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Healthcare staff perceptions and misconceptions regarding antibody testing in the United Kingdom: implications for the next steps for antibody screening

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SUMMARY

Background: Healthcare workers have been at increased risk of exposure, infection and serious complications from COVID-19. Antibody testing has been used to identify staff members who have been previously infected by SARS-CoV-2, and has been rolled out rapidly in the United Kingdom. A number of comment and editorial articles have been published that raise concerns about antibody testing in this context. We present perceptions of National Health Service (NHS) healthcare workers in relation to SARS-CoV-2 antibody testing.

Methods: An electronic survey regarding perceptions towards SARS-CoV-2 antibody testing was distributed to all healthcare workers at a major NHS tertiary hospital following implementation of antibody testing.

Results: In total, 560 healthcare workers completed the survey (80% female; 25% of Black and Minority Ethnic background; 58% from frontline clinical staff). Exploring whether they previously had COVID-19 was the primary reported reason for choosing to undergo antibody testing (85.2%). In case of a positive antibody test, 72% reported that they would feel relieved, whilst 48% felt that they would be happier to work in a patient-facing area. Moreover, 12% responded that a positive test would mean "social distancing is less important", with 34% of the responders indicating that in this case they would be both less likely to catch COVID-19 and happier to visit friends/relatives.

Conclusions: NHS staff members primarily seek out SARS-CoV-2 antibody testing for an appropriate reason. Based on our findings and given the lack of definite data regarding the extent of immunity protection from a positive SARS-CoV-2 antibody test, significant concerns may be raised regarding the reported interpretation by healthcare workers of positive antibody test results. This needs to be further explored and addressed to protect NHS staff and patients.

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Introduction

The COVID-19 pandemic has resulted in unprecedented challenges to healthcare systems worldwide [1]. Healthcare staff internationally have continued to work under increased pressure throughout the pandemic, coming into contact with large volumes of patients with confirmed or possible COVID-19 [2]. SARS-CoV-2 infection rates among healthcare staff have been shown to be higher compared with that in the general population, with relatively high rates of both serious infections and mortality [2—4]. Initial SARS-CoV-2-related testing relied on identifying the presence of the virus itself through polymerase chain reaction (PCR) tests. Typically, healthcare workers with COVID-19 symptoms were advised to isolate and get a COVID-19 swab antigen-based test to identify whether they were carrying the virus [5,6]. As antibody testing has become more reliable and readily available, there has been an increasing interest in the use of antibody testing to identify whether an individual has developed antibodies to a previous SARS-CoV-2 infection [7].

Significant concerns have been raised regarding the effectiveness and accuracy of antibody testing for COVID-19, particularly based on the lack of evidence regarding the practical implications of a positive or negative test for the acquired protective immunity at the level of both the tested individual (individual immunity) and the local community (herd immunity) [7,8]. In May 2020, the UK government purchased 10 million antibody test kits from Abbott and Roche. Roche's marketing material claims a sensitivity of 100% 14 days after a confirmed COVID-19 diagnosis through a PCR test, whilst Abbott claims 100% accuracy 17 days after symptom onset [9]. Importantly, neither of these tests detect antibodies against the SARS-CoV-2 spike protein, which are considered to be the most crucial factor for neutralizing this virus [9]. Accordingly, significant uncertainty remains regarding the immunity implications from the results of this antibody testing, with the UK Department of Health and Social Care giving a statement to the *British Medical Journal* stating that "We do not currently know how long an antibody response to the virus lasts, nor whether having antibodies means a person cannot transmit it to others" [9].

Despite this remaining uncertainty, antibody testing has been widely and rapidly rolled out to UK healthcare staff, patients, and care-home residents. To date, relatively large numbers of healthcare staff have taken up the offer of antibody testing and have received their corresponding results. However, the perceptions of tested individuals regarding this antibody testing have not been studied. As such, this study aimed to explore National Health Service (NHS) staff perceptions regarding SARS-CoV-2 antibody testing and its potential implications to themselves as individuals, their families and their patients.

The nature of the COVID-19 pandemic has placed healthcare staff under significant pressure, with many healthcare workers having been diagnosed with COVID-19, whilst others have experienced significant anxiety regarding potentially contracting or passing on SARS-CoV-2. Therefore, healthcare staff are increasingly keen to understand both their risk and exposure related to catching and transmitting this new viral infection. SARS-CoV-2 antibody testing has been rolled out rapidly across NHS staff to support the delivery of healthcare and to better understand the SARS-CoV-2 infection status among this essential workforce. Accordingly, a number of commentary and editorial pieces have been published in the scientific literature regarding the benefits and risks associated with SARS-CoV-2 antibody testing [6,9,10]. However, there is currently a marked paucity of data from the individuals themselves having these tests and particularly from healthcare staff. Here, we report the first systematic approach to capturing NHS staff perceptions regarding SARS-CoV-2 antibody testing.

