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Serious adverse reaction associated with the COVID-19 vaccines of BNT162b2, Ad26.COV2.S, and mRNA-1273: Gaining insight through the VAERS

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Background and purpose: Serious adverse events following immunization (AEFI) associated with the COVID-19 vaccines, including BNT162b2 (Pfizer-BioNTech), Ad26.COV2.S (Janssen), and mRNA-1273 (Moderna), have not yet been fully investigated. This study was designed to evaluate the serious AEFI associated with these three vaccines.

Methods: A disproportionality study was performed to analyze data acquired from the Vaccine Adverse Event-Reporting System (VAERS) between 1 January 2010 and 30 April 2021. The reporting odds ratio (ROR) method was used to identify the association between the COVID-19 vaccines BNT162b2, Ad26.COV2.S, and mRNA-1273 and each adverse event reported. Moreover, the ratio of the ROR value to the 95% CI span was applied to improve the credibility of the ROR. The median values of time from vaccination to onset (TTO) for the three vaccines were analyzed.

Results: Compared with BNT162b2 and mRNA-1273, Ad26.COV2.S vaccination was associated with a lower death frequency (p < 0.05). Ad26.COV2.S vaccination was associated with a lower birth defect and emergency room visit frequency than BNT162b2 (p < 0.05). There were 6,605, 830, and 2,292 vaccine recipients who suffered from COVID-19-related symptoms after vaccination with BNT162b2, Ad26.COV2.S, and mRNA-1273, respectively, including people who were infected by COVID-19, demonstrated a positive SARS-CoV-2 test, and were asymptomatic. Serious AEFI, including thromboembolism, hemorrhage, thrombocytopenia, cardiac arrhythmia, hypertension, and hepatotoxicity, were associated with all three vaccines. Cardiac failure and acute renal impairment events were associated with BNT162b2 and mRNA-1273, while seizure events were associated with

BNT162b2 and Ad26.COV2.S. The median values of TTO associated with the three vaccinations were similar.

Conclusion: These findings may be useful for health workers and the general public prior to inoculation, especially for patients with underlying diseases; however, the risk/benefit profile of these vaccines remains unchanged. The exact mechanism of SARS-CoV-2 vaccine-induced AEFI remains unknown, and further studies are required to explore these phenomena.

KEYWORDS

COVID-19 vaccine safety, adverse events following immunization, reporting odds ratio, BNT162b2, Ad26.Cov2.S, mRNA-1273

1 Introduction

The global COVID-19 epidemic is still very serious. As of July 2021, more than 196,601,716 confirmed cases and 4,198,083 deaths have been registered in more than 200 countries and territories. The current global case fatality rate of COVID-19 is 2.1%, and the cure rate is 90.4%. In particular, more than 10,000 cases of COVID-19 pneumonia are reported every day in more than 10 countries (WHO, 2021b). In October 2020, a new virus variant, Delta, was discovered for the first time in India. The Delta strain is more infectious than previous strains, and infected individuals are more likely to develop serious illness (Reardon, 2021). Delta spread to 74 countries and gradually became the main epidemic strain. Recently, a new variant of COVID-19 was reported from South Africa. The World Health Organization (WHO) named this mutant Omicron (B.1.1.529) as a variant of concern on 26 November 2021(Karim and Karim, 2021).

There is currently no effective treatment for the novel coronavirus, and vaccination is still one of the most economical and effective measures to prevent infection. Since the outbreak of COVID-19, countries worldwide have encouraged the development of vaccines. As of 27 July 2021, 108 vaccines have entered clinical trials, of which 27 have entered phase 3 clinical trials and eight have entered phase 4 clinical trials (WHO, 2021a). There are three main kinds of COVID-19 vaccines on the market: inactivated vaccines, adenovirus vector vaccines, and mRNA vaccines, including Pfizer's vaccine—BNT162b2, Moderna's mRNA mRNA-1273. Janssen's adenovirus vector vaccine-Ad26.COV2.S, and China Bio's novel coronavirus-inactivated vaccine (Bok et al., 2021). The development cycle of COVID-19 vaccines is short, and adverse reactions need to be monitored.

Although the abovementioned three vaccines can reduce the infection rate and the symptoms of infected patients, they can also elicit numerous adverse reactions, according to several researchers (Andraska et al., 2021; Jeet Kaur et al., 2021; See et al., 2021). The results of existing clinical studies on the COVID-19 vaccine show that the vast majority of adverse reactions are expected to be mild. Meanwhile, the incidence of unintended adverse reactions is low, and most of them are mild to moderate and mainly local reactions. Common local adverse reactions to the aforementioned three COVID-19 vaccines include pain, pruritus, redness, and induration at the injection site. Systemic adverse reactions mainly include fatigue, fever, diarrhea, cough, muscle pain, joint pain, headache, nausea, anorexia, and chills (Chen et al., 2021). Most of these adverse reactions occur in the first 24–48 h after vaccination (Rolla et al., 2021).

