

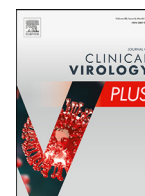


Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

## Journal of Clinical Virology Plus

journal homepage: [www.elsevier.com/locate/jcvp](http://www.elsevier.com/locate/jcvp)

Short communication

## Antigenic rapid test for SARS-CoV2 screening of individuals newly admitted to detention facilities: sensibility in an asymptomatic cohort

Sara Mazzilli<sup>a,b,\*</sup>, Francesco Oliani<sup>c</sup>, Andrea Restivo<sup>c</sup>, Ruggero Giuliani<sup>c</sup>, Lara Tavoschi<sup>b</sup>, Roberto Ranieri<sup>d</sup><sup>a</sup> Scuola Normale Superiore, P.za dei Cavalieri, 7, 56126 Pisa, Italy<sup>b</sup> Department of translational Research and New Technologies in Medicine and Surgery, University of Pisa, Via San Zeno 35, 56124, Pisa, Italy<sup>c</sup> Infectious Diseases Service, Penitentiary Health System, San Paolo University Hospital, P.za Gaetano Filangieri, 2, 20123 Milan, Italy<sup>d</sup> Welfare General Directorate, Lombardy Regional Health Authority, Milan, Lombardy, Italy

## ARTICLE INFO

## Keywords:

Antigen-detecting rapid diagnostic tests  
Rt-PCR cycle threshold  
Sensitivity  
Detention facility

## ABSTRACT

**Background:** Since the start of the Sars-CoV-2 pandemic, attention was called on the potential risk of COVID-19 outbreaks occurring inside prisons. In detention facilities, timely and accurate diagnosis is essential for allowing case isolation and contact tracing to avoid the spread of the infection. Until recently, reverse-transcriptase polymerase chain reaction (rt-PCR) was the recommended method to diagnose SARS-CoV-2 infection. However, antigen-detecting rapid diagnostic tests (ag-RDT) have emerged as point-of-care testing techniques.

**Objectives:** Here, we evaluate the use of ag-RDT for screening of individuals newly admitted to San Vittore prison (SV), a pre-trial prison, in Milan (Lombardy region, Italy), during the second SARS-CoV2 epidemic peak.

**Methods:** During the period 1 October-31 December 2020, ag-RDT and rt-PCR were performed individuals newly admitted to SV.

**Results:** Among 504 detained individuals tested, 21 (4.2%) resulted positive to rt-PCR. Of these, 10 had tested negative with ag-RDT and 11 had concordant results. Rt-PCR cycle threshold (CT) values were above 35 for the individuals with ag-RDT negative test, therefore the cases missed by the ag-RDT are unlikely to transmit disease. For all the individuals with ag-RDT positive results, CT values were below or equal to 27. In our study population, ag-RDT sensitivity was 52.4% (29.8%-74.3%), positive predictive value (PPV) was 100% and negative predictive value was 98.0% (96.8%-98.7%).

**Discussion:** Our study showed that ag-RDT is a promising and useful component of serial testing strategies in prison settings to perform SARS-CoV2 screening at admission based to its high PPV, ease of use, lower costs and resource needs.

## 1. Background

Since the start of the Sars-CoV-2 pandemic, attention was called on the potential risk of COVID-19 outbreaks occurring inside prisons [1]. Proximity, overcrowding, infrastructural constraints and environmental circumstances pose people in detention (PiD) at higher risk of acquiring infection. The likelihood of COVID-19 introduction in detention facilities is notably high, mainly due to two factors: firstly, turnover of PiD is considerable, especially in pre-trial institutions [2], and staff working in prison access the premises on daily bases. This risk is even more relevant for those prisons located in areas with sustained community virus circulation. Secondly, individuals in contact with the criminal justice system are usually from socially deprived communities with higher prevalence

of communicable and non-communicable diseases and sub-optimal access to care, including to SARS-CoV2 testing facilities [3].

In prison settings, timely and accurate diagnosis is essential for allowing case isolation and contact tracing to avoid the spread of the infection. Until recently, reverse-transcriptase polymerase chain reaction (rt-PCR) was the recommended laboratory method to diagnose SARS-CoV-2 infection. However, it requires special laboratory equipment, skilled staff, high cost, and turn-around time for results may be extended due to high demand. Antigen-detecting rapid diagnostic tests (ag-RDT) give results in about 15 minutes, are easy to perform and have emerged recently as point-of-care testing techniques [4].

