AJMAS
https://alqalam.utripoli.edu.ly/science/ eISSN 2707-7179

Original Article

Seroprevalence of Antibodies to SARS-CoV-2, at Four Sites in Al-Jabal Al Akhdar, Libya

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ARTICLE INFO

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Received: *23-10-2021* ***Accepted:*** *06-11-2021* ***Published:*** *08-11-2021*
Keywords: *Seroprevalence, Libya, SARS-CoV-2, Antibodies.*

ABSTRACT

Background and aims*. SARS CoV-2 is a global pandemic that has affected all aspects of life. The implementation of strategies to mitigate possible cases of SARS CoV-2 has become particularly important in controlling the spread of the pandemic. Such studies are lacking in Libya. The objectives of this study were to determine the presence of anti-SARS-CoV-2 antibodies in random populations in four different regions in Northeast of Libya (El-Beyda, Shahat, Al-Gubba and Al-Abraq).* ***Methods****. This study included all 1567 samples from November 1-14, 2020. A total of 1567 tested cases of SARS-CoV-2 were recorded in four regions with men (63.9%) and women (36.1%). Ages ranged between 9 and 84 years. The median age of the tested individuals was 35-36 years for both genders.* ***Results****. Over all, the number of cases was higher at age groups 20-60 years in four regions. Overall subjects, serological tests to detect anti SARS-CoV-2 antibodies were found positive for (IgG, IgM) with (57, 46%), (24.4, 2.9%), (95.4, 91.7%) and (60.9, 51.9%) in El-Beyda, Al-Gubba, Al-Abraq and Sahhat respectively. Over all, the number of positive IgG cases was higher at age groups 20-50 years in four regions with significant difference only in Al-Abraq region. Broad geographic variability and spatiotemporal spread variation of the SARS-CoV-2 pandemic in Libya was observed, indicating a significant increase of SARS-CoV-2 spread starting in the middle of July 2020.* ***Conclusion****. Detection of SARS-CoV-2 in the early stages of the epidemic is particularly important in understanding the pandemic spread. Such assessments are essential for designing effective prevention and control programs aimed at reducing the impact of the SARS CoV-2 pandemic, particularly in countries with limited resources.*

Cite this article: *Sulayman F, Ali MS, Qowaider S. Seroprevalence of Antibodies to SARS-CoV-2, at Four Sites in Al-Jabal Al Akhdar, Libya. Alq J Med App Sci. 2022;5(1):1-5. https://doi.org/10.5281/zenodo.5651949*

INTRODUCTION

Despite the fact that the coronavirus illness linked with severe acute respiratory syndrome 2 (SARS-CoV-2) just arose at the end of 2019, the related sickness–coronavirus disease 2019 (COVID-19). According to the World Health Organization (WHO), this virus spread quickly around the world, resulting in a global pandemic [1]. WHO named the virus, the 2019 novel coronavirus (2019-nCoV) on January 7, 2020 [2]. On February 11, 2020, It named the illness associated with 2019-nCoV the 2019 novel coronavirus disease (COVID-19/ SARS-CoV-2) [3]. As of September 7, 2020, nearly 27 million SARS CoV-2 cases have been reported worldwide, causing 876,616 deaths, with an associated case fatality rate of 3.3% [1, 4, 5]. Women diagnosed with SARS CoV-2 far outnumber infected men among adults of working age, according to data from eleven European nations that offer comprehensive distribution of SARS CoV-2 cases by sex and age. Around retirement, this tendency reverses: infection rates among women diminish between the ages of 60 and 69, resulting in a cross-over with infection rates among males. [6]. The first case of SARS CoV-2 was identified in Libya on 24/3/2020, and about 2 months later, the number of reported SARS CoV-2 cases started to increase notably. The outbreak was first prominent in the southern region (Sabha) and then spread to the western and eastern parts of Libya. By 24/12/2020, the reported total number of deaths from SARS CoV-2 reached 1415 [7].

Currently, the diagnosis of SARS CoV-2 is confirmed by the detection of SARS-CoV-2 via real-time reverse transcription polymerase chain reaction (qRT-PCR) assays [8]. However, the clinical manifestations of SARS CoV-2 include both respiratory and extra-respiratory signs and symptoms and can range from an asymptomatic mild disease to severe disease/ acute respiratory tract infections [4, 9, 10]. Therefore, misdiagnosis of SARS CoV-2 can occur in patients without a characteristic presentation, even for asymptomatic and mild infections, and in places where qRT-PCR is unavailable. These issues could limit our understanding of the extent of SARS-CoV-2 infection and further affect the implementation of infection control and prevention policies. To resolve this misunderstood, the use of a serological test to detect antiSARS-CoV-2 antibodies could be a better way to estimate the burden of SARS-CoV-2 infection than the PCR method, and help improve understanding of the associated epidemiology [8, 11-14]. Detecting antibodies against SARS-CoV-2 (IgG and IgM) plays a complementary role in providing epidemiological information [15]. Hence, this work was conducted to provide updated and comprehensive information about the random test for seroprevalence of the SARS-CoV-2 antibodies (IgG and IgM) in four different populations in Al-Jabal Al Akhdar, Libya with age and genders.

