Return to Flying Duties Following a COVID-19 Booster Dose

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INTRODUCTION: Israel began vaccinating with the booster dose of the Pfizer-BioNTech vaccine in July 2021, before the Food and Drug Administration (FDA) authorized the vaccine in September 2021. The first and second vaccines were shown to have several side effects that could possibly affect aircrews' fitness to fly. Thus, the Israel Air Force (IAF) decided on a disqualification period of 24 h following the first vaccine, and 48 h following the second vaccine. The aim of this study was to determine the disqualification period following the booster dose of the vaccine.

METHODS: A survey was conducted among IAF aviators in the Aeromedical Center (AMC) in order to characterize the side effects and their duration following a Pfizer-BioNTech COVID-19 vaccine booster dose.

RESULTS: The most common local side effect was injection site pain. The most common systemic side effects were general weakness, fatigue, and myalgia. Duration of side effects was up to 48 h from vaccine administration among the majority of aircrew members.

CONCLUSION: The IAF AMC policy for the Pfizer-BioNTech COVID-19 vaccine booster dose recipients is to disqualify from flight for 48 h following the vaccination.

KEYWORDS: COVID-19 vaccine, booster dose, aircrew, disqualification period, coronavirus disease 2019, side effects.

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Since the coronavirus disease 2019 (COVID-19) outbreak began in late 2019, researchers around the world have been racing to develop COVID-19 vaccines. In December 2020 the U.S. Food and Drug Administration (FDA) authorized the emergency use of two vaccines developed by Pfizer-BioNTech and Moderna. In Israel, the early initiation of a nationwide campaign resulted in the full vaccination (two vaccination doses) in more than half the population by the end of March 2021.[10,11] Consequently, the incidence of COVID-19 disease dropped from approximately 900 cases per million per day in mid-January 2021 to fewer than 2 cases per million per day by June 2021.[10] Nevertheless, the emergence of new variants of concern (specifically, the delta variant) has led to a resurgence in both confirmed infection and severe illness.[4] Several causes are possible for the high levels of transmission of the delta variant, including the increased infectiousness of the variant,[8] waning vaccine-elicited immunity,[4,7] and heightened immune evasion by the variant.[12] Of these causes, the latter two directly contribute to a decrease in vaccine efficacy. An analysis of the Israeli data with respect to the outbreak of the delta variant indicated a high degree of waning immunity.[4,7] Initial studies have suggested that a Pfizer-BioNTech COVID-19 vaccine booster dose could lead to increased protection against infection and severe illness.[6]

Israel was the first country to approve the administration of the booster (i.e., third) dose of the vaccine in July 2021, starting with those 60 yr of age or older and who had received a second dose of the vaccine at least 5 mo earlier. Thereafter the vaccine administration was extended to younger populations, all in an effort to remit the delta variant outbreak. As of November 2021, 43% of the Israeli population had received the booster dose of the vaccine.[5]

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As part of those efforts, an Israel Defense Forces (IDF) Medical Corps vaccination program has been initiated again, aiming to keep IDF service members immunized, as they are critical for state security and defense. A part of this program is the booster dose vaccination of aircrew members in the Israeli Air Force (IAF). All IAF aircrew members received Pfizer-BioNTech COVID-19 vaccines only. It is important to note that since the data collection of the current study a few more COVID-19 variants of concern have emerged (Omicron and BA2).

Many side effects have been associated with the first and second dose of the Pfizer-BioNTech COVID-19 vaccine, including injection site pain, fatigue, headaches, myalgia, chills, arthralgia, fever, nausea, and swollen lymph nodes.[9] In rare cases, a severe allergic reaction has been reported after receiving the Pfizer-BioNTech COVID-19 vaccine. Even though the most commonly reported side effect was pain at the injection site, other systemic side effects can affect the fitness to fly of the vaccinated individual.[3] Systemic events were reported more often by younger vaccine recipients and more often following the second dose of the vaccine.[1] Fatigue and headache were the most commonly reported systemic events. As observed among first and second dose vaccinated individuals, both local and systemic side effects lasted 1–3 d.[9]