\* Corresponding author at: Scuola Normale Superiore, P.za dei Cavalieri, Italy.  
E-mail address: [sara.mazzilli@gmail.com](mailto:sara.mazzilli@gmail.com) (S. Mazzilli).

## 2. Objectives

The aim of this study was to evaluate the use of ag-RDT for screening of individuals newly admitted to San Vittore prison (SV), a pre-trial detention facility, in Milan (Lombardy region, Italy), during the second SARS-CoV2 epidemic peak.

## 3. Methods

During the period 1 October-31 December 2020, ag-RDT (SD BIOSENSOR STANDARD Q) and rt-PCR assays were performed in 504 over the 578 individuals newly admitted to SV. Individuals with ag-RDT positive result were placed in COVID-19 patients dedicated area, individuals with ag-RDT negative result but with COVID-19 like symptoms were placed in a separate area for negative symptomatic patients. Asymptomatic individuals with a negative ag-RDT result spent a 10-day quarantine period before being admitted to main prison facility. Before entering the prison community, all individuals were tested a second time with rt-PCR.

## 4. Results

Among 504 (42 F, 462 M; median age 34) detained individuals tested, 21 (4.2%; 2 F, 19 M) resulted positive to rt-PCR. Of these, 10 had tested negative with ag-RDT and 11 had concordant results. All individuals tested positive were asymptomatic. Rt-PCR cycle threshold (CT) values were available for 13 of the 21 individuals with a positive rt-PCR test, including 6 with rt-PCR and ag-RDT discordant results. For 5 over the 6 individuals with ag-RDT negative test, rt-PCR CT values were above 35. Contrariwise, for all the individuals with rt-PCR and ag-RDT positive results, rt-PCR CT values were below or equal to 27. In our study population, ag-RDT sensitivity and specificity were respectively 52.4% (95% CI: 29.8%-74.3%) and 100% (95% CI: 99.2%-100%), the positive predictive value (PPV) was 100% and the negative predictive value (NPV) was 98.0% (95% CI: 96.8%-98.7%).

## 5. Discussion

To the best of our knowledge, this is the first study reporting the use of ag-RDT in detention facilities. Our results showed that, owing to faster

turnaround time, ag-RDT can be used profitably as a component of serial testing strategies in prison settings to perform SARS-CoV2 screening at admission.

Furthermore, our study contributes to accumulating evidence describing ag-RDT sensitivity among asymptomatic individuals. Our findings are in line with previously reported estimates [5].

As previously shown [6], despite lower sensitivity than rt-PCR detecting viral RNA, ag-RDT perform well on individuals with high viral load in their upper respiratory tract, who are also more likely to generate secondary cases. This has direct implications for the use of ag-RDT in prison settings, as these tests have the potential of quickly identifying newly admitted individuals at higher risk for SARS-CoV2 introduction and onward transmission within detention facilities.

In conclusion, our study showed that ag-RDT is a promising and useful component of serial testing strategies in prison settings to perform SARS-CoV2 screening at admission based to its high PPV, ease of use, lower costs and resource needs.

## Declaration of Competing Interest

None.

## References

- [1] L Tavoschi, R Monarca, R Giuliani, A Saponaro, S Petrella, R Ranieri, et al., Prevention and control of COVID-19 in Italian prisons: stringent measures and unintended consequences, *Front. Public Heal.* 8 (September) (2020) 17–19.
- [2] SA Kinner, JT Young, K Snow, L Southalan, D Lopez-Acuña, C Ferreira-Borges, et al., Prisons and custodial settings are part of a comprehensive response to COVID-19, *Lancet Public Heal.* 5 (4) (2020) e188–e189.
- [3] MF Aebi, MM. Tiago, SPACE I - 2019 – Council of Europe Annual Penal Statistics: Prison Populations, Council of Europe, Strasbourg, 2020.
- [4] ECDC, European centre for disease prevention and control. COVID-19 testing strategies and objectives, ECDC Tech. Rep. (2020) (15 September 2020).
- [5] M Linares, R Pérez-Tanoira, A Carrero, J Romanyk, F Pérez-García, P Gómez-Herruz, et al., Panbio antigen rapid test is reliable to diagnose SARS-CoV-2 infection in the first 7 days after the onset of symptoms, *J. Clin. Virol.* 133 (September) (2020) 3–6.
- [6] M Ciotti, M Maurici, M Pieri, M Andreoni, S. Bernardini, Performance of a rapid antigen test in the diagnosis of SARS-CoV-2 infection, *J. Med. Virol.* [Internet] (2021) 0–2 Available from: <http://www.ncbi.nlm.nih.gov/pubmed/33527409>.