Medical Science

pISSN 2321–7359; eISSN 2321–7367

Relationship between menstrual cycle changes and types of covid-19 vaccines among women living in Riyadh, Saudi Arabia 2022

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To Cite:
Alahmari AM, El-Rahman SKA. Relationship between menstrual cycle changes and types of covid-19 vaccines among women living in Riyadh, Saudi Arabia 2022. Medical Science 2022; 26:ms340e2306.
doi: https://doi.org/10.54905/disssi/v26i126/ms340e2306

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Peer-Review History
Received: 20 May 2022
Reviewed & Revised: 23/May/2022 to 05/August/2022
Accepted: 11 August 2022
Published: 14 August 2022

Peer-review Method
External peer-review was done through double-blind method.

URL: https://www.discoveryjournals.org/medicalscience

ABSTRACT

Background: Women across the world reported menstrual cycle changes after receiving COVID-19 vaccines. This may increase vaccine hesitancy. The aim of this study is to assess the impact of COVID-19 vaccines on menstrual cycle among women living in Riyadh. *Methods:* The study utilized online self-administered questionnaire targeting females at the childbearing period, eligible to receive COVID-19 vaccine and not pregnant. *Results:* In our study, a total of 762 females with a mean age of (32.19±8.71) years. Participants were, mostly, unemployed (59.6%) non-smoker (93.6%) married (61.1%) Saudis (88.5%), (63.2%) carried a bachelor or diploma degree, (81%) were stressed. About quarter had thyroid disorders, received medications and were previously infected. (96.9%) were vaccinated and (87.3%) got 2 doses. The bulk received Pfizer-BioNTech vaccine (1st dose=80.7%, 2nd doses=75.4%). (82%) noticed changes and (80.6%) experienced symptoms 1-3 months after vaccination, (17.4%) delayed menses. Abdominal pain (24.4%) was predominant. Females with previous infection had less menstrual changes after vaccination (P-value= 0.001, AOR=0.475, CI 95%= 0.323-0.700). Having symptoms was significantly different between education levels. "Diploma or bachelor's degree" vs "High school or less" (P-value =0.004, AOR=2.054, CI 95%= 1.257-3.356), "Postgraduate studies vs High school or less" (P-value=0.002, AOR=2.492, CI 95%= 1.396-4.448). COVID-19 vaccination was not associated with neither menstrual changes nor symptoms related to it. *Conclusion:* Previous infections had a protective effect against changes in menstruation after receiving the COVID-19 vaccines. Those at school age and postgraduate suffered more. Vaccination itself didn't cause neither changes nor symptoms related to menstrual.

Keywords: COVID-19, vaccination, menstrual cycle.

1. INTRODUCTION

In December 2019, scientists in Wuhan, China, discovered the virus that causes COVID-19. It spread quickly around the world and is very contagious. Although the symptoms of COVID-19 most frequently resemble those of a cold, the flu, or pneumonia in the respiratory system, COVID-19 can also harm other body systems. Most COVID-19 patients only have minor symptoms, but a few people end up being very sick. A severe illness from COVID-19 is more likely to strike older adults and people with specific underlying medical conditions. The COVID-19 vaccine is a secure and reliable vaccine. The Kingdom of Saudi Arabia (KSA) was one of the first nations to implement a number of preventive measures to halt the spread of the disease. Additionally, after the BNT162b2 vaccine was approved, the KSA was among the initial countries to implement COVID-19 vaccination programs (Al Bahrani et al., 2021).

Astra Zeneca, Pfizer-BioNTech, and most recently Moderna are the three vaccines against SARS-CoV-2 that are currently approved for use in KSA. Saudi Arabia has administered at least 55,449,797 doses of COVID vaccines up until the end of January 2022. That would be sufficient to immunize about 80.9% of the country's population, assuming each person needs two doses. There may be hesitation to get vaccinated due to worries that the coronavirus disease 2019 (COVID-19) vaccine and irregular menstrual cycles may be related (Edelman et al., 2022). After receiving the COVID-19 vaccine, a large number of women worldwide have reported irregularities in their menstrual bleeding. Some have reported heavy menstrual bleeding (menorrhagia), bleeding before their periods were due, or bleeding frequently (metrorrhagia/polymenorrhea), while others have reported postmenopausal bleeding (Merchant, 2021). We aim to study the effects of covid-19 vaccines on menstrual cycle changes among women who living in Riyadh, Saudi Arabia.

