

Exposure of hospital healthcare workers to the novel coronavirus (SARS-CoV-2)

Authors: Salman Razvi,^A Rahima Oliver,^B Jonathan Moore^C and Andrew Beeby^D

ABSTRACT

Healthcare workers (HCWs) are at higher risk of infection with the coronavirus disease 2019 (COVID-19) and can also amplify outbreaks within healthcare facilities if they become ill. Certain groups are known to be at higher risk of contracting severe COVID-19 infection, such as men and people from Black, Asian and minority ethnic (BAME) backgrounds. Identifying and managing HCWs who have been exposed to COVID-19 is of utmost importance in preventing healthcare transmission and protecting staff and vulnerable patients in healthcare settings. Recently, antibody testing to diagnose previous COVID-19 exposure among HCW has commenced in the UK. This provided an opportunity to assess exposure to COVID-19 among the various subgroups within the HCW community, based on their roles and ethnic background. We found that HCWs working in patient-facing roles were twice as likely to have been exposed to COVID-19 than their colleagues in non-patient-facing roles. Reassuringly, workers from BAME backgrounds had a similar risk of previous COVID-19 exposure to their white colleagues. More research is required to assess how frontline staff, especially those working in patient facing roles, can reduce their risk of exposure to COVID-19.

KEYWORDS: COVID-19 antibody, healthcare workers, BAME

DOI: 10.7861/clinmed.2020-0566

Introduction

The outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that causes COVID-19 has placed unprecedented strain on health-care services worldwide. Healthcare workers (HCWs) are at higher risk of infection; their infection can amplify outbreaks

within healthcare facilities if they become ill¹ as well as exacerbating staff shortages, increasing the pressures on healthcare organisations amidst the global effort against COVID-19. Certain groups appear to be at higher risk of being affected by COVID-19 such as men and members from the BAME groups.²

Identifying HCWs who have been infected previously by the SARS-CoV-2 virus may have several advantages. Firstly, it would help the HCW know whether they have already been infected with the virus. Secondly, it would give researchers and healthcare authorities a better idea of disease prevalence. Thirdly, knowing who has or has not been infected may help to identify donors for convalescent plasma therapy or volunteers for vaccine trials, respectively. Fourthly, and perhaps most importantly, knowing the prevalence of the disease in HCWs would help healthcare organisations to identify whether policies on personal protective equipment (PPE) are adequate or if additional measures may be required, particularly for groups who may be at higher risk.

From the end of May, the UK government has announced the start of a major new national antibody testing programme with plans to provide antibody tests to all NHS and care staff in England. We wanted to ascertain the prevalence of antibody positivity in HCWs and, in addition, determine if specific groups such as men, frontline staff and BAME HCWs may have had more exposure than others.

Methods

Our NHS Trust at Gateshead, UK started offering the COVID-19 antibody test to all staff from 28 May 2020. All staff within our organisation were offered the choice of having the COVID-19 antibody test on a voluntary first-come, first-served basis. A bespoke staff information leaflet was provided and written consent obtained from all HCWs wishing to proceed with the test. Blood samples were analysed on the day of collection using the Roche Elecsys Anti-Sars-CoV-2 serology assay. This electrochemiluminescent immunoassay is designed to detect both IgM and IgG antibodies to SARS-CoV-2 in human serum and plasma and has been shown to have a high sensitivity and specificity.³

Structured anonymous data were extracted across multiple Trust source systems. Referential integrity was maintained to remove any erroneous data due to a lack of a 'common key' across the systems.

By 8 June, 2,521 members of staff had had their COVID-19 antibody status checked. The characteristics of the staff who opted to have their COVID-19 antibody status tested were broadly similar overall to the staff working for the Trust except that more women

Authors: ^Aassociate medical director for research and development, consultant endocrinologist and senior lecturer, Gateshead Health NHS Foundation Trust, Gateshead, UK and Newcastle University, Newcastle upon Tyne, UK; ^Binformation governance manager, Gateshead Health NHS Foundation Trust, Gateshead, UK; ^Cconsultant microbiologist, Gateshead Health NHS Foundation Trust, Gateshead, UK; ^Dmedical director, Gateshead Health NHS Foundation Trust, Gateshead, UK