It is customary that aircrew members in the IAF are grounded for 12 h following most vaccines. The Pfizer-BioNTech COVID-19 vaccine required special consideration due to its side effects profile and its recent approval. A few months ago, the writers of the current paper published aeromedical recommendations regarding the grounding period following the first and second dose of the vaccine.[2] The recommendations were based on insights from a survey conducted at the IAF Aeromedical Center (AMC) among aircrews, aiming to characterize the side effects and their duration following Pfizer-BioNTech COVID-19 vaccines. Aiming to balance between safety and operational requirements, the IAF AMC determined to temporarily ground aircrews from flight duties for 24 and 48 h after having received the first and second dose of the vaccine, respectively.[2] In this study our goal was to assess the extent of side effects in our aircrew members following the booster vaccine and accordingly determine the grounding period from flight duties.

METHODS

IAF aircrew members who were vaccinated during August and September 2021 with the booster dose of Pfizer-BioNTech COVID-19 vaccine (following the first and second dose) participated in our research. A short survey conducted by the IAF AMC was sent to the vaccinated aircrew members 1 wk following the vaccine.

Participants were asked about a variety of side effects, including local injection site pain, swelling and redness, headache, fever above 38°C, chills, myalgia, arthralgia, allergic reaction (local or systemic), dyspnea, fatigue, general weakness, facial numbness, nausea, diarrhea, or none of the above.

Table I. Participants' Characteristics (*N* = 288).

VARIABLE	VALUE (%)
Gender	
Female	18 (6.3%)
Male	270 (93.7%)
Age	
Mean	37.04
Standard Deviation	± 8.13
Range	21–54
Aircraft Platform	
Rotary-Wing	105 (36.5%)
High Performance	104 (36.1%)
Transport	57 (19.8%)
N/A	22 (7.6%)

A positive answer to any of the above questions required the participant to describe the duration of the side effect (0–24, 24–48, 48–78 h, or other).

Data were analyzed using Statistical Package for the Social Sciences (SPSS) software (version 25; IBM, Armonk, NY, USA). Ethical approval was received by the Israeli Defence Force Institutional Review Board committee.

RESULTS

A total of 288 aircrew members answered the survey. All of them had previously received both doses of the Pfizer-BioNTech COVID-19 vaccine and now received the booster dose. The average age was 37.04 (range 21–54); 93.7% of the participants were men. Participants were from all three flying platforms: high performance, rotary wing, and transport (36.11%, 36.45%, and 19.79%, respectively). **Table I** describes participants' characteristics.

Local side effects were reported by 63.2% of subjects. Systemic side effects were reported by 57.3% of the subjects. The majority of subjects reported more than one systemic or local side effect. Only 12.8% of the subjects reported no side effects at all. A list of all the reported side effects is presented in **Table II**.

Table II. Side Effects (*N* = 288).

EVENT	VALUE (%)
Local	182 (63.2%)
Injection Site Pain	171 (59.4%)
Axillary Lymphadenopathy	25 (8.7%)
Swelling at Injection Site	21 (7.3%)
Redness at Injection Site	6 (2.1%)
Systemic	165 (57.3%)
General weakness	103 (35.8%)
Fatigue	101 (35.1%)
Headaches	64 (22.2%)
Myalgia	46 (16.0%)
Chills	21 (7.3%)
Fever Over 38	14 (4.9%)
Arthralgia	12 (4.2%)
Diarrhea Or Vomiting	4 (1.4%)
No side effects	37 (12.8%)
N/A	4 (1.4%)

