



Case Report

Active Covid-19 infection and transmission after the first dose of the BNT162b2 mRNA vaccination in Saudi Arabia: A case report

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ABSTRACT

A 47-year-old non-smoker male who has received the first dose of the BNT162b2 mRNA Covid-19 vaccine in Saudi Arabia. At day 3 post-vaccination, he tested negative for Covid-19 and travelled to Egypt. On day 12 he developed runny nose, body ache and fever, and he reportedly tested (PCR) negative for Covid-19. Upon his return to Saudi on day 15, his symptoms have worsened and he presented to the Emergency Department, at which he tested positive for Covid-19. The patient was overweight (BMI = 29), was not suffering from any comorbidities and was not taking any medication. Upon examination, he was vitally stable and his laboratory investigation only revealed a slightly increased Creatinine. His chest X-ray was unremarkable.

His condition did not require hospital admission, so he was discharged and advised to home-isolate himself. Four days after his discharge, his entire household came to the hospital and tested positive for Covid-19.

This is the first case report, in Saudi Arabia, of a person receiving the first dose of the BNT162b2 vaccine and got infected with Covid-19 afterwards. The report highlights the significance of receiving the second dose of the vaccine to be effective. It also demonstrates that those with a single dose mRNA vaccine, could get infected and transmit the infection.

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Case presentation

A case of 47-year-old non-smoker male who received his first dose of the Pfizer-BioNTech (BNT162b2) Covid-19 vaccine on the 5th of January 2021. He did not report any vaccine adverse reactions such as pain, fever or allergic reaction. On day 3 post-vaccination, Covid-19 PCR testing was negative, and he travelled to Egypt on day 5. On day 12, he developed a runny nose, generalised body ache, low-grade fever, mild cough with no change or loss in the smell and taste, and reportedly tested (PCR) negative for Covid-19. Upon his return to Saudi Arabia on day 15, his symptoms worsened and he presented to the Emergency Department at King Abdullah Bin Abdulaziz University hospital. A Covid-19 PCR sample was taken and came out positive after 12 h. The patient was informed about

the result immediately through a phone call. All of the PCR samples were obtained through the oropharyngeal swab.

The patient did not complain of any other symptoms such as vomiting, diarrhoea, shortness of breath or chest pain. He had no previous medical history of diabetes or hypertension, no known drug allergy, and is currently not taking any medications. Upon his arrival at the hospital, he was conscious and oriented. Upon examination, the patient was vitally stable, with normal heart sounds without murmurs, normal chest and neurological examinations. His body mass index was 29.

Radiological investigation in the form of a posteroanterior (PA) chest X-ray was unremarkable (Fig. 1).

A routine laboratory investigation showed a slightly raised Creatinine level, but otherwise normal (Table 1).

The patient was put under observation and was given 500 ml of normal saline, discharged with symptom-relieving medications, and instructed to isolate himself at home and return to the hospital if symptoms worsen. Four days after his hospital visit (day 19), his entire household, including his wife, two sons, and a daughter,

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Fig. 1. Posteroanterior chest X-ray of the patient.

The figure above shows the patient's chest X-ray showing an accentuated bronchovascular markings of both lung fields, preserved both cardiopulmonary angles with no patches of consolidation, cysts or cavitating lesions. An average cardiothoracic ratio without mediastinal shift nor air under the diaphragm.

came to the hospital and tested positive for Covid-19. They also confirmed that they had not left home for the past week.

Informed written consent was obtained from the patient to present this case.

Discussion

Here we present a case report of a 47-year-old male who took the first dose of the mRNA vaccine BNT162b2 produced by Pfizer/BioNTech. This vaccine is an mRNA vaccine made up of strands of RNA packed into lipid nanoparticles, and it does not contain a live virus [1]. This explains why the patient Covid-19 PCR test was negative three days after the vaccination.

The concept of vaccination is dependent on eliciting an adaptive immune response, B and T cells, from which memory cells will develop and provide long-lasting immunity. Although an immune response can happen as early as within the first week, long-lasting immunity can take up to 4 weeks to develop [2,3]. The BNT162b2 vaccine was shown to elicit an effective humoral (antibody-mediated) and cellular (T-cell-mediated) responses a week after the booster dose. However, the response between the first and second doses was negligible [4]. In this case, it seems that the virus was transmitted to the patient between day 3, when he tested negative, and day 12 when he became symptomatic. The patient could have also contracted one of the new variants of the virus, which the vaccine has not been proved to protect against it fully [5,6]. However, we could not confirm this as we did not sequence the virus's genome. Currently, Egypt struggles with tackling the virus, with a vast population, over 100 million, and limited resources, including testing facilities. These factors indicate that the actual number of Covid-19 cases and mortality are likely to be grossly underestimated [7].

