as having SARS-CoV-2 infection) | | | | | | | | 16 (8 to 24) | 20 (10 to 30) | 20 (10 to 30) | |

**Explanations**

a. Substantial heterogeneity (p<0.10, I^2>75%)

**Figure 19.** Summary of evidence table for saliva RT-PCR diagnosis in the community/outpatient setting.

**Question**: Should saliva drool/spit RT-PCR be used to diagnose SARS-coV-2 infection in the general population?

| | |
|---|---|
| Sensitivity | 0.83 (95% CI: 0.78 to 0.97) |
| Specificity | 0.97 (95% CI: 0.94 to 0.98) |

| Prevalences | 25.7% | | |
|---|---|---|---|

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 25.7% | |
| **True positives** (patients with SARS-coV-2 infection) | 44 studies 2286 patients | cohort & case-control type studies | not serious | not serious | serious | not serious | none | 213 (200 to 249) | ⊕⊕⊕◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-coV-2 infection) | | | | | | | | 44 (8 to 57) | |
| **True negatives** (patients without SARS-coV-2 infection) | 44 studies 14493 patients | cohort & case-control type studies | not serious | not serious | not serious | not serious | none | 721 (698 to 728) | ⊕⊕⊕⊕ HIGH |
| **False positives** (patients incorrectly classified as having SARS-coV-2 infection) | | | | | | | | 22 (15 to 45) | |

**Figure 20.** Summary of evidence table for saliva drool/spit RT-PCR.

**Question**: Should saliva swab RT-PCR be used to diagnose SARS-coV-2 infection in the general population?

| | |
|---|---|
| Sensitivity | 0.71 (95% CI: 0.46 to 0.87) |
| Specificity | 0.98 (95% CI: 0.90 to 1.00) |

| | | | | |
|---|---|---|---|---|
| Prevalences | 0% | | | |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 0% | |
| **True positives** (patients with SARS-coV-2 infection) | 6 studies 317 patients | cohort & case-control type studies | not serious | not serious | serious | serious | none | 0 (0 to 0) | ⊕⊕◯◯ LOW |
| **False negatives** (patients incorrectly classified as not having SARS-coV-2 infection) | | | | | | | | 0 (0 to 0) | |
| **True negatives** (patients without SARS-coV-2 infection) | 6 studies 3578 patients | cohort & case-control type studies | not serious | not serious | not serious | not serious | none | 980 (900 to 1000) | ⊕⊕⊕⊕ HIGH |
| **False positives** (patients incorrectly classified as having SARS-coV-2 infection) | | | | | | | | 20 (0 to 100) | |

**Figure 21.** Summary of evidence table for saliva swab RT-PCR.

**Question**: Should oral saliva RT-PCR be used to diagnose SARS-coV-2 infection in the general population?

| | |
|---|---|
| Sensitivity | 0.82 (95% CI: 0.77 to 0.86) |
| Specificity | 0.97 (95% CI: 0.96 to 0.98) |

| | | | | |
|---|---|---|---|---|
| Prevalences | 0% | | | |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 0% | |
| **True positives** (patients with SARS-coV-2 infection) | 42 studies 2201 patients | cohort & case-control type studies | not serious | not serious | serious | not serious | none | 0 (0 to 0) | ⊕⊕⊕◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-coV-2 infection) | | | | | | | | 0 (0 to 0) | |
| **True negatives** (patients without SARS-coV-2 infection) | 42 studies 15108 patients | cohort & case-control type studies | not serious | not serious | not serious | not serious | none | 970 (960 to 980) | ⊕⊕⊕⊕ HIGH |
| **False positives** (patients incorrectly classified as having SARS-coV-2 infection) | | | | | | | | 30 (20 to 40) | |

**Figure 22.** Summary of evidence table for oral saliva RT-PCR.

**Question**: Should posterior oropharnygeal saliva RT-PCR be used to diagnose SARS-coV-2 infection in the general population?

| | |
|---|---|
| Sensitivity | 0.89 (95% CI: 0.83 to 0.93) |
| Specificity | 0.79 (95% CI: 0.53 to 0.93) |

| | |
|---|---|
| Prevalences | 44.5% |

| Outcome | № of studies (№ of patients) | Study design | Factors that may decrease certainty of evidence | | | | | Effect per 1,000 patients tested | Test accuracy CoE |
|---|---|---|---|---|---|---|---|---|---|
| | | | Risk of bias | Indirectness | Inconsistency | Imprecision | Publication bias | pre-test probability of 44.5% | |
| **True positives** (patients with SARS-coV-2 infection) | 7 studies patients | cohort & case-control type studies | not serious | not serious | not serious | serious | none | 396 (369 to 414) | ⊕⊕⊕◯ MODERATE |
| **False negatives** (patients incorrectly classified as not having SARS-coV-2 infection) | | | | | | | | 49 (31 to 76) | |
| **True negatives** (patients without SARS-coV-2 infection) | 7 studies patients | cohort & case-control type studies | not serious | not serious | serious | serious | none | 438 (294 to 516) | ⊕⊕◯◯ LOW |
| **False positives** (patients incorrectly classified as having SARS-coV-2 infection) | | | | | | | | 117 (39 to 261) | |

**Figure 23.** Summary of evidence table for posterior oropharyngeal saliva RT-PCR.