ROLE OF A COVID-19 CONTACT TRACING PROGRAM IN IDENTIFYING A FALSE-POSITIVE NASOPHARYNGEAL RT-PCR CASE: A CASE REPORT*

ROL DE UN PROGRAMA MUNICIPAL DE RASTREO DE CONTACTOS DE COVID-19 EN LA IDENTIFICACIÓN DE UN CASO FALSO POSITIVO A TOMA DE MUESTRA NASOFARÍNGEA RT-PCR: UN ESTUDIO DE CASO

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ABSTRACT

This article presents a case report to highlight the role that local contact tracing programs have in the identification of false-positive cases of COVID-19. On June 19, 2020, the contact tracing program of San Germán in Puerto Rico was notified about a woman (JB11) whose nasopharyngeal RT-PCR test result for COVID-19 was positive. JB11 reported that the initial test was performed on June 12 as part of a widespread screening program for COVID-19. On June 21, the Puerto Rico Department of Health (PRDH) issued a statement to the local media alleging a possible outbreak in San Germán. However, after further testing, JB11 was recategorized as an RT-PCR false-positive case. This false-positive result may have been caused by technical cross-contamination at any point along the sample chain of testing. JB11 suffered from psychological distress due to the mishandling of her case in the media by the PRDH. This case report serves to illustrate that a well-organized local contact tracing program can be effective in identifying false-positive RT-PCR cases and reducing the risk of contagion, as well as to help reduce personal distress and the burden on the healthcare system by building public trust through effective science and risk communication.

KEYWORDS: Case report, contact tracing, COVID-19, false-positive.

RESUMEN

Este artículo presenta un reporte de caso para resaltar el rol que los programas municipales de rastreo de casos tienen en identificar casos falsos positivos de COVID-19. El 19 de junio de 2020, el programa de rastreo de San Germán, Puerto Rico recibió una notificación de una mujer (JB11) con resultado positivo a prueba RT-PCR realizada el 12 de junio como parte de un evento de cribado extenso. El 21 de junio, el Departamento de Salud de Puerto Rico (DSPR) emitió un comunicado a los medios de comunicación alegando un posible brote en San Germán. Tras realizarse pruebas adicionales, el caso de JB11 fue recategorizado como uno falso positivo. Una contaminación cruzada en cualquier punto del proceso de manejo de la muestra pudo haber sido la causa del falso positivo. JB11 experimentó distrés debido al mal manejo de la información por el DSPR en los medios de comunicación. Este reporte ejemplifica como un programa municipal de rastreo bien estructurado puede ser eficaz en identificar falsos positivos a prueba RT-PCR y en reducir el riesgo de contagio, así como en ayudar a reducir el distrés y la carga al sistema sanitario generando confianza en la comunidad mediante la comunicación efectiva basada en la evidencia.

PALABRAS CLAVE: COVID-19, falso positivo, rastreo de contactos, reporte de caso.

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On March 13, 2020, the first case of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was reported in Puerto Rico (Cruz-Correa et al., 2020). Six days later, a medical task force was established by the governor to assist the Puerto Rico Department of Health (PRDH) to establish an effective public health response (Cruz-Correa et al., 2020). The medical task force developed protocols and recommendations in the following areas: emergency response, hospital response and management, laboratory tests for COVID-19, contact tracing, surveillance, risk communication and community engagement, infection prevention and control, and societal response. However, the medical task force and PRDH struggled to implement these protocols. Therefore, the municipality of Villalba, inspired by the Ebola outbreak (Saurabh & Prateek, 2017), decided to implement a local contact tracing program. This was not an isolated event. A town in the province of Udine Friuli Venezia Giulia, northeast Italy, called Remanzacco, had implemented similar measures (Valent et al., 2020). On April 28, following the effective response of Villalba, the municipality of San Germán implemented its own contact tracing program. The program was reinforced with the lessons learned from other contact tracing experiences; such as tuberculosis, human immunodeficiency virus, and sexually transmitted diseases (Armbruster & Brandeau, 2007).

Contact tracing has been described as an essential tool for cutting the chains of transmission (Armbruster & Brandeau, 2007; Rorres et al., 2018; Salathé et al., 2020; Saurabh & Prateek, 2017). However, a well-organized local contact tracing program can achieve much more. There is extensive literature regarding false-negative nasopharyngeal reverse transcriptase-polymerase chain reaction (RT-PCR) cases, but identifying false-positive cases is important as well (Katz et al., 2020). This case report aims to expose the role that local contact tracing programs might play in the detection of false-positive cases.

Case Report

Historically, case reports have been important for recognizing new or rare diseases, assessing therapeutic effects, adverse events, costs of interventions, and improving problem-based medical education. Collecting accurate and transparent data from episodes of care informs the delivery of high-quality individualized health care (Gagnier et al., 2013). Real-world data in real-world settings can be used by patients, clinicians, and other stakeholders to review and compare therapeutic options and to support case-based learning in a new disease such as COVID-19.