METHODS

Subjects information and data collection

The Supreme Committee to Combat the Corona Epidemic of the Interim Government was tested for SARS-CoV-2 in four different regions in Al-Jabal Al Akhdar (El-Beyda, Al-Gubba, Al-Abraq and Shahhat). Blood sample were collected for serological testing for IgG and IgM antibodies. To determine the presence of infection in the study group Sample collection: The samples were collected by trained rapid response team according to CDC guidelines [16].

To determine the immunological status of the study group: Technique: A rapid serological test using Lateral flow immunoassay was performed to assess the presence of the specific SARS CoV-2 IgM and IgG antibodies. Kit: Right Sign kits manufactured by Biotest Company Lot No. COV20030003 and the authorized representative is Shanghai International Holding Corp. GmbH (Europe) 20537 Hamburg, Germany. Test performance: According to the manufacturing company the test combined IgG and IgM sensitivity and specificity is: Sensitivity is 81.7% Specificity 96.7%.

Statistical Analysis

The data were interoperated in Tables; the numerical data were shown as number and percentage. To find the significant difference between the observed variable studied, Chi –Square test, unpaired t test were used, P value was taken as level of significance at <0.05. Statistical analysis was carried out in Minitab software (version17).

RESULTS

The study population consisted of randomly 1567 people from four different regions tested for SARS-CoV-2 IgM and IgG from 1 to 14 November 2020. The demographic characteristics for each region according to age groups were illustrated separately in Table 1. The El-Beyda City considered as largest contributed (in term of area and number of population), followed by Shahat and Al-Gubba regions, while Al-Abraq is the smallest region. Of these cases, 1001, 566 (63.9, 36.1%) were men and women respectively. Ages ranged from 9 to 84 years.

The age distribution of men and women is shown in Table 1. The median age of the tested individuals was 35-36 years for both genders. Over all, the number of cases was higher at age groups 20-60 years in four regions. All serological assays for anti SARS-CoV-2 antibodies were showed positive results for both IgM and IgG without significant difference between positive and negative cases in male and female subjects in three rejoins, except in Al-Abraq region was found significant difference (Table 2).

The age distribution of positive IgG and negative IgG is shown in Table 3 that shown significant difference only in Al-Abraq region. Over all, the number of positive IgG cases was higher at age groups 20-50 years in four regions.

Table 1: Age distribution for male and female of 1567 tested cases of SARS-CoV-2 at different four regions in Al-Jabal Al Akhdar

Parameters	El-Beyda		Al-Gubba		Al-Abraq		Shahhat	
Gender No (%)	Male	Female	Male	Female	Male	Female	Male	Female
	602 (63.9)	340 (36.1)	111 (64.5)	61 (35.5)	67 (62)	41 (36)	221 (64.1)	124 (35.9)
Average of Age	35.9	34.99	32.4	42.1	34.7	31.4	37	33.7
Age group (Years)								
>15	8.6	12.1	8.1	0	13.4	9.8	7.7	15.3
16-20	11.1	10	9	4.9	11.9	17.1	11.8	10.5
21-30	20.6	22.9	39.6	21.3	17.9	24.4	16.3	23.4
31-40	21.4	16.2	18	19.7	18.4	34.1	22.6	12.9
41-50	22.4	24.7	13.5	23	22.4	9.8	24.9	26.6
51-60	10.5	9.7	9.9	24.6	10.4	2.4	10.4	7.3
61-70	3.2	3.8	1.8	6.6	3	2.4	3.6	3.2
71-80	1.8	0.6	0	0	1.5	0	2.3	0.8
<80	0.3	0	0	0	0	0	0.5	0
Total	602	340	111	61	67	41	221	124

Table 2: Results of anti-SARS-CoV-2 antibodies (IgG and IgM), PCR results for male and female of 1567 tested cases of SARS-CoV-2 at different four regions in Al-Jabal Al Akhdar (No. (%)).

