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Short Communication

Severe acute respiratory syndrome coronavirus 2 seroprevalence survey among 10,256 workers in Kuwait

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ABSTRACT

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has emerged as a global pandemic. Seroprevalence surveillance is urgently needed to estimate and monitor the growing burden of coronavirus disease 2019 (COVID-19). The aim of this study is to estimate the seroprevalence of SARS-CoV-2 infection among worker population residing in areas under lockdown in Kuwait and investigated their risk factors associated with a positive status.

From April 18 to May 10, 2020 a randomly sampled, worker-based survey was conducted in 7 governorate in Kuwait (Ahmadi, Farwaniya, Hawali, Asma, Jahra, and Mubarak Alkabeer) among 10,256 workers. SARS-CoV-2 IgG and IgM antibodies was assessed using a commercially point-of-care lateral flow immunoassay (Biozek medical COVID-19 IgG/IgM Rapid Test Cassette).

We estimated an overall seroprevalence (IgG or IgM positive) of 5.9% (95% CI: 5.4–6.3). Notably, SARS-CoV-2 seropositivity was significantly higher in males (6.2%) than females (1.9%) ($p < 0.001$). Furthermore, the seroprevalence was significantly different by age group, governorate, and nationality of the workers.

These results highlighted that the relatively low prevalence of anti-SARS-CoV-2 antibodies in hotspot areas in a specific population. Thus, we emphasize to repeat the serosurvey in the general population to assess the magnitude of viral spread and monitor the growing burden of COVID-19 in Kuwait.

1. Introduction

Coronaviruses belong to the *Coronaviridae* family that usually causes mild to moderate respiratory illnesses like the common cold. However, a novel strain of coronavirus, belonging to the genus *betacoronavirus,* emerged in Wuhan City of China's Hubei province in December 2019 and because of increased transmission potential this pathogen spread globally evolving into a pandemic [1,2]. This newly discovered strain of coronavirus has been referred to as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which primarily causes an acute respiratory disease termed as the Coronavirus Disease 2019 (COVID-19) and has the ability to extrapulmonary manifestations [3].

Currently, two main diagnostic methods are being employed namely, molecular tests that detect viral RNA by reverse trascriptase polymerase chain reaction (RT-PCR) and serological tests that detect anti SARS-CoV-2 antibodies [4]. However, limitations with RT-qPCR have been reported such as, false-negative cases due to improper sample collection and transportation, changes in the diagnostic accuracy during the course of the disease, precarious supply of reagents and the cost of tests [5,6]. In view of these limitations with RT-qPCR method, immunoassays may offer an alternative diagnostic approach to detect undiagnosed cases with

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an advantage of rapid turn-around-time and lower cost. Additionally, profile of specific antibodies in patient's serum or plasma samples can guide in determining the course of the disease providing information on both active infection and past exposure with potential immunity to the infection [7].

To date, serological data are lacking in Kuwait. Therefore, we conducted a cross-sectional seroprevalence study among the migrant workers residing in areas under lockdown in Kuwait and investigated their risk factors associated with a positive status.

2. Materials and methods

2.1. Study population

We performed a cross-sectional serological survey of SARS-CoV-2 antibodies (IgG and IgM) between April 18 and May 10, 2020. During this time there were entry and exit restrictions (lockdown) in place on two districts in Kuwait, namely Jeleeb Al Shuyoukh and Mahboula. These areas have a high population density with a large proportion of the residents being migrant workers. These areas are characterized by multiple occupancy housing with hostel like conditions and shared facilities where social distancing measures are difficult to apply. Employees wanting to relocate their employees from the lockdown areas had to ensure appropriate accommodation for quarantine in areas not under lockdown. All individuals who requested to be relocated outside of the lockdown areas of Jeleeb al Shuyoukh and Mahboula were included. The exclusion criteria were age less than 18 years old. Next, we enrolled participants from Hawali, Asma, Jahra, and Mubarak Alkabeer governates. Those participants had close contact with confirmed positive cases by real time RT-PCR. All participants provided informed consents. A total of 10,256 workers finger prick blood samples were collected during lockdown period. The protocol was approved by the permanent Committee for Coordination of Medical and Health Research, Ministry of health, Kuwait and the study was conducted in accordance with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the institution's human research committee.