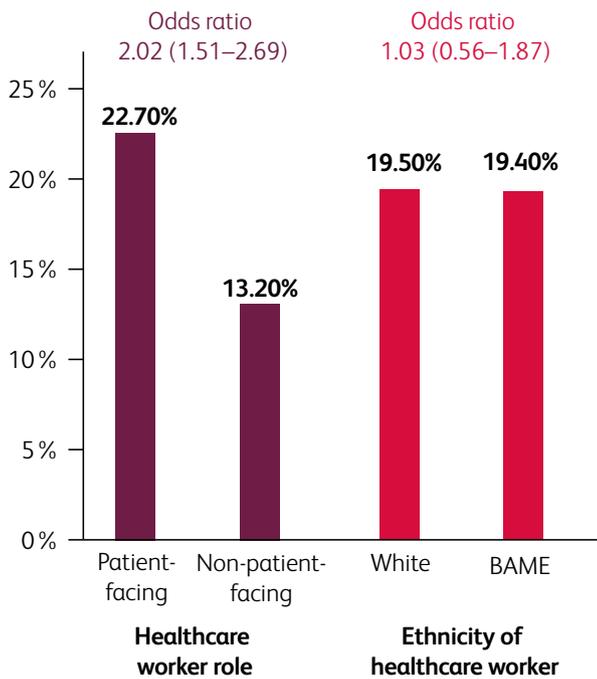


Fig 1. Risk of exposure to Covid-19 in healthcare workers by role and ethnicity. Odds ratios are adjusted for age and sex, and additionally for ethnicity (for analysis by role) or role (for analysis by ethnicity).

chose to have the antibody test (Fisher’s exact test $p < 0.01$) (Table 1). Of these, 491 (19.4%) members of staff tested positive. The mean (SD) age of those testing positive (42.5 years [12.5]) or negative (42.5 years [12.9]) was similar (t test, $p = 0.988$). Likewise, the frequency of positive tests in men (77/407 [18.9%]) and women (414/2118 [19.5%]) was also similar (Fisher’s exact test $p = 0.837$).

To explore the occupational roles and the ethnic background of staff that underwent testing, we cross-referenced serological and electronic patient records data with the electronic staff records. Although data were incomplete, we were able to identify staff roles for 2,133 staff tested, categorising them into two groups:

- > directly patient facing (such as nurses, doctors, physiotherapists, clinical pharmacists, occupational therapists, ward clerks and porters)
- > non-patient facing (such as staff working in clerical, administrative, information technology, secretarial, domestic and laboratory roles).

Likewise, the self-reported ethnicity status of staff was available for 2,292 members of staff and were categorised as either White or BAME. We hypothesised that staff involved in patient-facing roles and those from a BAME background would have a higher frequency of exposure to SARS-CoV-2 infection.

Results

Of the 1,971 members of staff for whom staff roles and antibody test results were available, those in patient facing roles had a higher frequency of positive COVID-19 antibody tests (295/1302 [22.7%]) than those in non-patient facing roles (88/669 [13.2%]), which was statistically significant (Fisher’s exact test $p < 0.0001$). However, more women from the non-patient facing roles chose to have their COVID-19 antibody status tested ($p = 0.02$). When we further

Table 1. Characteristics of staff included in this analysis (analysed sample) versus all staff employed by the organisation (all trust staff)

	Analysed sample (n=2521)	All trust staff (n=4753)	P value
Mean age (SD)	42.5 (12.6)	43.2 (11.8)	ns
Females, n (%)	2317 (91.9)	3728 (78.4)	<0.01
BAME, n (%)	72 (3.4)*	205 (4.3)	ns
Patient facing role, n (%)	1302 (66.1) [†]	3296 (69.3)	ns

*Data available for 2,100 members of staff; [†]data available for 1,971 members of staff. BAME = Black, Asian and minority ethnic, ns = non-significant.

examined this association using binary logistic regression analysis, the odds (95% confidence intervals) of those in patient-facing roles testing positive for the antibody test was slightly more than double than those in non-patient facing roles (OR 2.02 [1.51–2.69], $p < 0.0001$), after adjusting for age, sex and ethnic group (Fig 1).