Research Aim

To assess the impact of COVID-19 vaccines on menstrual cycle among women living in Riyadh, Saudi Arabia 2022

Research Objectives

To determine the magnitude and patterns of changes and/or symptomsassociated with menstrual cycle following COVID-19 vaccination

To compare between the effect of different COVID-19 vaccine types and doseson the menstrual cycle in terms of changes and/or symptoms.

To investigate the possible risk factors that may lead tochanges and/or symptoms associated with menstrual cycle following COVID-19 vaccination.

2. METHODOLOGY

An analytic cross-sectional study was conducted over a period of four months from 1st January 2022 to 30 April 2022 and included questions related to the post-vaccination menstrual changes experienced in females living in Riyadh City, KSA. Sample size (n)≈ 400 subjects as basic sample. This sample multiplied by 2 to overcome potential low response rate and the design effect, the total was around 800 females. The current study included (Saudi and non-Saudi) females' participants only living in Riyadh, Saudi Arabia and we have excluded pregnant women. Data was collected through self-administered questionnaire distributed through internet-based link to google forms. Convenient sampling where a link sent to subjects to fill and urge them to resend the link to more subjects until we reach our target sample. Data collected from self-administered questionnaire, then statistical software SPSS used. SPSS version 22 is the computer program used to analyze data. For Ethical considerations, the informed consent was clear and indicates the purpose of the study and participants anonymity assured.

3. RESULTS

Demography

The mean age for total of 762 participants was (32.19±8.71) shown in (Table 1). All living in Riyadh, mostly Saudi (88.5%), (61.1%) were married, (32.4%) single, (5.9%) divorced and (0.5%) were widowed. For education status (63.2%) had a Diploma or a Bachelor's degree while (24.4%) had High school certificate or less and (12.3%) had a Postgraduate studies. (59.6%) of participants were unemployed. Most (93.6%) didn't smoke. The only significant demographic factor was the education with p-value (0.011). The highest frequency of menstrual changes occurred for the Diploma or a Bachelor's degree group with 64.1% while the least was the Postgraduate studies group with 11.4% as shown in (Table 2).

Table 1 Mean age among participants who had symptoms or menstrual changes after COVID-19 vaccination

			N	Mean	Std. Deviation	P-value
Age	Symptoms	No	394	32.2259	8.65906	0.090
		yes	35	29.9429	7.02074	
	Menstrual change	No	8	32.2500	4.71320	0.905
		Yes	26	31.8462	5.78060	

Table 2 Effect of demographic characteristics on menstrual changes and symptoms after COVID-19 vaccination

		changes					symptoms				
		No		Yes		P-value	No		Yes		P-value
		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)	
Nationality	Non-Saudi	28	10.6%	59	11.8%	0.608	42	10.6%	45	12.4%	0.433
	Saudi	236	89.4%	439	88.2%		356	89.4%	319	87.6%	
Social status	Not married (single/ divorced or widowed)	97	36.7%	199	40.0%	0.386	154	38.7%	142	39.0%	0.928
	Married	167	63.3%	299	60.0%		244	61.3%	222	61.0%	
Education	A Diploma or a Bachelor's degree	163	61.7%	319	64.1%	0.585	248	62.3%	234	64.3%	0.011
	High school or less	64	24.2%	122	24.5%		88	22.1%	98	26.9%	
	postgraduat e studies	37	14.0%	57	11.4%		62	15.6%	32	8.8%	
Job	No	160	60.6%	295	59.2%	0.714	236	59.3%	219	60.2%	0.807
	Yes	104	39.4%	203	40.8%		162	40.7%	145	39.8%	
Smoking	No	251	95.1%	463	93.0%	0.255	376	94.5%	338	92.9%	0.359
	Yes	13	4.9%	35	7.0%		22	5.5%	26	7.1%	

Clinical

(Figure 1) shows that highest reported symptom was abdominal pain (24.37%). The Highest menstrual change reported was late menstruation (17.37%) as shown in (Figure 2). As for comorbidities the most females had thyroid disorders (24.24%) (Figure 3). Majority of participants felt stressed "sometimes"(53.3%), "most times"(23.2%), "never stressed" (19%) and "stressed all times" (4.3%). The only significant factor associated with menstrual cycle changes and symptoms was pre-infection with COVID-19 with p-value = (0.001) and (0.049) respectively (Table 3).

