Research Letter

Seroprevalence of SARS-CoV-2 in migrant workers in Kuwait

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The low-skilled migrant population in Kuwait is large constituting about one-fifth of the country's 4.7 million population.[1] The number of diagnosed cases in the migrant population has been high, representing >60% of all cases in Kuwait at the study time.[2] The coronavirus disease 2019 (COVID-19) epidemic started in Kuwait on 24 February 2020 with three confirmed travel-related cases. By 15 March 2020, the appearance of community-based cases indicated local transmission of the virus, leading to an acceleration in the number of new daily cases especially among migrant workers starting 30 March 2020. These workers reside in close accommodations, which increases the risk of COVID-19 transmission.[1]

Knowing the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) prevalence among migrant workers is necessary to assess the risk of disease transmission in the community and to help control the local epidemic. Studies reported SARS-CoV-2 prevalence in populations resides in high-risk accommodations such as migrant workers, refugee camps and homeless shelters ranging between 11.7 and 88%.[3–6] We estimated the prevalence of SARS-CoV2 infection and seroprevalence (anti-SARS-CoV-2 antibodies, IgM and IgG) among asymptomatic migrant supermarket workers.

This manuscript is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) protocol.[7] The Ministry of Health and in cooperation with Cooperative Society in Kuwait conducted intensive COVID-19 testing of migrant workers in response to reports of cases in March 2020. Between 23 May and 26 June 2020, we enrolled 525 asymptomatic non-Kuwaiti migrant workers employed at the Cooperative Society supermarkets across Kuwait. All workers were adult males over the age of 20 years, have been resident of Kuwait for a minimum of 6 months, and worked as cashiers, packers or cleaners. All participants lived under similar housing conditions with limited social distancing.

A multi-stage random sampling method was used to recruit participants from 21 supermarkets, stratified by the five health regions in Kuwait. Two to four districts within each region were selected and the central supermarket was selected for participant recruitment. Up to 30 eligible participants were recruited, where every third worker encountered during a convenience sampling 'walk-through' of the sampling site was selected; exclusion criteria were inability to provide informed consent and worker with apparent COVID-19-like symptoms including temperature, cough and runny nose.

Eligible participants received self-administered questionnaires comprising five questions covering basic sociodemographic (age, nationality), major chronic conditions (hypertension, diabetes, lung conditions and any other chronic conditions) and tobacco smoking (smoker or non-smoker). All provided written informed consent (in English or Arabic) before participation.

Specimen collection (nasopharyngeal swab) and diagnostic testing for SARS-CoV-2 infection via reverse-transcriptase real-time polymerase chain reaction (PCR) using commercially available kit were conducted in accordance with WHO guidelines.[8] To assess the anti-SARS-CoV-2 antibodies (IgG/IgM), a lateral flow chromatographic immunoassay point-of-care rapid test (Biozek Medical, COVID-19 Rapid Test Cassette, The Netherlands) was applied directly to a fingerprick blood sample and result read in 15 min. It was reported that similar lateral flow immunoassays have 66% sensitivity and 97% specificity.[9]

Table 1. Prevalence estimates for SARS-CoV-2 and serology stratified by participant risk factors (N= 525 supermarket workers)[a]

Characteristics	No. participants	SARS-CoV-2 prevalence 95% CI	P value	Seroprevalence[b] 95% CI	P value
Overall	525	21.0% (17.7–24.7)		38.1% (34.0–42.3)	
Age group (years)			0.709		0.376
20–30	50	22.0% (12.6–35.5)		36.0% (24.0–50.0)	
31–40	150	18.0% (12.6–25.0)		32.7% (25.6–40.6)	
41–50	171	21.1% (15.6–27.8)		40.9% (33.8–48.5)	
>50	154	23.4% (17.3–30.7)		40.9% (33.4–48.9)	
Hypertension			0.261		0.648
Yes	69	26.1% (17.1–37.7)		40.6% (29.7–52.5)	
No	456	20.2% (16.7–24.1)		37.7% (33.4–42.3)	
Diabetes			0.293		0.481
Yes	70	25.7% (16.8–37.2)		34.3% (24.1–46.1)	
No	455	20.2% (16.8–24.2)		38.7% (34.3–43.3)	
Lung condition			0.581		0.488
Yes	15	26.7% (10.4–53.4)		46.7% (24.0–70.7)	
No	552	20.8% (17.5–24.5)		37.8% (33.7–42.1)	
Other conditions			0.464		0.093
Yes	9	11.1% (1.5–50.1)		11.1% (1.53–50.1)	
No	516	21.1% (17.8–24.9)		38.6% (34.5–42.9)	
Smoker			0.040		<0.001
Yes	207	16.4% (12.0–22.1)		28.0% (22.3–34.5)	
No	318	24.0% (19.5–29.0)		44.7% (39.3–50.2)	

[a]*P* values are based on chi-square test of the differences in risk factors and prevalence measures. These *P* values are not adjusted for the dependence of responses within supermarket locations.
[b]Seroprevalence defined as either a positive IgM or IgG rapid SARS-CoV-2 antibody test.

