CLINICAL USEFULNESS OF SARS-CoV-2 RAPID ANTIGEN TESTS IN ADULTS DURING HIGH PREVALENCE COMMUNITY OUTBREAKS.

Number of words 761 (text) + 100 (abstract)

1 table, 1 figure

[No conflict of interest statement in article file; authors declare in the submission form that they have no conflicts of interest.]

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ABSTRACT: 100 words

We evaluated performance of Abbott PanBio® COVID-19 Rapid Antigen Test Device (RATD) to detect SARS-CoV-2 infection in adults during high prevalence COVID-19 outbreaks. We found high accuracy in correct diagnosis (88% CI 85-91%, $p<0.05$) regardless of gender, presence of symptoms, disease timeline. Test sensitivity appeared to increase with age, specificity seemed to decline. Best diagnostic accuracy was obtained in middle-aged adults (94% CI 89-97%, $p<0.05$), but remained high through all ages. These results support RATD as a reliable measure to determine isolation of infected individuals during outbreaks. More studies are needed to assess RATD performance in low prevalence post-vaccination scenarios.

Key words (MeSH): COVID-19, Disease Outbreaks, Immunologic Tests, Primary Care issues

INTRODUCTION: 114 words

The coronavirus disease 2019 (COVID-19) pandemic, particularly in the context of widespread transmission of new viral variants, has led to an ongoing need for early and reliable detection of individuals with acute SARS-CoV-2 infection[1,2,3], mainly for isolation purposes[2,4,5,6]. Previous studies have shown different results for several rapid antigen testing devices using reverse transcription polymerase chain reaction (RT-PCR) as a reference method[1,3,7,8,9], being most efficient in the days around the onset of symptoms[2,4], or when the viral load is highest[2,3,5,6]. However, their performance during actual COVID-19 outbreaks in family practice, including detecting close contacts and asymptomatic individuals, or according to gender and age groups, has not yet been documented[5,7,8].

METHODS: 182 words

During a serious community COVID-19 outbreak in [redacted], Spain, with exceptionally high prevalence (31%) of SARS-Cov-2 infection, we collected nasopharyngeal specimens (NPhS) from 380 close contact adults attending Primary HealthCare Centres. NPhS were properly taken from the surface of the respiratory mucosa with nasopharyngeal swabs, and then analyzed by RATD and RT-PCR assay. Proper NPhS collection meant swabbing both nostrils, carefully inserting deep at a horizontal angle between the nasal opening and external ear canal. Data from 7 cases were eliminated due to invalid tests or insufficient information. This resulted in a final sample of 373 adults (average 56.14 ± 2.06 years old, range: 21-102), 27,08% (n = 101) men and 72.92% (n = 272) women, with a high proportion of clinically asymptomatic or presymptomatic cases (57.9%, n = 216). We compared RATD results versus RT-PCR, regardless of their cycle threshold (Ct) values. Sensitivity, specificity and diagnostic accuracy, amongst other parameters, were calculated using Fisher's exact test to

analyze corresponding 2x2 contingency tables, and then recalculated by gender and age ranges corresponding to young adults, middle-aged adults, older adults, and eldest people.

RESULTS: 207 words

In our sample, RATD testing correctly diagnosed 88% (CI 85-91% p<0.05) of cases infected by SARS-CoV-2, symptomatic and asymptomatic, regardless of their disease timeline (table 1). This relates to a high mean sensitivity (79%) and very high mean specificity (93%). Diagnostic accuracy seems to be similar for men and women, despite a higher prevalence of infection in men (41%) than in women (28%), and a proportionally greater number of women in our sample. Sensitivity, likewise, is very similar in men and women, and specificity is slightly higher in men than in women, with no significant differences. Considering RATD outcomes by age (figure 1), we found a high level of diagnostic accuracy across all age groups: 21-40 y.o. 83% (CI 71-90% p<0.05), 41-60 y.o. remarkably 94% (CI 89-97% p<0.05), 61-80 y.o. 88% (CI 77-95% P<0.05), and more than 80 y.o. 83% (CI 73-90% p<0.05). We observed higher sensitivity with increasing age: 21-40 y.o. 39% (CI 18-64% p<0.05, 41-60 y.o. 53% (CI 29-76% p<0.05), 61-80 y.o. 87% (CI 65-97% p<0.05), >80 y.o. 95% (CI 85-99% p<0.05), and the opposite for specificity, which declines with age: 21-40 y.o. 98% (CI 88-100% p<0.05), 41-60 y.o. 99% (CI 96-100% p<0.05), 61-80 y.o. 89% (CI 74-96% p<0.05), >80 y.o. 56% (CI 36-74% p<0.05).

DISCUSSION: 258 words

The current COVID-19 pandemic has revealed the challenges that Family Medicine endures to manage high infection outbreaks and the need for efficient, rapid and convenient diagnostic tools that include the detection of asymptomatic cases[2,4,7].

Amongst its strengths, our study demonstrates the benefits of reliably using RATD testing in primary care settings including a faster speed of isolating infective cases. Overall, in high prevalence community COVID-19 outbreaks a positive RATD result is likely to indicate a truly infected person and may not require additional confirmation by RT-PCR. A negative test should be confirmed by RT-PCR where available, or another rapid antigen test a few days later[10]. We believe that careful specimen collection is essential to identify a large number of low viral load cases, thus improving overall epidemic control by reducing COVID-19 spread.

Our study included significant vulnerable and elderly populations, many in nursing homes. Whereas local protocols favor the use of RT-PCR to exclude other respiratory illnesses in this group[6,10], our results indicate that RATD could be used instead, with a high level of confidence.

Although our findings could contribute to the managing of COVID-19 outbreaks in Family Medicine settings, they clearly have inherent limitations. More studies are required to explore other areas of interest in detail: correlation of RATD outcomes with RT-PCR Ct, multivariate analysis in larger studies to find a logistic regression model considering age, gender, multidimensional characteristics of symptoms, and infection timeline, and more importantly, RATD diagnostic accuracy in post-vaccination scenarios characterized by low prevalence of SARS-CoV-2 infection for the coming years.

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Table 1. Diagnostic performance of SARS-CoV-2 RATD during outbreaks, by gender

Sample / Subgroup		Average percent	95% CI
All	(N=373)		
	Diagnostic accuracy	88	(85-91)
	Sensitivity	79	(70-85)
	Specificity	93	(89-96)
Men	(N=101)		
	Diagnostic accuracy	89	(81-94)
	Sensitivity	78	(62-89)
	Specificity	97	(87-99)
Women	(N=272)		
	Diagnostic accuracy	88	(84-92)
	Sensitivity	79	(68-87)
	Specificity	92	(87-95)

N - sample size; CI – confidence interval

Figure 1. Diagnostic performance of SARS-CoV-2 RATD during outbreaks, by age