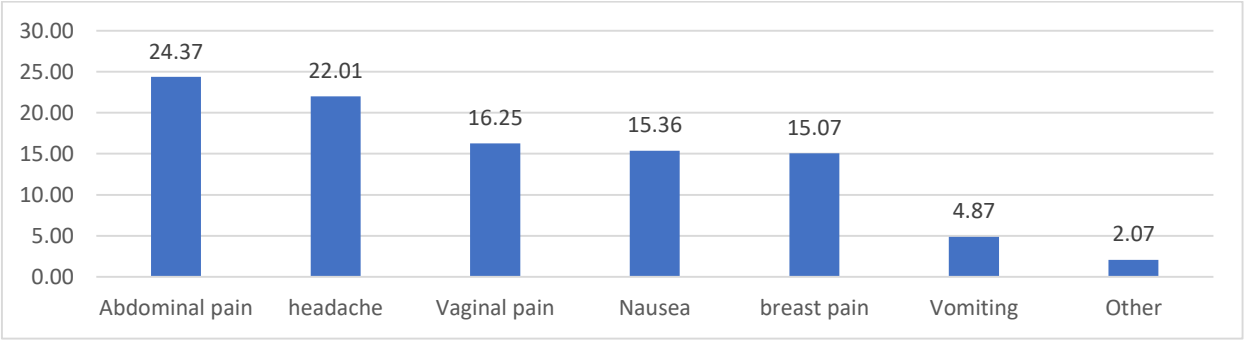

Figure 1 Frequency of symptoms (%)

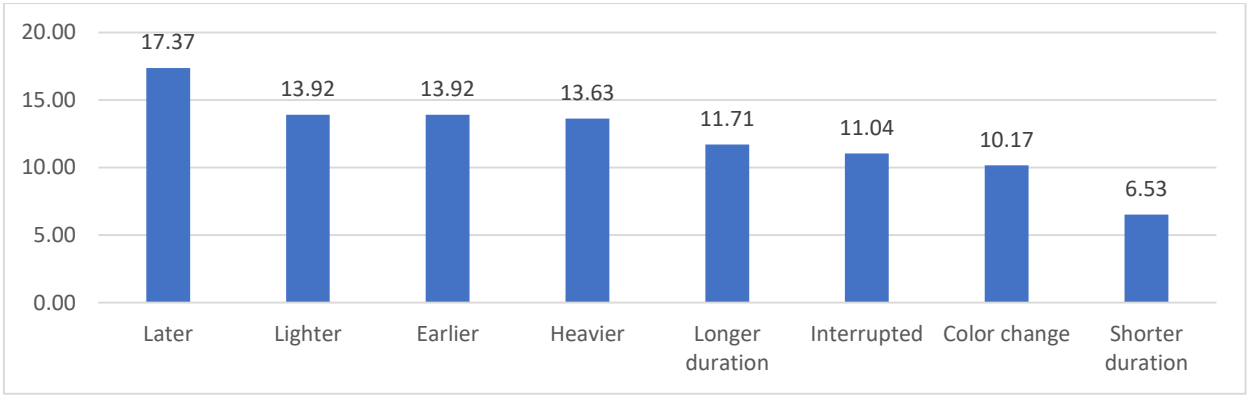

Figure 2 Frequency of menstrual changes (%)