Age has been previously reported as an independent risk factor of the infection, associated with higher disease activity [8]. How-

ever, this case was not severe, i.e., requiring hospital admission, despite his age being older than the median age of Covid-19 patients in Saudi Arabia [9]. Although his radiological and laboratory investigations were unremarkable, his neutrophil-to-lymphocyte ratio (NLR) was 2.52, an indicator of active Covid-19 infection [8,10].

The patient was not fully protected as he has not received the second dose of the vaccine. Although the first dose may have reduced the infection's impact, it did not prevent the virus's spread to his family. As his family members confirmed that they have not come in contact with anyone, it confirms that the patient was the primary source of infection for them.

Vaccine efficacy does not always predict vaccine effectiveness, i.e., the protection attributable to a vaccine administered non-randomly under field conditions. Equally, randomised controlled trials were done in a particular age group, or geographical setting might not predict effectiveness if the vaccine is more widely deployed. Alternative vaccine platforms or the addition of adjuvants may be required for adequate immunogenicity, as for influenza vaccines [11].

As far as the authors are concerned, this is the first case report, in Saudi Arabia, of an active infection and transmission of the Sars-Cov-2 virus from a person who has received a single dose of the mRNA vaccine. This case report confirms that the first dose of the mRNA vaccine, BNT162b2, more specifically, is insufficient to protect from Covid-19 infection. Hence, the adherence to protective measures, as the ones that are taken in Saudi Arabia [12], is significant, even after vaccination, to minimise transmission risk. These include applying social distancing measures and applying strict personal hygiene measures of wearing face masks and frequent hand washings. These measures should be strictly adhered to until the completion of the vaccination schedule and the production of immunity postvaccination.

Conflict of interest

None

Table 1
Laboratory investigation of the patient.

Investigation	Reference values	Patient's results
Red Cell Count	4.5–6.1 ($\times 10^{12}/L$)	4.83 ($\times 10^{12}/L$)
Hemoglobin	135–180 (g/L)	154 (g/L)
Hematocrit	0.42–0.54 (L/L)	0.468 (L/L)
MCV	76–96 (fL)	96.9 (fL)
MCH	27–32 (pg)	31.9 (pg)
MCHC	320–350 (g/L)	329 (g/L)
RDW	11.5–14.5 (%CV)	12.5 (%CV)
Platelet Count	150–400 ($\times 10^9/L$)	179 ($\times 10^9/L$)
Mean Platelet Volume	7.4–10.4 (fL)	9.6 (fL)
White Cell Count	4–11 ($\times 10^9/L$)	5.56 ($\times 10^9/L$)
Neutrophil %	%	62.6%
Neutrophil Count	0.9–9.6 ($\times 10^9/L$)	3.48 ($\times 10^9/L$)
Lymphocyte %	%	24.8%
Lymphocyte Count	1–4.4 ($\times 10^9/L$)	1.38 ($\times 10^9/L$)
Monocyte %	%	5.7%
Monocyte Count	0.1–1.1 ($\times 10^9/L$)	0.32 ($\times 10^9/L$)
Eosinophil %	%	3.2%
Eosinophil Count	0.1–0.7 ($\times 10^9/L$)	0.18 ($\times 10^9/L$)
Basophil %	%	0.8%
Basophil Count	0–0.1 ($\times 10^9/L$)	0.04 ($\times 10^9/L$)
D-Dimer	0–0.5 (mg/L)	0.21 (mg/L)
Alanine Aminotransferase	17–63 (U/L)	29
Albumin	35–50 (g/L)	39
Alkaline Phosphatase	32–91 (U/L)	54
Aspartate Aminotransferase	15–41 (U/L)	19
Bilirubin – Total	5.1–20.5 (umol/L)	8.9
Bilirubin – Direct	1.7–8.6 (umol/L)	2.1
Calcium	2.23–2.58 (mmol/L)	2.19
Chloride – Plasma or serum	1.01–1.11 (mmol/L)	103
Creatinine	54–110 (umol/L)	114
Estimated GFR	>60 (mL/min/1.73 m ²)	63
Gamma Glutamyl Transferase – GGT	12–64 (U/L)	22
Lactate Dehydrogenase (LDH)	98–192 (U/L)	121
Magnesium	0.74–1.03 (mmol/L)	0.88
Phosphorus	0.81–1.49 (mmol/L)	1.17
Potassium	3.6–5.1 (mmol/L)	4.2
Protein (Total)	65–81 (g/L)	69
Sodium – Plasma or serum	136–144 (mmol/L)	136
Uric Acid (Urate)	286–518 (umol/L)	373
Urea (BUN)	2.9–9.3 (mmol/L)	4.5

The table demonstrates the laboratory blood results of the patient. Values written in bold reflect those that were higher than reference values. MCH: Mean Corpuscular Hemoglobin; MCHC: Mean Corpuscular Hemoglobin Concentration; MCV: Mean Corpuscular Volume; RDW: Red cell distribution width.

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