Parameters No. (%)	El-Beyda		Al-Gubba		Al-Abraq		Sahhat	
	Male	Female	Male	Female	Male	Female	Male	Female
Positive IgG	318 (53)	219 (64.4)	26 (23.4)	16 (26.2)	62 (92.5)	41 (100)	123 (55.7)	87 (70.1)
Negative IgG	284 (47)	121 (35.6)	85 (76.6)	45 (73.8)	5 (7.5)	0 (0)	98 (44.3)	37 (29.8)
P. Value	0.14		0.62		0.002		0.04	
Positive IgM	251(41.7)	182 (53.5)	3 (2.7)	2 (3.3)	58 (86.6.)	41 (100)	102 (46.2)	77 (62.1)
Negative IgM	351(58.3)	158 (46.5)	108(97.3)	59 (96.7)	9 (13.4)	0 (0)	119 (53.8)	47 (37.9)
P. Value	0.89		0.65		0.00		0.23	
Positive IgG/IGM	236(39.5)	182 (53.5)	2 (1.8)	2 (3.3)	60 (89.6)	40 (97.6)	96 (43.4)	76 (61.3)

Table 3: Age distribution for positive IgG and negative IgG of 1567 tested cases of SARS-CoV-2 at different four regions in Al-Jabal Al Akhdar (%).

Parameters	El-Beyda		Al-Gubba		Al-Abraq		Sahhat	
No. (%)	Positive IgG	Negative IgG	Positive IgG	Negative IgG	Positive IgG	Negative IgG	Positive IgG	Negative IgG
	539	403	42	130	102	6	210	135
Age group (Year)								
>15	7.01	2.87	1.16	4.07	12.04	0	7.54	2.90
16-20	6.80	3.93	1.74	5.81	12.96	0.93	7.54	3.77
21-30	11.04	10.40	7.56	25.58	17.59	2.78	9.57	7.54
31-40	9.87	9.66	4.07	14.53	23.15	1.85	11.30	9.57
41-50	14.44	8.81	4.65	12.21	17.59	0	16.52	8.99
51-60	5.84	4.35	4.07	11.05	7.41	0	6.09	3.19
61-70	1.27	2.12	1.16	2.33	2.78	0	1.16	2.32
71-80	0.74	0.64	0	0	0.93	0	0.87	0.87
<80	0.21	0	0	0	0	0	0.29	0
P. Value	0.45		0.082		0.007		0.28	
Total	539	403	42	130	102	6	210	135

DISCUSSION

SARS CoV-2 is currently the world's leading threat to human health, posing serious challenges for governments and healthcare workers in terms of its spread, treatment, and prevention. As a result, there is a pressing need to comprehend disease behavior and how any preventive or controlled measures may have influenced its spread. Therefore, the current study aimed to study the demographic characteristic with serological results of SARS CoV-2 patients in the Al-Jabal Al Akhdar in Northeast of Libya and to compare them with other affected countries.

Libya has been hampered by a major armed conflict since 2011. The country is divided and two counterattack governments were founded. This has been clearly reflected on the quality of health services all over the country and citizens suffer immensely to get the basic and emergency services [17]. Age- and sex-specific pattern of infections in combination with age and sex composition of the population are key for understanding and explaining differences in SARS CoV-2 transmission and fatality across countries [18].

Amid uncertainties around coronavirus disease 2019 SARS CoV-2, there is one pattern which is persistent across countries and age groups: once infected, men are more likely to die from or with SARS CoV-2 than women [19-21]. These observations were agreed with our finding. It also contrasts with a seemingly gender-neutral distribution of the confirmed SARS CoV-2 cases: on average, men account for 49.5% cases across 40 countries with complete data on sex-specific infections 6 and in Libya [22]. The current study examines whether this apparent gender equality in SARS CoV-2 positive cases prevails across different age groups, which found between 21-50 years in both genders. Another study in Libya was agreed with our finding [22].

In this study, no significant difference was found between the positive and negative seroprevalence, (For both IgG and IgM against SARS CoV-2) at area of study, except in one region (Al-Abraq). Al-Abraq is smallest region in this study and people so close to each other. This result may give a good example about herd immunity. To reach herd immunity for SARS CoV-2, likely 70% or more of the population would need to be immune without a vaccine [23] (Vaccinations have not started at time of this study). The seroprevalence was ranged from 0.1% to 12.5% in the USA, and from 0.05% to 4.0% in Brazil [24-29]. These findings may be due to the fact that anti-SARS-CoV-2 antibody seroprevalence varies according to the different study countries/ regions, study populations, timing during the period of the SARS CoV-2 pandemic, and methods used for serology testing. Therefore, the seroprevalence reported in this article can only reflect the situation of the time and place in which the surveillance investigation was performed and with the specific test method used. In fact, the number of SARS CoV-2 cases is still growing rapidly, and given the time-sensitivity, a true estimation of the epidemiology of SARSCoV-2 infection remains a great challenge. Therefore, such seroprevalence surveillance should be continued and is necessary to estimate the burden of SARS CoV-2 [30].

CONCLUSION

This study was highlighted the prospects of the detection of IgM and IgG antibodies against SARS-CoV-2 as a preferred method for the identification of asymptomatic SARS-CoV-2 infection at four different region in Al-Jabal Al Akhdar. Arthurs are grateful to all the subjects for participating in this study.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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