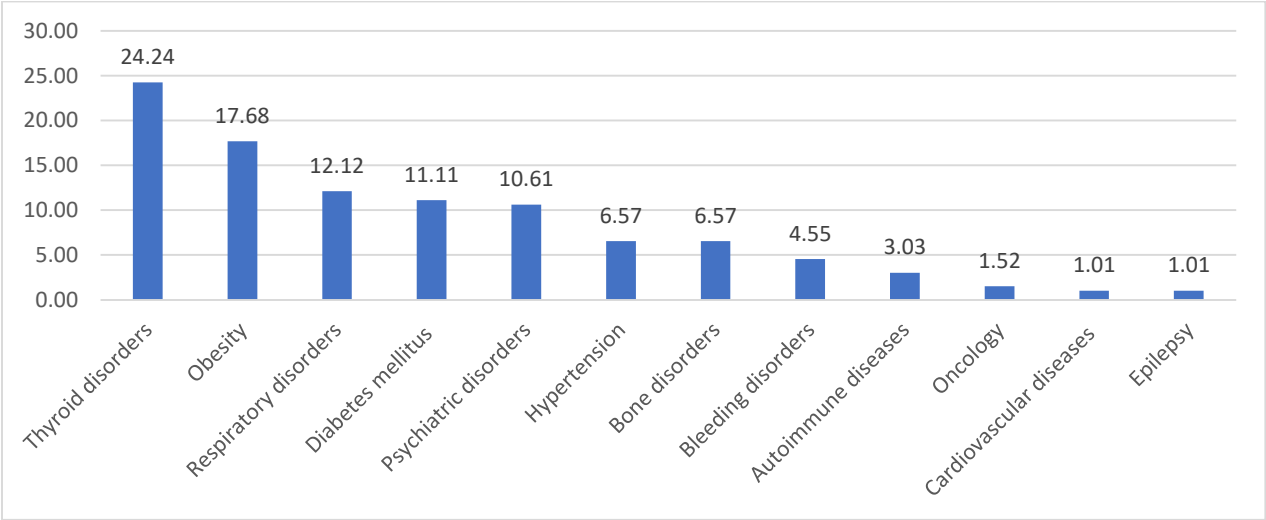

Figure 3 Frequency of comorbidity (%)

Table 3 Effect of vaccination Clinical characteristics on menstrual changes and symptoms after COVID-19

		Menstrual changes					Symptoms				
		No		Yes		P-value	No		Yes		
		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)	P-value
Stress	No	43	16.3%	101	20.3%	0.176	68	17.1%	76	20.9%	0.175
	Yes	221	83.7%	396	79.7%		330	82.9%	287	79.1%	
Comorbidities	No	183	69.3%	343	69.0%	0.931	273	68.6%	253	69.7%	0.742
	Yes	81	30.7%	154	31.0%		125	31.4%	110	30.3%	
Medication	No	202	76.5%	375	75.3%	0.710	307	77.1%	270	74.2%	0.341
	Yes	62	23.5%	123	24.7%		91	22.9%	94	25.8%	
Pre-infection COVID-19	No	221	83.7%	356	71.5%	0.001	313	78.6%	264	72.5%	0.049
	Yes	43	16.3%	142	28.5%		85	21.4%	100	27.5%	

Post-vaccination changes and symptoms related to menstrual cycle

Most participants were vaccinated (96.9%). About (87.3%) got 2 doses of vaccines while (8.8%) got a 3rddose. Most took Pfizer-BioNTech vaccines for the 1st dose (80.7%), 2nd dose (75.4%); Majority of females noticed changes (83.2%) and symptoms (80.5%) within 1-3 months after vaccination. Changes and symptoms were present almost equally after 1st dose (48.5%, 46.4%) and 2nd dose (50.3%, 53%). "Time to notice changes" and "changes after doses" were significantly associated with menstrual cycle change with p-value = (0.024), (0.008) respectively. No significant difference for changes between first and second dose, P-value=0.921. No significant difference for symptoms between first and second dose, P-value=0.705 (Table 4).