2.2. Detection of SARS-CoV-2 antibodies

A point of care test was used for the detection of SARS-CoV-2 antibodies from whole blood according to manufacturer instructions. The point-of-care (POC) device is a lateral flow chromatographic immunoassay for the qualitative detection of IgG and IgM antibodies to SARS-CoV-2 in human whole blood; serum or plasma specimen was used (Biozek medical COVID-19 IgG/IgM Rapid Test Cassette, Apeldoorn, The Netherlands). For this study, a finger prick blood sample was applied to the device. The manufacture reported sensitivity of 100% for IgG and 88% for IgM and specificity of 98% for IgG and 96% for IgM when compared to RT-qPCR as the gold standard. The estimated seroprevalence was the proportion of workers having a positive result for either the IgM or IgG band of the POC test.

2.3. Statistical analysis

The relationship between the seroprevalence and potential characteristics (sex, age groups, home location by governorate, and nationality) was assessed using 2 × 2 chi-square or 2 x n likelihood ratio chi-square test, as appropriate. Binomial exact 95% confidence intervals (CI) were constructed around proportions. Nationalities with frequency less than 50 were collapsed into one category as 'Other nationalities'. A multivariate analysis was conducted to assess the association between seroprevalence and the study variables (worker characteristics) via a logistic regression model. Statistical analyses were performed using STATA software version 15.1 (STAT Corp., College Station, Texas). A p-value of less than 0.05 was used as a cut-off value for statistical significance.

3. Results

The mean age of participants was 37.4 years (SD 9.5 years) and most blood specimens were derived from men (90%). The overall seroprevalence found among workers (n = 10,256) was 5.9% (95% CI: 5.4–6.3). Based on the univariate analysis, the seroprevalence was significantly higher in males (6.2%) than females (1.9%) ($p < 0.001$) (Table 1). Furthermore, the seroprevalence was significantly different by age group, governorate, and nationality of the workers. When adjusting for the variables in the multivariate logistic regression model, workers in age group 41–50 years were significantly more likely (adjusted OR = 1.3, $P = 0.038$) to be seropositive than the reference group (≤30 years). In addition, workers live in the five different governorate were significantly more likely to be seropositive than those workers who live in Ahmadi governorate (Table 1).

Analysis according to nationalities showed that workers who are Nepalese; Filipinos, or from other nationalities were at significantly lower probability to be seropositive compared to Bangladeshi workers (Table 1).

4. Discussion

SARS-CoV-2 seroprevalence surveys in community-based settings are critical for tracking spread of SARS-CoV-2 and define the potential existing of immunity. In addition, data from these studies could be used to target public health interventions [8]. There are several limitations of our study. First, we used a rapid serological test therefore; the seroprevalence of SARS-CoV-2 antibodies might have been influenced. Secondly, our sample is not representative of the general population because we assessed the seroprevalence among non-Kuwaiti workers.

To the best of our knowledge, this is the first study that attempts to describe the seroprevalence of SARS-CoV-2 among workers in Kuwait. Overall, we found a prevalence of 5.9% of workers were previously exposed to SARS-CoV-2 on April–May, 2020 in Kuwait. This finding showed that in these geographical areas of Kuwait, approximately 95,771 people might have developed antibodies (5.9% of 1623,242 inhabitants), which is greater than the cumulative number of confirmed infections in the county on same period (7623 cases) . In addition, no significant association between the country's incidence of COVID-19 cases and their associated seroprevalence [9]. Notably, this percentage is completely comparable to that found in April in Italy (~5%) [10], Spain (5.0%) [11], and Los Angeles (4.65%) [12]. Higher seroprevalences was also reported in New York (12.5%) [13]. Whereas, a low seroprevalence was reported Southern Brazil (0.05%–0.22%) [14], Greece (0.36%) [15], Denmark (2%) [16], France (2.7%) [17], and Wuhan (3.2–3.8%) [18] in the beginning of COVID-19 pandemic. The seroprevalence can vary according to different sites and the selected group and can increase with time in the longitudinal follow-up [9].