The result for risk of exposure by ethnicity of the HCW was more reassuring. Of the 2,100 members of staff for whom details of ethnic background and a valid COVID-19 antibody result was available, the frequency of those that tested positive to SARS-CoV-2 antibody in the BAME (14/72 [19.4%]) and White (395/2028 [19.5%]) groups was similar (Fisher’s exact test $p = 1.00$). When the ethnicity of the staff who were tested was stratified by clinical role, the proportion of BAME staff who were tested was similar in both the patient-facing and non-patient facing-roles ($p = ns$). In multivariable binary logistic regression analysis, the risk remained similar in the BAME ethnic group (OR of 1.03 [0.56–1.87], $p = 0.93$) compared to the White group, adjusted for age, gender and role within the organisation (Fig 1).

Discussion

The prevalence of SARS-CoV-2 antibody positive tests in HCWs reported from various countries differs considerably. In New York City, the prevalence of COVID-19 antibody seropositive status among 40,329 HCWs was 13.7%,⁴ whereas 9.3% of HCWs from a large tertiary hospital in Spain tested positive.⁵ Another study with data from various hospitals from the Capital Region of Denmark identified 4.04% of all HCWs as being COVID-19 seropositive.⁶ The possible reasons for the reported wide variation in seropositivity for COVID-19 among HCWs from different countries is unclear but is likely to include the time point of testing, variances in PPE guidance and adherence to guidelines, and differences between the various antibody assays.

These data provide several important insights into the COVID-19 epidemic in the hospital sector in England. Overall, the percentage of HCW testing positive to previous exposure to SARS-CoV-2 was much higher (19.4%) than is reported in the general population (6.8%).⁷ Even staff working in non-patient facing roles had nearly double the positivity rate (13.2%) than the general population. The reasons underlying the higher risk of exposure to SARS-CoV-2 in frontline staff are unclear from our data. More work is required to ascertain the reasons behind this finding. The explanations are likely

to be complex and multifactorial and could include shortcomings in PPE or lack of meticulous adherence to the PPE guidance formulated by Public Health England for patient-facing staff.⁸ It is also possible that the number of HCWs from the BAME background were insufficient in our study to be able to detect a statistical difference.

Conclusion

Our results reinforce the need for more research to be undertaken to ensure that the most effective PPE for frontline staff is ultimately made available. It is reassuring that members of staff from BAME groups do not seem to have had a higher risk of exposure to SARS-CoV-2 infection. ■

Acknowledgements

We acknowledge the assistance of many staff involved in establishing and supporting the COVID-19 antibody screening programme.

References

- 1 The US Centers for Disease Control and Prevention. *Interim operational considerations for public health management of healthcare workers exposed to or with suspected or confirmed COVID-19: non-US healthcare settings*. CDC, 2020. www.cdc.gov/coronavirus/2019-ncov/hcp/non-us-settings/public-health-management-hcw-exposed.html [Accessed 29 June 2020].
- 2 NHS. *Who's at higher risk from coronavirus*. www.nhs.uk/conditions/coronavirus-covid-19/people-at-higher-risk/whos-at-higher-risk-from-coronavirus [Accessed 12 June 2020].
- 3 Public Health England. *Evaluation of Roche Elecsys AntiSARS-CoV-2 serology assay for the detection of anti-SARS-CoV-2 antibodies*. PHE, 2020. Available from www.gov.uk/government/publications/covid-19-laboratory-evaluations-of-serological-assays [Accessed 16 June 2020].
- 4 Moscola J, Sembajwe G, Jarrett M *et al*. Prevalence of SARS-CoV-2 antibodies in health care personnel in the New York City area. *JAMA* 2020;324:893–5.
- 5 Garcia-Basteiro A, Moncunill G, Tortadaja M *et al*. Seroprevalence of antibodies against SARS-CoV-2 among health care workers in a large Spanish reference hospital. *Nature Comm* 2020;11:3500.
- 6 Iversen K, Bundgaard H, Hasselbalch R *et al*. Risk of COVID-19 in health-care workers in Denmark: an observational cohort study. *Lancet Infect Dis* 2020, in press (DOI: 10.1016/S1473-3099(20)30589-2).
- 7 Office for National Statistics. *Antibody tests for Covid-19*. www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/coronaviruscovid19infectionsurveyplot/5june2020#characteristics-of-people-testing-positive-for-covid-19 [Accessed 12 June 2020].
- 8 Public Health England. *COVID-19: infection prevention and control (IPC)*. www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control [Accessed 12 June 2020].

Address for correspondence: Dr Salman Razvi, Translational and Clinical Research Institute, Newcastle University, Newcastle upon Tyne NE1 3BG, UK. salman.razvi@ncl.ac.uk