Table 4 Vaccination profile in relation to menstrual changes and/or symptoms

		Menstrual changes				P-value	Symptoms				P-value
		No		Yes			No		Yes		
		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)	
Vaccinated	No	10	3.8%	13	2.6%	0.366	9	2.3%	14	3.8%	0.202
	Yes	254	96.2%	485	97.4%		389	97.7%	350	96.2%	
1st dose	Other types	8	21.1%	100	20.5%	0.939	38	20.3%	70	20.7%	0.916
	Pfizer-BioNTech	30	78.9%	387	79.5%		149	79.7%	268	79.3%	
2nd dose	Other types	12	31.6%	124	25.5%	0.407	48	25.7%	88	26.0%	0.927
	Pfizer-BioNTech	26	68.4%	363	74.5%		139	74.3%	250	74.0%	
3rd dose	Other types	34	89.5%	444	91.2%	0.724	167	89.3%	311	92.0%	0
	Pfizer-BioNTech	4	10.5%	43	8.8%		20	10.7%	27	8.0%	.298
Period to notice changes	1-3 months	25	65.8%	405	83.2%	0.024	158	84.5%	272	80.5%	0.457
	4-6 months	12	31.6%	78	16.0%		28	15.0%	62	18.3%	
	More than 6 months	1	2.6%	4	0.8%		1	0.5%	4	1.2%	
Changes noticed after*	1st dose	9	23.7%	236	48.5%	0.008	88	47.1%	157	46.4%	0.267
	2nd dose	29	76.3%	245	50.3%		95	50.8%	179	53.0%	
	3rd dose	0	0.0%	6	1.2%		4	2.1%	2	0.6%	

* No significant difference for menstrual changes between first and second dose, P value=0.921
No significant difference for symptoms between first and second dose, P value=0.705

Logistic regression: Model for possible risk factors associated with menstrual changes after vaccination

After using logistic regression modeling the only significant factor associated with menstrual cycle changes after vaccination was previous infection with COVID-19 (p-value= 0.001). Previous infection had a protective effect (OR=0.475, CI 95%= 0.323-0.700) (Table 5).

Table 5 Possible risk factors associated with post-COVID-19 vaccination changes in menstruation

Factors *	P-value	Odds ratio (OR)	95% C.I. for OR	
			Lower	Upper
Age	0.867	0.998	0.976	1.020
nationality	0.886	1.037	0.631	1.704
Social status	0.373	1.188	0.813	1.735
^A Diploma or a Bachelor's degree	0.382			
High school or less	0.170	1.403	0.865	2.275
postgraduate studies	0.247	1.409	0.789	2.518
job	0.467	0.876	0.615	1.250
smoking	0.356	0.727	0.370	1.430
medication	0.585	0.903	0.624	1.304
Pre-infection COVID-19	0.001	0.475	0.323	0.700
vaccination	0.243	0.589	0.243	1.431
^doses	0.476			
doses(1)	0.876	1.076	0.431	2.687
doses(2)	0.265	1.353	0.796	2.299
stress	0.131	0.730	0.486	1.099
Comorbidities	0.631	1.086	0.776	1.519
Constant	0.064	3.793		

*Factors entered: Age, nationality, social status, education, job, smoking, medication, pre-infection COVID-19, vaccination, doses, stress, and comorbidities.

^ Reference group

Logistic regression: Model for possible risk factors associated with symptoms after vaccination

After using logistic regression modeling the only significant factor associated with symptoms after vaccination was the education. "Diploma or bachelor degree" vs "High school or less" P-value =0.004 (OR=2.054, CI 95%= 1.257-3.356), "Postgraduate studies vs High school or less" P-value=0.002(OR=2.492, CI 95%= 1.396-4.448) (Table 6).

Table 6 Possible risk factors associated with symptoms after COVID-19 vaccination

Factors *	P-value	Odds ratio (OR)	95% C.I. for OR	
			Lower	Upper
Age	0.627	1.005	0.984	1.026
nationality	0.809	1.059	0.664	1.689
Social status	0.581	1.106	0.772	1.584
^A Diploma or a Bachelor's degree	0.006			
High school or less	0.004	2.054	1.257	3.356

postgraduate studies	0.002	2.492	1.396	4.448
job	0.437	0.875	0.625	1.225
smoking	0.352	0.751	0.411	1.372
medication	0.381	0.855	0.603	1.213
Pre-infection COVID-19	0.066	0.727	0.517	1.022
vaccination	0.460	1.394	0.577	3.367
^doses	0.762			
doses(1)	0.471	0.719	0.293	1.763
doses(2)	0.809	0.938	0.559	1.574
stress	0.185	0.774	0.530	1.130
Comorbidities	0.987	0.997	0.724	1.373
Constant	0.968	0.974		

*Factors entered: Age, nationality, social status, education, job, smoker, medication, pre-infection COVID-19, vaccination, doses, stress, and comorbid.