The overall prevalence of PCR-detected SARS-CoV-2 in 525 migrant workers was 21.0% (95% CI 17.7–24.7), and the seroprevalence was 38.1% (95% CI 34.0–42.3). Nearly 50% of the workers had one of three outcomes: resolved infection (29.0%), early infection (11.8%) or late infection (9.1%), whereas the other 50% were negative for both SARS-CoV-2 and antibodies, and were presumed to be 'susceptible' (Supplementary material Table S1). The seroprevalence for IgM, IgG and both IgM and IgG were 8.2% (95% CI 6.1–10.9), 36.8% (95% CI 32.7–41.0) and 6.9% (95% CI 5.0–9.4), respectively.

The median age of migrant workers was 43 years. Approximately 64% of workers were Egyptians, 14% were Bangladeshi and 8% were Indians. The remaining 14% were from 12 different nationalities. The percentage of workers with hypertension, diabetes, lung conditions (mostly asthma), other chronic conditions (mostly heart disease) and smoking were 13.1%, 13.3, 2.9, 1.7 and 39.4%, respectively.

The distribution of the SARS-CoV-2 prevalence by age, underlying conditions and smoking for the migrant workers is shown in Table 1. There were no significant differences in both prevalence measures by age groups or any of the underlying conditions. Based on the univariate analysis (chi-square test), both SARS-CoV-2 prevalence and seroprevalence were lower among daily smokers compared to non-daily smokers (Table 1). However, when we accounted for the dependency-effect within supermarket and adjusted for age and underlying conditions in the multivariable generalized estimating equation (GEE) model (STATA version 15.1 (Stata Corp., College Station, Texas)), there was no statistical significance difference in SARS-CoV-2 prevalence between smokers and non-smokers (OR = 0.64 [95% CI: 0.41–1.00]), whereas smokers were

significantly less likely to be seropositive compared to non-smokers (OR= 0.49 [95% CI: 0.34–0.72]). Interestingly, when stratifying the seroprevalence by smoking status, age and the underlying conditions as a multiple factor (none, one factor or two factor or more), younger smokers with no or few underlying conditions had lower seroprevalence compared to non-smokers with more underlying conditions especially in the older age groups (Supplementary material Table S2).

The prevalence of SARS-CoV-2 virus among asymptomatic supermarket workers was surprisingly high and poses substantial transmission risk to others in the community. Furthermore, high seroprevalence estimate indicates historical infections among workers who either recovered or were in late stage of the disease. SARS-CoV-2 positive workers in this study were quarantined for 14 days at a designated dormitory provided by the employer.

Studies assessing the prevalence of SARS-CoV-2 at the population level (whether in the wide community or in specific populations) are limited. A large segment of the population in many developing countries such as Qatar, United Arab Emirates, Singapore and Hong Kong is composed of low-skilled migrant workers. Hence, this study fills a knowledge gap related to COVID-19 among migrant workers.

In this study, none of the underlying conditions (hypertension, diabetes and lung condition) were associated with SARS-CoV-2 prevalence or the seroprevalence in the worker population. Our study was not based on clinical data from diagnosed cases, which might explain the difference in our findings compared to other studies.

Smoking has a negative health effect associated with several respiratory diseases.[10] Current knowledge on the relationship

between smoking and COVID-19 is based mostly on clinical cases and less on population-based studies. We believe that the overall seroprevalence and smoking trend may be confounded by age and underlying conditions; hence, these findings should be interpreted with caution.

The study has few limitations: prevalence estimates represented a single point-of-time measures (i.e. snapshot) of the virus and antibodies in the study population; both diagnostic tests have relatively moderate/low sensitivity; selection bias due to enrolled workers might not have been representative of supermarket workers across Kuwait; and information bias due to self-reported information via the questionnaire.

In conclusion, high SARS-CoV-2 infection prevalence and seroprevalence in low-skilled migrant workers who worked at supermarkets in Kuwait might have played a role in the disease spread in the community. The higher prevalence is likely attributed to workers' housing conditions where physical distancing opportunities are limited and intensive testing of this population.

Author contributions

All authors were involved in the scholarly creativity and design of the study, with W.Q.A., H.B., J.C.L. and M.A. involved in the implementation of the study (recruitment and sample collection). Authors W.Q.A., S.M.A., W.C. and H.V. were involved in reviewing the study and manuscript methodology, and W.Q.A, J.C.L., S.M.A. and H.V. conducting the statistical analyses and write-up.

Ethical Approval

The study was approved by the Ministry of Health Standing Committee for the Coordination of Health and Medical Research (Ethics Committee), Kuwait City, Kuwait (Approval number: 1435/2020).

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