The case report in this article is presented following the CAse REport (CARE) guidelines checklist (Gagnier et al., 2013). Our institution does not require ethical approval for the reporting of individual cases. However, written informed consent was obtained from the patient for their anonymized information to be published in this article.

Patient Information

On June 19, 2020, our program was notified about a 59-year-old woman (referred to as JB11 in this report) with asthma whose nasopharyngeal RT-PCR test result for COVID-19 was positive. JB11 reported that the initial test was taken on June 12 as part of a widespread screening program for COVID-19, which was established to encourage people to return to work. JB11 did not report any symptoms and had not recently traveled. In an initial interview, JB11 identified 11 direct contacts. However, the day after, in a subsequent interview, JB11 was able to identify 17 additional indirect contacts with whom she had shared the same space during a family gathering.

Clinical Findings and Diagnostic Assessment

On June 21, the PRDH issued a statement to the local media alleging a possible outbreak in the municipality of San Germán. This non-evidence-based statement generated fear in the local citizens.

On June 22, the index case (JB11) and her contacts (*n* = 28) were tested (nasopharyngeal RT-PCR) by the PRDH. JB11 then remembered attending another gathering and identified 98 additional indirect contacts. The contact list (11 direct contacts and 115 indirect contacts) was updated and sent to the Department of Health to coordinate the RT-PCR tests of the missing contacts.

On June 25, the results of the RT-PCR tests for all the people tested on June 22 came back as "not detected". The negative RT-PCR test results of the index case and the initially identified 28 contacts generated skepticism in the medical team (composed of an emergency physician, laboratory technician, epidemiologist, and internal medicine resident) because, according to the information gathered through the interviews, these results did not correspond to the expected clinical evolution. However, at this time, some indirect contacts were yet to undergo their RT-PCR tests, which were finally completed on July 2.

After an in-depth discussion of the case, it was concluded that JB11 might be a false-positive case. However, false-positives were not well documented in the medical literature. At the time of the events, only four cases had been described, and all of them in surgical settings (Katz et al., 2020). Therefore, to confirm that JB11 was a false-positive case, more tests were undertaken. A nasopharyngeal RT-PCR retest and rapid chromatographic immunoassay test (sensitivity: immunoglobulin M [IgM], 91.8%; immunoglobulin G [IgG], 100%; and specificity: IgM, 99.2%; IgG, 99.5%) were recommended to JB11, and on June 27, both were completed.

Outcomes

On June 29, the nasopharyngeal RT-PCR test results and the rapid chromatographic immunoassay test results came back as "not detected" (for both IgM and IgG). If JB11 had recovered from COVID-19, IgG should have been detected. Prior research has reported that the seroconversion of specific IgM and IgG antibodies is observed as early as the fourth day after symptom onset (Xiang et al., 2020). To limit the exposure of JB11 to an environment in which she might be exposed to COVID-19 (e.g., chest imaging in hospital), we recommended testing JB11 for SARS-CoV-2 total antibodies (sensitivity: 100%, specificity: 99.5%).

JB11 was tested on July 3 and received a non-reactive test result. Therefore, JB11 was recategorized as an RT-PCR false-positive case instead of the index case of a possible outbreak. This allowed us to rule out the possibility of contagion for the rest of her contacts. Table 1 shows a summary of the test results for JB11.

TABLE 1.
Summary of JB11's test results.

Date of test	Type of test	Date when the result was received	Test result
June 12, 2020	RT-PCR	June 19, 2020	Detected
June 22, 2020	RT-PCR	June 25, 2020	Not detected
June 27, 2020	RT-PCR, IgM, IgG	June 29, 2020	Not detected, Not detected, Not detected
July 3, 2020	SARS-CoV-2 total antibody	July 3, 2020	Non-reactive

In addition to obtaining information related to test results, we also assessed symptoms that could be presented by JB11 using a questionnaire developed by our team. A symptoms checklist was included and was pre-established after an exhaustive revision of the existent literature. The entire questionnaire was completed via phone call by trained personnel with the information provided by the case and their contacts. The specific instructions on how to fill out the questionnaire, the days scheduled for follow-up calls, and other

details about the optimal handling of the calls were included in a procedure manual that underwent continuous revision and updates. Despite being a false-positive case, JB11 reported sore throat, cough, and psychological distress related to the media exposure surrounding her case. For this reason, JB11 was provided with psychological support. However, upon being informed that her initial test result was a false positive, JB11 expressed the desire to discontinue the psychological assistance. Table 2 summarizes JB11's symptoms during the follow-up process.

TABLE 2.
Self-reported symptoms by JB11 during the follow-up.