With regard to gender, the seroprevalence was significantly higher in males (6.2%) than females (1.9%) ($p < 0.001$). This data seems be in line with several reports [9,16]. However, other studies reported that the seroprevalence among males and females was similar [11,17]. These findings indicated no clear association between seroprevalence and gender, further studies are warranted to address this issue.

Notably, we found that the seroprevalence was significantly among age group 41–50 years old (7.6%). This data seems to be consistent with previous epidemiological studies wish showed that younger people have a lower risk than other age groups [9,11,19].

In conclusion, the results of the present seroprevalence demonstrated a relatively low rate of SARS-CoV-2 antibodies in Kuwait workers population sample in early pandemic and are clearly insufficient to provide herd immunity. Moreover, the seroprevalence reported in this study can only reflect the situation of the time and specific population in which the surveillance investigation was done. Thus, repetition of serosurvey in the general population-based can better inform the viral spread, identify the factors that mitigate transmission and monitor the growing burden

Table 1
Seroprevalence estimates and adjusted odds ratios of workers (n = 10,256) stratified by sex, age, governorate, and nationality.

Characteristics	No. workers	Seroprevalence95% CI	*P*-value	Adjusted OR	95% CI	*P*-value
Sex*			<0.001			
Female	393	1.9% (0.9–3.7)		1	[Reference]	
Male	9236	6.2% (5.7–6.7)		1.6	(0.8–3.8)	0.155
Age group (years)			<0.001			
≤30	2609	5.1% (4.4–6.1)		1	[Reference]	
31–40	3784	5.2% (4.5–5.9)		1	(0.8–1.2)	0.779
41–50	2197	7.6% (6.6–8.9)		1.3	(1.0–1.6)	0.038
>50	1666	6.3% (5.2–7.6)		1.2	(0.9–1.6)	0.263
Governorate*			<0.001			
Ahmadi	3664	2.9% (2.4–3.5)		1	[Reference]	
Farwaniya	5239	8.0% (7.3–8.8)		2.9	(2.3–3.7)	<0.001
Hawali	255	4.7% (2.7–8.1)		2	(1.0–3.7)	0.035
Asma	192	6.3% (2.7–8.1)		2.4	(1.3–4.4)	0.007
Jahra	166	10.8% (6.9–16.6)		4.2	(2.5–7.2)	<0.001
Mubarak Alkabeer	101	9.9% (5.4–17.4)		4.2	(2.1–8.3)	<0.001
Nationality*			<0.001			
Bangladesh	632	6.6% (4.9–8.9)		1	[Reference]	
Egypt	1790	6.7% (5.7–8.0)		1	(0.7–1.5)	0.852
India	5856	6.4% (5.8–7.0)		1.1	(0.8–1.6)	0.572
Nepal	409	2.0% (1.0–3.9)		0.3	(0.1–0.6)	0.001
Other nationalities	218	1.1% (0.3–4.5)		0.2	(0.04–0.8)	0.02
Pakistan	269	8.9% (6.1–13.0)		1.1	(0.6–1.8)	0.796
Philippine	404	1.7% (0.8–3.6)		0.3	(0.1–0.7)	0.003
Syria	51	3.9% (1.0–14.4		0.5	(0.1–2.0)	0.309

* Data are missing.

of COVID-19 in order to evaluate the public health efforts in COVID-19 response in Kuwait.

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Declaration of Competing Interest

All authors declare that there are no conflicts of interests.

CRediT authorship contribution statement

Haya Altawalah: Conceptualization, Funding acquisition, Project administration, Writing - original draft. **Wadha Alfouzan:** Conceptualization, Investigation, Methodology, Formal analysis, Writing - original draft. **Rita Dhar:** Data curation, Software. **Walid Alali:** Data curation, Software, Validation, Visualization. **Hamad Bastaki:** Data curation, Investigation, Methodology, Resources. **Talal Al-Fadalah:** Data curation, Investigation. **Fahad Al-Ghimlas:** Investigation, Methodology, Writing - review & editing. **Ali A. Rabaan:** Writing - review & editing. **Sayeh Ezzikouri:** Data curation, Visualization, Writing - review & editing.

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