Methods

We conducted an electronic survey including staff members at the University Hospitals Coventry & Warwickshire NHS Trust (UHCW). UHCW is a major tertiary referral centre in the West Midlands region, and in line with government advice, antibody testing was offered to all healthcare staff working at the Trust. There were 8884 antibody tests performed for staff members at the Trust by the end of the survey period.

The study survey was designed by a multi-disciplinary collaboration of clinicians and research and development staff, and was developed using GoogleForms software. Ethical approval was granted through the Trust's COVID-19 ethics committee (GAFREC ID: GF0404). The survey was distributed using the same channels as the initial invitation to participate in antibody testing, including a rolling advert on the intranet homepage and group e-mails to staff members. All staff members therefore had access to the survey either through the TrustNav system or their personal e-mails. Staff were advised that participation in this survey was voluntary.

The results were analysed using descriptive and semi-quantitative methods. Differences between demographic groups (sex and ethnicity) in relation to perceptions following receipt of a results were analysed using a Chi-squared test [11], with P-values <0.05 deemed to be statistically significant. Statistical analyses were performed using the SPSS statistics 24 package (SPSS Inc., Chicago, USA).

Results

Respondents

There were 560 respondents who completed the study survey, with 80% of responses from female staff members and 25% from staff of Black and Minority Ethnic (BAME) background. The majority of staff completing the survey (58%) worked in frontline roles either directly caring for confirmed/suspected COVID-19 patients or in other frontline areas. Overall, 56% of participants reported they were unsure as to whether they had previously had COVID-19, whilst 15% reported having COVID-19 confirmed by a swab test and 23% that they had relevant symptoms which had not been confirmed by a COVID-19 swab test. The breakdown of respondents by age, ethnicity, working area and COVID-19 infection status is presented in Figure 1.

Reported reasons for having a SARS-CoV-2 antibody test

The majority of staff (78%) requested a SARS-CoV-2 antibody test to check whether they previously had COVID-19, whilst 26%

stated that they took a test "to provide reassurance about potential future immunity". In addition, 1.6% of respondents reported taking this test because they "didn't believe a COVID-19 swab test result".

Reported reasons for not having a SARS-CoV-2 antibody test

Amongst those who reported not having a SARS-CoV-2 antibody test ($N = 34$), 39% reported that this was because they "didn't think it would make any difference", whilst 17% reported that they "did not have time" and 8% that they doubted the reliability of the test.

Response to test outcome scenarios

The study survey asked respondents to imagine a scenario where they had received a positive antibody test result (whether this actually happened or not). In the responses for this scenario, 72% (401) stated that they would feel "relieved" to have had previous COVID-19 history confirmed, and 44% (246) reported that following a positive test they would be happier to work in a patient-facing area in the future; 11% (61) mentioned that such a positive test would mean "social distancing is less important" for them; 30% (170) stated that they would be less likely to catch COVID-19 in the future; and 31% (175) reported that they would be happier to visit friends and relatives.

Similarly, participating staff were also asked to respond to a scenario where they had received a negative antibody test result (whether this actually happened or not). For this scenario, 34% (165) reported that following a negative result they would be "less happy to work in a patient-facing role" and 34% (166) mentioned that they would be "more likely to catch COVID-19 in comparison with a colleague".

Test accuracy and timing of test

Overall, 45% (230) of respondents reported that they had at no point been symptomatic themselves or in contact with anyone symptomatic of COVID-19, while 22% (116) reported that they had been symptomatic themselves or in contact with someone symptomatic within 40 days of the antibody test being performed. Moreover, 64% (331) of respondents reported not knowing that the test might not be accurate if you were symptomatic or in contact with someone symptomatic <40 days before being tested. In addition, 77% (394) replied that they would like the opportunity to be re-tested if they had been symptomatic or in contact with someone symptomatic <40 days before the test.

Demographic determinants

There was no statistically significant difference between male and female respondents regarding reported perceptions after receiving the antibody test results. Respondents of BAME background reported that 39% would be less happy working in a patient-facing role following a negative result, while 28% of non-BAME respondents reported that they would be less happy to working in a patient-facing role following a negative test result ($P<0.01$).