Symptoms	Day						
	2	4	6	8	10	12	14
Fever	NO	NO	NO	NO	NO	NO	NO
Respiratory problems	NO	NO	NO	NO	NO	NO	NO
Chest pain	NO	NO	NO	NO	NO	NO	NO
Cough	NO	YES	NO	NO	NO	NO	NO
Diarrhea	NO	NO	NO	NO	NO	NO	NO
Sore throat	YES	YES	NO	NO	NO	NO	NO
Fatigue	NO	NO	NO	NO	NO	NO	NO
Anosmia	NO	NO	NO	NO	NO	NO	NO
Other: Anxiety	YES	YES	YES	YES	YES	NO	NO

DISCUSSION

The contact tracing program of the municipality of San Germán was crucial in identifying JB11 as a false-positive RT-PCR case. Even though JB11 was identified as a false-positive case, she reported a sore throat and cough on days two and four of the follow-up. However, these symptoms can be attributed to the high concentration of Sahara dust that was in the air on those days in Puerto Rico. Several potential reasons for inaccurate RT-PCR results have been described (Piras et al., 2020). However, we believe that technical cross-contamination at any point along the sample chain of testing was the cause of the RT-PCR false-positive result for JB11 (Layfield et al., 2021; To et al., 2021).

There is extensive literature regarding false-negative cases, but the identification of false-positive cases is also important. In a hospital setting, while COVID-19 specific units are appropriate and necessary for the safe treatment of people with the disease, the misplacement of a false-positive case in these units exposes the person to SARS-CoV-2 at an unnecessarily high rate (Katz et al., 2020). Moreover, prior research conducted on other diseases has shown that people with positive screening results are re-screened with more sophisticated and expensive tests, which places a burden on the healthcare system (Brewer et al., 2007).

There is no current gold standard for the diagnosis of COVID-19. Nevertheless, some researchers have suggested an algorithm that uses a combination of RT-PCR tests, serological tests, and chest imaging with both radiographs and computed tomography (Bastos et al., 2020; Long et al., 2020). However, this theoretical combination of diagnostic strategies is not feasible for people in low-income settings with no universal healthcare, as is the case in Puerto Rico (Ayebare et al., 2020). Prior research has reported that testing is the primary challenge in Puerto Rico's COVID-19 response, and without adequate testing, the ability to perform adequate contact tracing is limited (Marzán-Rodríguez et al., 2020). At the time of the events described in this case, there was no accessibility to antigen tests (Kyritsi et al., 2021; Martín-Sánchez et al., 2021), which would have been an inexpensive and useful tool to obtain rapid results and determine whether JB11 and her contacts were in an infectious period.

The medical task force appointed by the governor claimed to have developed guidelines for key areas of the COVID-19 response in Puerto Rico, such as risk communication and societal response. However, the non-evidence-based statement issued by the PRDH of a possible outbreak in San Germán showed that such recommendations without proper implementation are not useful. Communicating information that has not been corroborated by the necessary diagnostic tests may do more harm than good and could generate vulnerability by allowing the stigmatization of individuals (Stolow et al., 2020). Science and risk communication are essential. We cannot expect the public to understand what is going on, or to change their behaviors, if we are not able to communicate effectively. To do so, all risk and science communicators should understand the science for themselves, remain honest, and take responsibility (Madad & Eleanor, 2021).

Our recommendation is to humanize the diagnosis and prognosis process. Humanizing healthcare implies turning away industrial healthcare and moving towards a careful and kind care for all (Montori, 2020, 2021). For this to happen is crucial to recognize individuals as persons with a disease and not as a disease. This process requires healthcare professionals with good skills in active listening, effective communication, and compassion (Sonis et al., 2020). However, in the context of official communications by the PRDH, this could be achieved by replacing alarmist communication with effective communication, which promotes health literacy and allows citizens to make informed risk-based decisions.

Furthermore, this event resulted in media coverage that JB11 reported as stressful. The psychological distress might be associated with stigma to COVID-19. This type of stigma could be comprehended as a social process that sets to exclude those who are perceived to be a potential source of disease and may pose threat to the effective social living in the society (Bhanot et al., 2021; Zhang et al., 2020). Prior research in other diseases has shown that false-positive cases, which are first considered positive by a screening test, never completely escape that label, even if the subsequent results are negative (Toft et al., 2019). This could generate short-term and long-term psychological distress (Brewer et al., 2007). However, as COVID-19 is a novel disease, more research is needed to determine if the long-term effects are similar to those of other widely studied diseases.

Conclusion

In summary, a well-organized local contact tracing program can be effective in identifying false-positive RT-PCR cases, reducing the risk of contagion, reducing the personal distress, reducing the burden on the health-care system, and building public trust through an effective science and risk communication.

Research Ethical Standards

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Declaration of Conflicting Interests: The authors declare that there are no conflicts of interest.

Approval from the Institutional Review Board for Human Research: The authors' institution does not require ethical approval for the reporting of individual cases.

Informed Consent/Assent: Written informed consent was obtained from the patient for their anonymized information to be published in this article.

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