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IGG and IGM response in a group of Iraqi health care worker following SARS-CoV-2 mRNA vaccine

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ABSTRACT

The global pandemic of coronavirus disease 2019 (COVID-19) is caused by infection with the SARS-CoV-2 virus. Positive detection of IgM and IgG antibodies specific to SARS-CoV-2 has been recognized as an evidence for confirmed SARS-CoV-2 infection or vaccination.

Method: One hundred healthy health care workers from both genders over eighteen years old were participated to test their humeral response (IgG, IgM) after vaccinated with Pfizer vaccine in the vaccination center Baghdad Teaching Hospital after one week of the second shot, and one hundred healthy health care workers with matched age and gender had test of their humeral response (IgG, IgM) before they get vaccinated (control), both groups deny recent COVID-19 infection.

Result: Our finding shows that increase antibody responses of both (IgG, IgM) following vaccination with lesser extent increase of IgM titer than the obvious increase IgG titer in our entire participant compared with control.

Conclusion our result support that the vaccine successful in production of humoral immunity and protection against COVID-19 infection.

Keywords: *COVID-19, IgG , IgM.*

INTRODUCTION

Severe acute respiratory syndrome (SARS) virus disease represent a major threat to public health Epidemiological investigations have suggested that the outbreak was associated with a seafood market in Wuhan China in 2019[1, 2] more than 680 million people were infected worldwide, including more than 6.8 million related deaths (https://covid19.who.int/).Successful vaccination strategies have already provided significant protection against at least 31 human diseases [3], and it's one of the powerful measures to prevent and block the transmission of communicable diseases[4]. 4,814 million people were vaccinated worldwide with Covid-19 vaccines (https://covid19.who.int/). Positive detection of SARS-CoV-2 RNA in nasopharyngeal swab samples, sputum samples or bronchoalveolar lavage samples

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by reverse transcriptase polymerase chain reaction (RT–PCR) has been used to confirm SARS-CoV-2 infection[5] Humoral immune responses play critical roles in protecting individuals against SARS-CoV-2 infection, particularly through the production of neutralizing antibodies. Understanding humeral immune reactions to SARS-CoV-2 and how these reactions impact vaccine-induced immunity is needed specially immunoglobulin M (IgM), IgG.[6, 7] Although SARS-CoV-2 infection has been more carefully investigated using IgG and IgM antibody responses, there have been limited studies contributed to response of IgG and IgM antibody after vaccination, US Food and Drug Administration (FDA)-approved SARS-CoV-2 vaccines that are based on messenger RNA (mRNA) [8, 9] it has been demonstrated that after a single dose of SARS-CoV-2 mRNA vaccine, individuals with previous infection have more robust antibody responses when compared to infection-naive individuals [10, 11,12,13] This boost of preexisting antibody immunity from prior infection may be considered when deciding whether a single or double dose is required for vaccine-mediated protection in individuals with prior history of infection.

We aim to provide an estimate of antibody responses for both genders in three different age groups between vaccinated and non-vaccinated after one week to second dose of SARS-CoV-2 vaccination of Pfizer.

MATERIAL AND METHODS

Individuals and sample collection

We enrolled two groups, first group one hundred healthy health care workers from both genders over eighteen years old one week after vaccinated with the second Pfizer covid-19 vaccine in the vaccination center Baghdad Teaching Hospital, who had no known history of infection. Peripheral blood was collected from 50 male and 50 female from December 1/ 2021 to March 1/2022, and another group , one hundred healthy health care workers with matched age and gender had test of their humeral response (IgG, IgM) before they get vaccinated (control) .

This study was approved by the latter hospital in Baghdad governorate. Before the survey, participants were asked verbal consent to identify their willingness to take part in this study, and to ensure their rights of voluntary participation and privacy.

IgG and IgM antibody assay

To measure antibody levels of IgG and IgM titer we utilized Fluorescence Immunoassay (FIA) covid-19 titer technology following standard manufacture protocols considering <0.04 Negative and > 0.04 Positive for both IgG and IgM antibody levels with control using BIOT-YG-I FIA Immunoassay Analyzer.

Statistical analysis

All statistical analysis was performed with SPSS version 25.0 software (IBM SPSS) and a P-value <0.05 was considered to be statistically significant.

RESULTS

As of December 1/ 2021 to March 1/2022, the vaccination center of the medical city in Baghdad has vaccinated more than 100 individuals with Pfizer vaccine (50 male & 50 female) . We measured immunoglobulin G (IgG) and immunoglobulin M (IgM) antibody levels after one week of the second shot. IgG and IgM below 0.04 are considered as a negative response and values higher than0.04 are considered positive response for both genders in all age group. Mean of IgG level for male were 6.98 and 0.027 for IgM in vaccinated cases, while the mean of IgG for female were 5.360 and 0.032 for IgM in vaccinated cases. At the same time Mean of IgG for male were 0.028 and 0.022 for IgM in control (non-vaccinated) cases and mean of IgG for female were 0.028 and 0.022 for IgM in control (non-vaccinated) cases. P- Value for IgG and IgM considered statistically significant for vaccinated and non-vaccinated (control) in both genders as shown in table 1, figure 1 & 2

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TABLE 1: P-Value for IgG and IgM for vaccinated and non-vaccinated (control) in both male and female

