SHORT COMMUNICATION

Changes in blood pressure after Messenger RNA COVID-19 vaccination

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SUMMARY

The SARS-Cov-2 (COVID-19) vaccination began in Malaysia in March 2021 among frontliners and healthcare workers. Everyone at our hospital received the tozinameran (BNT162b2) Messenger RNA COVID-19 vaccine. Although hypertension has not been mentioned explicitly as an adverse event, concerns were raised after some healthcare staff observed an increase in their blood pressures. In response to that, the hospital began collecting vital signs during second-dose appointments. Vital signs were measured before, immediately after and 15–30 minutes post-vaccination. We report our findings from the institution-wide effort to monitor changes in blood pressure among its staff and respond to any possible unwanted events.

KEYWORDS:
Hypertension, blood pressure, SARS-Cov-2, COVID-19, mRNA vaccine

INTRODUCTION

The SARS-Cov-2 (COVID-19) vaccination in Malaysia began in March 2021 among frontliners and healthcare workers. In preparation for the program, our hospital collected information on demographics, comorbidities, and willingness to be vaccinated among all its healthcare and essential workers using an online survey.

Vaccination at our hospital began on March 1. Everyone received the tozinameran (BNT162b2) mRNA COVID-19 vaccine. By the end of the month, 4904 staff members had received at least one dose (1225 completed two doses distanced 21 days apart, while another 3679 had yet to receive their second dose). Although hypertension has not been mentioned explicitly as an adverse event,[1] concerns were raised after some healthcare staff observed an increase in their blood pressure post-vaccination.

In response to that, the hospital began collecting vital signs during second-dose appointments. Vital signs were measured three times for each staff member using automated blood pressure monitors that have been calibrated by the vendor of the machines. With the exception of emergencies where the subjects were in a supine pose, all blood pressures were measured in a seated position with the cuff on the arm that was not vaccinated.

Pre-vaccination vital signs were recorded when the staff members arrived at the vaccination site, while post-vaccination vital signs were measured immediately after vaccination and again 15–30 minutes later in a waiting room. They were allowed to leave if their vitals were stable or if they had no complaints. As there was a high load of subjects at the site, vital signs measured immediately post-vaccination were actually delayed by a few minutes. For the same reason, we could not afford to monitor for delayed or extended effects on blood pressure.

RESULTS

Characteristics of the subjects are shown in Table I. Most of the subjects did not report any adverse effects from both first and second doses. Among those who experienced adverse effects, 84.5% claimed the severity was worse for the second dose. The most common adverse effects were redness, pain or swelling at the injection site, tiredness, fever, chills, headache, and myalgia.

Mean pre-vaccination systolic and diastolic blood pressures were 130.1 (SD 17.38) mmHg and 80.2 (SD 11.62) mmHg, respectively. Both systolic and diastolic blood pressures were significantly higher among those with underlying hypertension compared with those without (SBP difference: 19.9 (95% CI 17.77, 22.0) mmHg, $p<0.001$; DBP difference: 8.9 (95% CI 7.58, 10.29) mmHg, $p<0.001$).

Compared with baseline, blood pressure was increased in more than half of the subjects immediately and 30 minutes post-vaccination. The mean changes across all measures were highly significant, but the difference may not be clinically important. When we looked at those with hypertension (n = 244), paired t-tests revealed that only increases in diastolic blood pressure were significant (Table II).

The mean increase in systolic blood pressure immediately postvaccination was significantly lower for females compared to males (1.96 (SD 12.20) vs 3.19 (SD 13.26), $p = 0.001$). There were no significant changes in mean blood pressure among those with history of SARS-Cov-2 infection compared with those without previous exposure to the virus.

Overall, 58 (1.02%) were admitted into the observation room either due to hypertensive urgency or complaints of

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Table I: Characteristics of subjects, N = 4906

Characteristics	
Age in years, mean (SD)	33.6 (8.3)
Females, n (%)	3074 (62.7)
Current smokers, n (%)	370 (7.5)
History of serious allergic reaction, n (%)	309 (6.3)
History of confirmed SARS-CoV-2 infection, n (%)	51 (1.0)
History of comorbidities, n (%)	
Hypertension	244 (5.0)
Diabetes mellitus	141 (2.9)
Hyperlipidaemia	18 (0.4)
Asthma	207 (4.2)
Cardiovascular disease	43 (0.9)
Baseline (pre-vaccination) blood pressure in mmHg, mean (SD)	
Systolic	130.1 (17.38)
Diastolic	80.2 (11.62)

SD, standard deviation.

Table II: Changes in blood pressure immediately and 15–30 minutes after vaccination compared with baseline (pre-vaccination)

Blood pressure	Immediately after vaccination compared with baseline	15–30 minutes after vaccination compared with baseline
Mean systolic change (95% CI), mmHg		
All subjects, n = 4906	2.3 (1.95, 2.66) **	1.1 (0.76, 1.48) **
Subjects with hypertension, n =244	1.4 (-0.41, 3.26)	-1.0 (-2.87, 0.91)
Subjects with cardiovascular disease, n =43	3.8 (0.28, 7.39) *	2.0 (-1.78, 5.74)
Mean diastolic change (95% CI), mmHg		
All subjects, n = 4906	2.4 (2.13, 2.68) **	2.2 (1.87, 2.43) **
Subjects with hypertension, n =244	3.1 (1.58, 4.51) **	2.2 (0.76, 3.58) **
Subjects with cardiovascular disease, n =43	1.8 (-1.21, 4.89)	2.2 (-0.80, 5.13)

SD standard deviation
Paired t-test significance: * p <0.05, ** p <0.001

giddiness. Their mean baseline systolic and diastolic blood pressures were 159.5 (SD 20.19) and 96.4 (SD 12.92), respectively. Ten (17.2%) had underlying hypertension. Eighteen (31.0%) whose complications did not improve were transferred to the Emergency Department for further monitoring and treatment as necessary.

DISCUSSION

Our findings extend similar occurrences that have been reported previously in several European countries to the Asian population.[2-5] A recent paper by Bouhanick et al.[6] has suggested a possible increased risk of hypertension with the Pfizer/BioNTech vaccine. Several mechanisms for hypertension have been suggested involving interactions between components of the vaccine and the renin-angiotensin system; however, they remain hypothetical and causality is yet to be established.[3,6]

Our findings indicated a general increase in blood pressure in more than half of the subjects; however, only a small fraction reacted symptomatically. Pain, stress, or other emotional triggers on changes in blood pressure could not be ruled out. We were also unable to monitor if these changes persisted or if there were any delayed effects on the blood pressure. Thus, it may be in the interest of future studies to observe for extended effects of the vaccine on blood pressure. In our subjects, history of hypertension or other comorbidities was voluntarily reported and there may be cases where hypertension had been undiagnosed.

Overall, the increases were relatively small and may not prevail over the benefits offered by vaccination. Nevertheless, on the safety side, monitoring of blood pressure and other related symptoms may be warranted to prevent any unexpected serious events.

DECLARATION

Ethics approval and consent to participate

Approval and waiver of informed consent were obtained from the Medical Research and Ethics Committee (MREC) Malaysia (Ref: 21-02036-YOX (2)).

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