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Determination of SARS-CoV-2 Antispike Immunoglobulin G Level after First Dose of Oxford-AstraZeneca Vaccine among Healthcare Workers in Khartoum State

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ABSTRACT

This descriptive study was done during the period from 3 to 11 June 2021 to determine the level of SARS-CoV-2 antispike IgG among Healthcare workers after the first dose of Oxford-AstraZenka vaccine in Khartoum state. A total of 40 blood samples were randomly collected. Four ml of blood samples have been collected from each participant and placed in a plain container to obtain serum samples after centrifugation for SARS-CoV-2 anti-spike IgG. *The serum samples were analyzed using Chorus TRIO analyzer based of (Enzyme-Linked- Immuno Sorbent-Assay) technique*. Our results showed that 22 (55%) of the participants were females whereas 18 (45%) were males. Most of the participants 28 (70%) aged 25-30 years old and most of them 35 (87.5%) reside in Omdurman city. Several clinical symptoms have been exhibited by participants after vaccination, ranging from arm pain at the side of the injection, headache, fever, fatigue, and GIT disturbances. With the exception of one participant, none of them have a history of previous COVID19 infection. Our results showed that 30 (75.0%) of participants were reactive (positive SARS-CoV-2 IgG) after the first dose of Oxford-AstraZenka and SARS-CoV anti-spike IgG antibody titers ranged from 1.2-2.7 S/CO and a few of participants 9 (22.5%) showed doubtful result and only one participant 2.5% have shown negative result for anti-spike IgG antibody. The mean antibody titer for male 1.47 was significantly lower than female 1.49 with P-value 0.18. Our results confirm earlier studies on Oxford-AstraZenka vaccine efficacy.

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Introduction

Coronavirus infection (COVID-19) is an infectious respiratory disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, also known as 2019 novel coronavirus or 2019-nCoV). The virus is member of the Coronavirinae family and has a microscopic crown-like shape. SARS-CoV-2 is a positive-sense single-stranded RNA virus. Covid 19 has been initially discovered in Wuhan province in China as a few cases of pneumonia of unknown etiology, and now the infection is distributed in almost all countries around the world in a short period [1,2].

The World Health Organization (WHO) announced a global health emergency of international concern on January 30, 2020, and about 10 million COVID-19 cases were confirmed worldwide in the first six months [3]. It was announced by the World Health Organization as a pandemic in March 2020. The Oxford-AstraZenka, ChAdOx1nCoV-19 (AZD1222) vaccine was developed by the university of Oxford and AstraZeneca Company and according to clinical trials, the vaccine is protective, safe and effective. [4] ChAdOx1nCOV Vaccination course consists of two separate doses (single dose contain 5x1010 viral particles) with a standard dose of 0.5 ml for intramuscular injection and second dose should be administrated between 4 and 12 weeks after the first dose [5]. The vaccine induced neutralizing protective antibodies after the first dose of Oxford AstraZeneca and minimized the development of COVID19 disease in the vaccinated individuals. The antibodies produced by B cell, which provide rapid protective immunity and generation of memory B cell, become capable of mounting a recall response whenever re-exposed [6]. The vaccine was firstly introduced to front-line healthcare workers and elderly people. Oxford-AstraZeneca vaccine is likely to be widely used globally and mainly in developing countries [7].

Due to continuous virus mutations, the outbreak of viral may happen. Therefore, scientists are constantly looking for ways to prevent or reduce lethal viral attacks on humans by the

development of vaccines. Oxford-AstraZeneca COVID19 is a vaccine developed by Oxford University and AstraZenka Company, based on the virus's genetic instructions for building the spike protein to produce protective immunity [8]. Continuous evaluation of vaccine efficacy will help to save millions of life's throughout the world, therefore this study was amid to determine of SARS-CoV-2 anti-spike Immunoglobulin G level after the first dose of Oxford-AstraZeneca vaccine among Healthcare Workers.

Study Design and Setting

This is a descriptive cross-sectional study aimed to evaluate the level of SARS-CoV-2 anti-spike IgG after the first dose of Oxford-AstraZenka vaccine among healthcare workers (HCW). This study was carried out during the period from 9 June to 11 June 2021. The blood samples were collected from a health care worker in Omdurman of pediatric medicine, Umbda, Qatar, Alnada, and Libya specialization hospital. A total of 40 samples were collected from a vaccinated healthcare worker who met the inclusion criteria.

Inclusion and Exclusion Criteria

Only HCW those had no history, COVID-19 infection, or immunodeficient were included as cases in this study, in contrary, healthy adult volunteers were included as controls. Any HCW with immunodeficient or with any kind of inflammatory disorder was excluded from this study.

Sample Collection and Processing

A total of 40 blood samples were randomly collected. Four ml of blood samples have been collected from each participant and placed in a plain container to obtain serum samples after centrifugation for SARS-CoV-2 anti-spike IgG.