Sex	Test	Control			Vaccinated			P-Value	Significant $P \leq 0.05$
		Mean	±	Se	Mean	±	Se		Significant $P \leq 0.05$
Male	Igg	0.028	±	0.001	6.980	±	0.213	0.000	S
Female	Igg	0.028	±	0.001	5.360	±	0.278	0.000	S
Male	IgM	0.022	±	0.001	0.027	±	0.003	0.039	S
Female	IgM	0.022	±	0.001	0.032	±	0.006	0.041	S

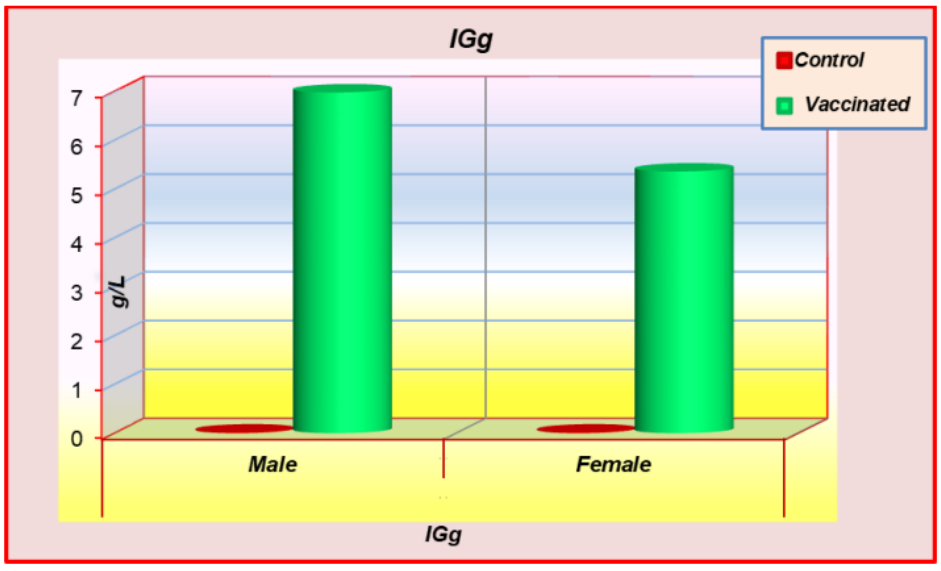

FIG 1: IgG titer in both genders for all age groups

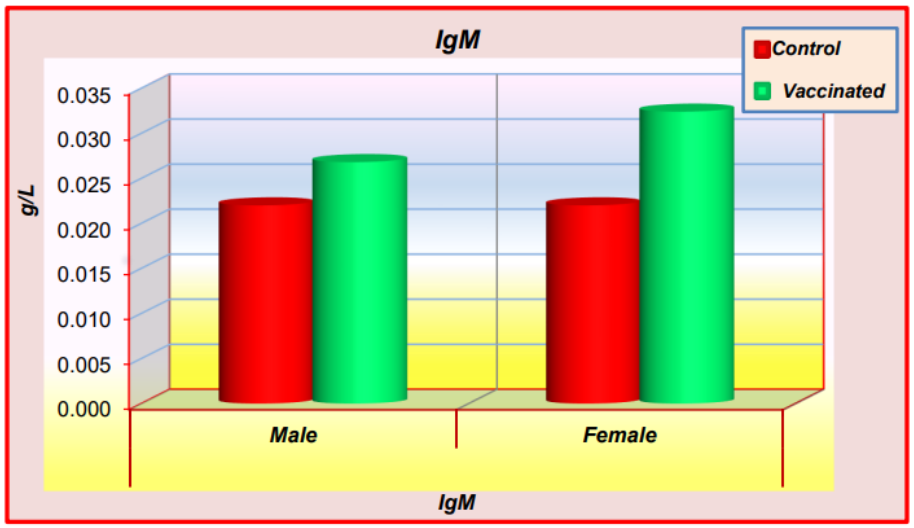

FIG 2: IgM titer in both genders for all age groups

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DISCUSSION

To the best of our knowledge, this is the first study on the association of vaccinations and immunoglobulin G (IgG) and immunoglobulin M (IgM) antibody for male and female in Iraq. IgG considered antibodies specific for covid-19 spike protein following vaccination and used to estimate vaccine response in Iraq, while IgM antibodies estimate immunity to SARS –cov-2 [14] Similar to other respiratory infections, SARS-CoV-2 infection stimulates rapid production of IgM, IgG antibodies, which are measurable in the sera, including those that bind to nucleocapsid and the spike protein [15,16,17,18,19,20]. In the post-vaccination era, IgM responses and those against nucleoprotein were much less prevalent [21] we have noticed IgM antibodies titer showed a low secondary response that was different from the IgG [22] In responses were associated with higher IgG antibodies titers [23] Jo-Lewis Banga Ndzouboukou etal., [24] found IgG antibody levels were significantly higher than IgM levels ($P<0.0001$). Sex had no effect on IgM and IgG antibody response after the second dose, which supports our result. Jassim etal., [25] found significant variations in immunoglobulin (IgG) levels ($P\leq 0.05$) between case (Recipients mRNA vaccination) and control patients, there were. In terms of age and gender, however, there were no significant changes ($P\geq 0.05$) in immunoglobulin (IgM) levels between case (Recipients mRNA vaccination) and control patients, which also support our finding.

CONCLUSIONS

Our finding shows that increase antibody responses of both (IgG, IgM) following vaccination with lesser extent increase of IgM titer than the obvious increase IgG titer in all our participant compared with control , which support that the vaccine successful in production of humoral immunity.

CONFLICT OF INTEREST

The Authors declare that they have no conflict of interests.

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