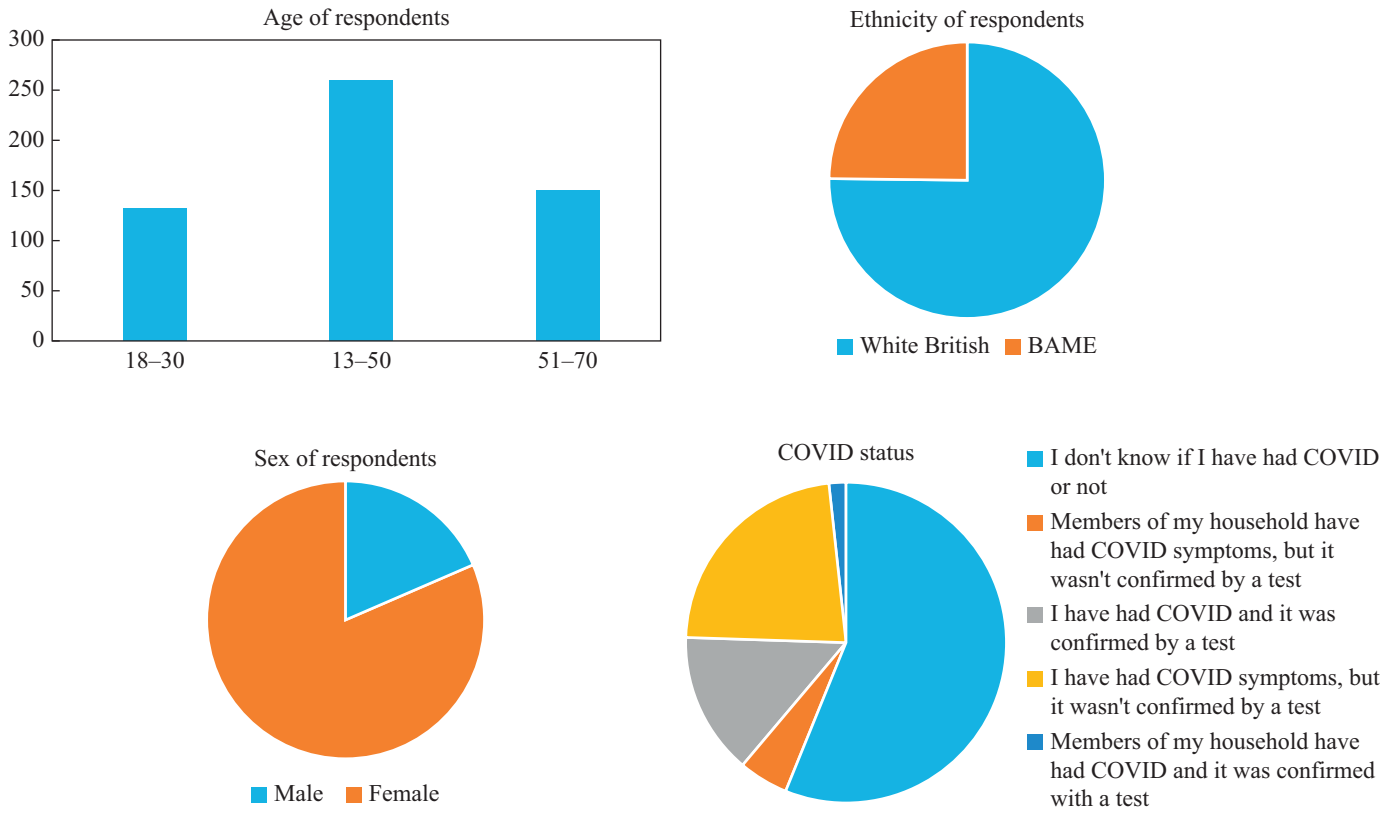

Figure 1. Characteristics of respondents. BAME, Black and Minority Ethnic.

Discussion

Our present study shows that NHS staff decide to undergo a SARS-CoV-2 antibody test for appropriate reasons, with the vast majority looking to identify whether they have had a previous SARS-CoV-2 infection. Of note, SARS-CoV-2 antibody testing is able to reliably answer this question if timings are appropriate [12]. Moreover, our findings indicate that receiving the results from such testing appears to be emotionally charged for healthcare workers, with a high proportion expressing relief at receiving a positive test result. Given that the challenges of mental and psychological health during the COVID-19 pandemic for healthcare staff have been well documented [13,14], these findings further suggest that more work is needed to support the psychological wellbeing of healthcare workers receiving such test results (whether positive or negative).

Another major concern regarding SARS-CoV-2 antibody testing is the interpretation of the results by tested healthcare workers. A large proportion of the respondents in the present study reported that this antibody test result would directly influence how happy they would be to work in patient-facing areas, with a significant proportion of those receiving a negative test result mentioning that they would be less happy to work in patient-facing areas. Potentially, this may have further implications for the recruitment, retention, morale and mental health wellbeing of healthcare staff. Notably, this may be increasingly important amongst NHS staff of BAME background who are also at significantly increased risk of severe COVID-19 infection [15].