^ Reference group

4. DISCUSSION

The current study showed that mean age for total of 762 participants is (32.19±8.71), mostly Saudi (88.5%) and (61.1%) were married. For education status (63.2%) had a Diploma or a Bachelor's degree while (24.4%) High school certificate or less and (12.3%) Postgraduate studies. (59.6%) of participants were unemployed. Most (93.6%) didn't smoke. In our study the only significant demographic factor was education level. A recent study done in Riyadh found that age and marital status were related to post-vaccination menstrual changes (Morsi et al., 2022). Other study showed that smoking was a significant factor ($p<0.001$) (Muhaidat et al., 2022). Our study finding showed that stress was not related to menstrual cycle changes and symptoms while many other studies reported the opposite. A cross-sectional study found that stress was significantly higher in women with irregular menstruation ($p < 0.001$) (Takmaz et al.,2021). Other retrospective observational study found a statistical difference ($p < 0.0001$) between menstrual cycle and menstruation length between 2020 and 2019 for women who reported feeling stressed during the pandemic (Liya et al., 2022). Also, There is a relationship between genitourinary, premenstrual, and menstrual symptoms to COVID-19 pandemic-related psychological distress, according to a cross-sectional study among Jordanian medical students (Aolymat et al., 2022).

The current study showed that highest reported menstrual change was late menstruation. Other studies found that most of participant's responds were change in menstrual cycle length. In the MENA region, a cross-sectional investigation found that women who received the vaccine reported having menstrual periods that lasted noticeably longer on average than they did before receiving the vaccine (Muhaidat et al., 2022). In another recent study the subjects reported the same results of having uncommon post-vaccination adverse effects, includes a lengthening of the duration (Alghamdi et al., 2021). A study in U.S. residents showed thatCOVID-19 vaccination is associated with a change in menstrual cycle length but not menstruation length (Edelman et al., 2022). In our study, pre-infection with COVID-19 had a protective effect with menstrual cycle changes and symptoms. Women who had pre-infection had fewer symptoms and changes. This finding is against other study were subjects who were previously infected, experienced severe post-vaccination side effects (Tissot et al., 2021). Another study showed that there was no significant association with prior history of COVID-19 infection (Muhaidat et al., 2022).

Regarding vaccination profile, a similar study found that most of theparticipants received Pfizer-BioNTech and had (85.4%) two doses.Menstrual irregularities were reported by (66.3%)of women after vaccination.. Of those, symptoms began to manifestwithin a month in (86.8%). Vaccination type was not a significant factor (Muhaidat et al., 2022). Our study found no significant difference between first and second dose for neither symptoms nor changes. In agreement, one study found that reproductive-age women who received the 1st dose and the 2ndDose of the vaccine were equally present with changes approximately (60%) regardless of the type of administered vaccine (Laganà et al., 2022). On the other side, other study reported that the most participants (46.7%) had the symptoms after the 1st dose, while (32.4%) after the 2nd dose (Muhaidat et al., 2022).

5. CONCLUSION

Previous infections had a protective effect on menstrual changes and symptoms after COVID-19 vaccination. Those at school age or with postgraduate studies suffered more or seemed more aware of post vaccination symptoms than those with diploma / bachelor degrees.

Acknowledgement

We thank the participants who were all contributed samples to the study.

Author Contributions

This work was carried out in collaboration among all authors. The main Authordesigned the study, managed the literature searches, wrote the protocol and wrote the first draft of the manuscript. Second Authorperformed the statistical analysis and supervised the whole study. All authors read and approved the final manuscript.

Recommendation

We recommend raising the awareness about menstrual health in general and possible post-vaccination menstrual changes /symptoms. Concerns about a possible association between COVID-19 vaccination and abnormal menstrual should be addressed during counseling.

Limitations

The main limitation of our study was online survey which there is no interaction with the researcher.

Ethical approval

The study was approved by the Ethics and Scientific Research Committee at the Research Deputy of King Fahad Medical City, Riyadh, Saudi Arabia (Ethical approval code: IRB log number: 22-061E).

Funding

This study has not received any external funding.

Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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