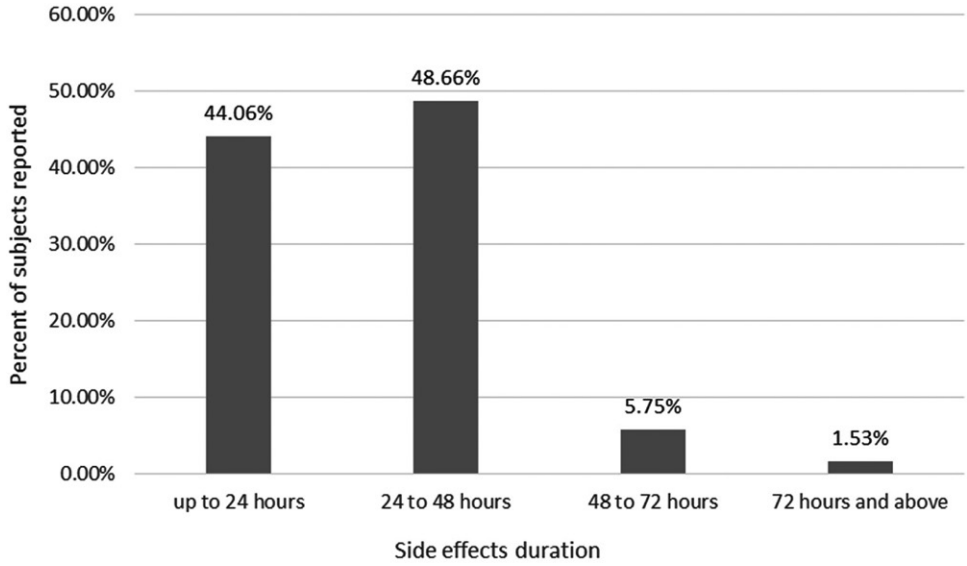

Fig 1. Side effects duration following vaccination.

Apart from the common side effects described above in Table II, a few other symptoms were observed within our cohort, but with low incidence. The symptoms are noted here because of their potential clinical significance: facial numbness, itching, facial angioedema, cervical adenopathy, insomnia, finger numbness, nausea, night sweats, and chest pain. All these symptoms had no more than one observation within our cohort. **Fig. 1** describes side effects duration. It is of note that between 24 to 48 h following the vaccination almost 50% of subjects still reported at least one side effect. However, only 7.28% of the subjects continued to experience side effects for 48 h or longer following the vaccination.

DISCUSSION

The aim of this study was to determine the disqualification period following the booster dose of the Pfizer–BioNTech COVID-19 vaccine, because both local and systemic side effects may impair aviators' function. In our previous research, we concluded that the disqualification period from flight duties for 24 and 48 h is recommended after the first and second dose of the vaccine, respectively.[2] The data from this study demonstrate that following the booster dose, the most reported local side effect was injection site pain, and the most reported systemic side effects were general weakness, fatigue, headaches, and myalgia. These side effects may cause significant discomfort while flying, impair aviator's performance, and even possibly result in sudden incapacitation.

IAF needs to maintain a high operational capacity. Thus, disqualification periods may have significant operational implications. A balanced disqualification policy is needed, which takes into account both the risk of unfit aviators and the maintenance of an adequate operational level. Side effects duration is a very important factor while debating the decision regarding disqualifying time. For most vaccines, the IAF policy is to ground for 12 h following vaccine receipt. In this study, most of the participants who received the booster dose suffered from side effects that lasted up to 48 h from vaccine receipt. According to that, we determined to disqualify the aviators for 48 h. Another question that was debated was when to start disqualification—immediately after the vaccine or later? The results of this study show that 44% of the subjects presented side effects during the first 24 h. Therefore, the disqualification period was determined to start immediately following the vaccine and to last for 48 h. Aircrew members are asked to report on any adverse effects lasting more than the disqualification period to the flight surgeon.

This study has a few limitations. It may be biased due to the fact that the subjects who responded to it may be those who experienced more prominent side effects. Not all subjects who responded to the third survey also responded to the previous ones. Also, response rate differed between the three surveys. Our decisions are limited to the Pfizer-BioNtech COVID-19 vaccine only. We recommend other air forces to reproduce our study with other COVID-19 vaccines. We also recommend adding a question to the survey reflecting the aircrews' subjective impression regarding the severity of their symptoms and the likelihood of the symptoms impacting their flying duties. Finally, we acknowledge the need for intersectionality data regarding the severity and duration of symptoms based on aircrew race, sex, age, premorbid conditions, etc. We call for other air forces to include these data in further studies.

Nevertheless, this study may serve as a tool for air forces around the world in coming to a decision regarding disqualification period following the booster dose of the vaccine. It may also prove important in the decision when to vaccinate an aircrew member according to the planned operational activity. The IAF AMC policy for the Pfizer-BioNTech COVID-19 vaccine booster dose, based on side effects duration and severity, is to disqualify for 48 h following the vaccination.

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