Furthermore, a third of the respondents in the present study mentioned that a positive SARS-CoV-2 antibody test result would mean they were less likely to catch COVID-19 in the future, and similarly a third that they would be more happy to visit staff and relatives. Interestingly, a significant proportion of the respondents felt that such a positive test meant that social distancing was less important for them. This finding is of particular concern, given the uncertainty regarding the exact protective role of these antibodies. As such, negative implications may arise if healthcare workers who have received a positive SARS-CoV-2 antibody test result feel that they are more protected and thus potentially take fewer preventative actions (e.g., social distancing). The interpretation by some healthcare workers that a positive antibody test results means that they are less likely to be infected in the future and that social distancing may be less important for them is concerning. This greater emphasis around training and education of healthcare workers undergoing antibody testing to promote accurate interpretation of the results with respect to individual actions and implications both for their own safety and those that they treat or interact with on a regular basis, including their familes.

It is noteworthy that 65% of respondents reported not being aware that this testing might not be accurate in cases which were symptomatic or in contact with someone symptomatic within the previous 40 days. This suggests a significant gap in the knowledge regarding SARS-CoV-2 antibody testing among healthcare workers. Interestingly, once the study survey provided this information, a large proportion (78%) of respondents noted that they would like the opportunity to have a re-test in cases where this might not have been accurate. Of note, antibody retesting is currently not offered in many NHS centres and so this may be an additional option which should be considered in order to further support healthcare workers during the ongoing pandemic response.

The present study has a number of strengths, providing the first systematic approach to collecting perceptions of NHS healthcare staff on SARS-CoV-2 antibody testing. Given the multiple concerns raised regarding antibody testing in the NHS setting [7,9,10], this is a knowledge gap in the current research on COVID-19 which merits further attention. Our survey also captured a relatively large number of responses from an NHS staff population that is both diverse and representative of the NHS workforce. Nevertheless, a number of study limitations should also be acknowledged, including the single-centre nature of the study. Moreover, due to ethical considerations and in order to maintain the anonymity of respondents, there was no link between the survey responses and the results of antibody testing for the study participants, whilst no face-to-face interviews were included. We did not collect information on patient's individual job roles, which would have ensured results were representative across departments and roles. Further research is clearly needed to explore this area in more detail, with potential in-depth interviews and the trialling of the impact of relevant interventions for healthcare workers (e.g., education packages for NHS staff having SARS-CoV-2 antibody testing).

In conclusion, our findings indicate that the rapid roll out of SARS-CoV-2 antibody testing in the UK has enabled NHS staff to seek this testing for appropriate reasons; however, significant gaps appear to continue to exist regarding the appropriate education/information provided and the support regarding the practical and psychological implications of receiving positive or negative results from this testing. As misinterpretation of the implications of these results by NHS staff may have wider consequences (e.g., potentially having false reassurance and relaxing of taking sufficient preventative measures in the result of a positive antibody test), potentially putting themselves or others at risk. Our present findings highlight an issue which merits further research and, subsequently, appropriate education/information action by the NHS.

Author contributions

T.R. was significantly involved in the conception and design of the work, acquisition of data, analysis and interpretation of the findings and drafted the first version of the manuscript including approval for submission. I.K. was significantly involved in the design of the work, acquisition of data and revision of the manuscript and gave approval for submission. S.L. was significantly involved in the design and customization of the work, in particular the survey questions used, and was involved in the analysis/interpretation of findings as part of critically reviewing the draft manuscript and gave approval for submission. N.M. was significantly involved in the leadership of both antibody testing and the infection prevention work streams that supported the delivery of this research; she critically reviewed the draft manuscript and gave approval for submission. N.A. was significantly involved in the implementation and staff recruitment to antibody testing and the same recruitment approach was used for this survey; he critically and expertly reviewed the manuscript and gave approval for submission. C.I. was significantly involved in the leadership

of both antibody testing and related research work streams that supported the delivery of this research; he critically reviewed the draft manuscript and gave approval for submission. K.P. was significantly involved in the leadership of this piece of work within the wider COVID-19 research strategy at the Trust, in particular the ethical approval needed; he was involved in critical review of the manuscript and gave approval prior to submission. S.S. was significantly involved in the initial approach including survey model design used to deliver this research, including mentoring and supervision of the junior research team; he critically reviewed the manuscript and gave approval prior to submission. H.R. was significantly involved in the conception and design of the work, including the data acquisition and necessary ethical approvals; he was involved in structuring the final manuscript and critically reviewing it before giving approval for submission. C.J. was responsible for the initial idea and concept on which this study was based, including the design of the work, plan for acquisition of data; she critically reviewed the manuscript before giving approval for submission.

Conflict of interest statement
The authors have no conflicts of interest to declare.

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