Evaluation of SARS-CoV-2 Anti-Spike IgG

The principle of Chorus TRIO SARS-CoV-2 IgG kit (DIESSE Diagnostica Senese S.p.A. Strada dei Laghi 39 53035 Monteriggioni (SIENA) Italy) is based on sandwitsh ELISA technology, Using e Chorus/Chorus TRIO instruments. The Procedure was done to assess the SARS-CoV-2 anti-spike IgG in each sample according to the manufacture instructions. The disposable devices contain all reagents to perform the test when applied to the Chorus/Chorus TRIO instruments. The results are expressed in index (OD sample/ OD cut-off) where >1.1 =Positive (Reactive) result
<0.9 = Negative (Non-reactive) result Between 0.9-1.1 = doubtful result.

Data Collection

Structural questionnaire has been utilized to gather data from each participant including age, gender, and clinical information of cases. Laboratory data have been collected after analyzing samples.

Ethical Consideration

Prior *approval was taken from research ethics committee of Alzaem Alazarhi University and verbal consent was taken from each patient. And all information's taken were treated confidentially and it was used for research purposes only*.

Result

This research was conducted for the determination of SARS-CoV-2 IgG levels among healthcare workers after the first dose of Oxford-AstraZeneca COVID19 vaccine in Khartoum state. A total of 40 participants were included in this study. Our results showed that 22 (55%) of the participants were females whereas 18 (45%) were males. Most of the participants 28 (70%) aged 25-30 years old and most of them 35 (87.5%) reside in Omdurman city (Table 1). Several clinical symptoms had been exhibited by participants after vaccination, ranging from arm pain at the side of injection, headache, fever, fatigue, and GIT disturbances. With the exception of one participant none of them have a history of previous COVID19 infection. Our results showed that 30 (75%) of participants were reactive (positive SARS-CoV-2 IgG) after the first dose of Oxford-AstraZenka and SARS-CoV anti-spike IgG antibody titer ranged from 1.2-2.7 S/CO and a few of the participants 9 (22.5%) showed doubtful result and only one participant 2.5% have shown negative result for anti-spike IgG antibody (Table 2). The mean antibody titer for male 1.47 was similar to female 1.49 with P-value 0.18.

Table 1: The distribution of study group according to their gender, age and residence

Characteristic	Study group	N /%
Gender	Male Female	18 (45%) 22 (55%)
Age	25-30 y 31-40 y 41-47 y	28 (70%) 8 (20%) 4 (10%)
Residence place	Omdurman Khartoum	35 (87.5%) 5 (12.5%)

Table 2: Level of SARS-CoV-2 IgG after Oxford-AstraZeneca vaccination

Overall number of participants =40	
Number of participants	Range of SARS-CoV2 IgG result S/CO*
N= 30 (75%)	1.2-2.7 (Reactive)
N=9 (22.5%)	0.9-1.1 (Borderline)
N=1(2.5%)	>0.9 (Non-reactive)

Discussion

In this cross-sectional study, the Oxford-AstraZeneca vaccine (SARS-CoV-2 anti-spike IgG antibody) has shown a positivity rate (75%) in Sudanese healthcare workers after the first dose of Oxford AstraZenka vaccine. This result was agreed with most of the previously published data, for example, in 2021, Jia et al. study showed that SARS-COV-2 anti-spike IgG has been detected in the majority of individuals after the first dose of Pfizer-BioNTech and Oxford AstraZeneca vaccine [9]. Moreover, in the same year, Awadhesh et al., study elicited good response rate (86.8% p <0.001) after the first dose of Oxford AstraZeneca in Indian healthcare workers [10]. *With the* exception of one participant none of them have a history of previous COVID19 infection and this participant had shown a doubtful SARS-COV-2 anti-spike IgG result . About 9 (22.5%) of participants have shown doubtful results and did not show an adequate rise in SARS-CoV-2 anti-spike IgG of which three of them were smokers and six of them are working in same place and took vaccine from same source and this may indicate failure in vaccine handling and storge. *Our results found that there is no significant difference between males and females in the mean of SARS-CoV-2 anti-spike IgG antibody levels and this was disagreed with* Di Resta et al., finding that serological values were significantly higher in females; the reported side effects are more frequent in females than in males [11].

Conclusion

Oxford-AstraZenka revealed a protective immune response (IgG) in most of Sudanese healthcare workers after the first dose of vaccine. Females and males have a similar immune response. The results confirm earlier studies on Oxford-AstraZenka vaccine

efficacy. *Protective SARS-COV-2 anti-spike IgG levels after the second dose of Oxford-AstraZenka must be measured and compared with the first dose response. Further studies should be done to evaluate the cellular immune response against Oxford-AstraZenka vaccine*.

Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

Submitting authors are responsible for coauthors declaring their interests.

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