However, serious or rare adverse reactions have been reported. BNT162b2 and mRNA-1273 vaccines can cause serious allergic reactions (Shimabukuro and Nair, 2021; Shimabukuro and Surgeons, 2021), usually within 30 min of vaccination; therefore, contraindications and history of allergy should be determined in advance, and adequate amounts of epinephrine should be available. Serious adverse reactions associated with the Ad26.COV2.S vaccine include serious skin adverse reactions (Lospinoso et al., 2021), Bell's palsy (Nishizawa et al., 2021), and anxiety (Hause et al., 2021). Some rare adverse reactions have been reported with Pfizer-BioNTech and mRNA-1273 vaccines, including cutaneous adverse reactions (Larson et al., 2021), myasthenia gravis (Tagliaferri et al., 2021), hearing loss (Wichova et al., 2021), rhabdomyolysis (Mack et al., 2021), urinary tract infections (Zhao et al., 2021), liver damage (Ackerman et al., 2021), gastroparesis (Scott et al., 2021), and acute pancreatitis (Parkash et al., 2021). If these events are not properly handled, they can lead to adverse effects in individuals and serious consequences for the prevention and control of infectious diseases. Therefore, it is of great significance to explore the possible signals of adverse reactions to vaccines and predict and avoid the occurrence of adverse events.

The serious adverse events following immunization (AEFI) reported concerning the COVID-19 vaccines also include thrombosis (Marcucci et al., 2021), thrombocytopenia (Welsh et al., 2021), and several cases of unusual thrombotic events in combination with thrombocytopenia (Gunther et al., 2021; Iavorska et al.,

2021). The vast majority of reported immune thrombotic thrombocytopenia (VITT) cases have occurred following adenoviral vector-based vaccination with ChAdOx1nCoV-19 (Oxford/AstraZeneca) (Bayas et al., 2021; Schultz et al., 2021) or Ad26.COV2.S (Bayas et al., 2021; Iavorska et al., 2021; Schultz et al., 2021; Schultz et al., 2021; Schultz et al., 2021; Schultz et al., 2021; See et al., 2021). It is unclear whether thrombosis is related to the Pfizer-BioNTech and mRNA-1273 vaccines or whether BNT162b2 and Ad26.COV2.S recipients have a similar frequency of blood clots and bleeding. It is also unclear whether patients are at risk of other serious AEFI when receiving the COVID-19 vaccine.

The U.S. Food and Drug Administration (FDA)'s Vaccine Adverse Event Reporting System (VAERS) is the database for vaccines. The VAERS was used to obtain data, and statistical methods such as the reporting odds ratio (ROR) were used to process the collected data to discover the various adverse reaction signals of the aforementioned three COVID-19 vaccines, especially serious AEFI. We hope that the results may enhance physicians' awareness of the potential serious side effects associated with COVID-19 vaccines.

2 Methods

2.1 Data source

On 8 May 2021, we obtained VAERS data from the U.S. FDA website (https://vaers.hhs.gov). Individuals who were vaccinated between 1 January 2010 and 30 April 2021 and were 18 years of age or older at the time of vaccination were included in the study. Each report was categorized based on the following binomial factors: "with" or "without" exposure to the administration of vaccines of interest (specifically, BNT162b2 from Pfizer-BioNTech, mRNA-1273 from Moderna, and Janssen's adenovirus vector vaccine—Ad26. COV2.S) and "with" or "without" the experience of an AEFI category of interest.

2.2 Definition of target adverse events

Serious AEFI were defined as hospitalization, extended hospital stay, suffering from life-threatening events, admission to an emergency department, disability related to vaccination, birth defect, and death. The recovery from AEFI was also statistically analyzed. Other serious AEFI including thromboembolism, hemorrhage, thrombocytopenia, cardiac arrhythmias, cardiac failure, hypertension, hepatotoxicity, acute renal impairment, acute pancreatitis, and convulsion events were also analyzed. The preferred terms (PTs) of these serious AEFI were defined based on the Standardized MedDRA Query (SMQ, version 23.0) (Almenoff et al., 2005). The PTs of COVID-19-related events included "COVID-19," "COVID-19 pneumonia," "exposure to SARS-CoV-2," "suspected COVID-19," "asymptomatic COVID-19," "COVID-19 immunization," "SARS-CoV-2 test," "SARS-CoV-2 test negative," "SARS-CoV-2 test positive," and "SARS-CoV-2 antibody test negative." The other PTs used in this study are listed in Supplementary Tables S1–S10.

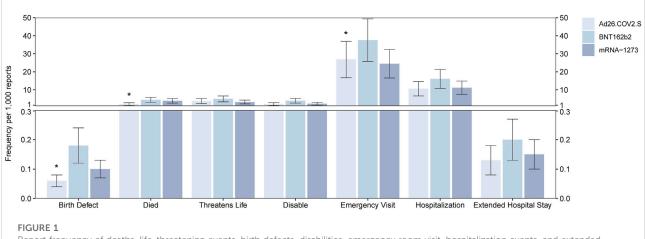
2.3 Disproportionality analyses and signal detection

The ROR method of disproportionality based on a four-grid algorithm was first proposed by the Netherlands Pharmacovigilance Center and has the advantages of high sensitivity, simple calculation, and the ability to eliminate a large number of biases (Napke, 1968; Moore et al., 2005). When a target adverse effect is caused by a COVID-19 vaccine, it will occur more frequently in reports listing COVID-19 vaccines than in those not listing COVID-19 vaccines, as suspect or concomitant, thus generating disproportionality (Almenoff et al., 2007). In the disproportionality analysis, a statistically significant ROR was defined as reported: absolute count of PTs linked to the targeted drug \geq 3 and a lower limit of the 95% confidence interval (CI) > 1 (Wilson et al., 2004).

The ROR value tends to become extraordinarily large with a broad 95% CI because of a minor-valued absolute count (a), which is a property of the case/non-case method. A unique method was used to improve the credibility of the ROR by removing false positives caused by lack of absolute counts. The 95% CI reflects the potential range in which the ROR value can fluctuate since the ROR value indicates the signal's intensity (Kadjo et al., 2017). The ratio of the ROR value to the span of 95% CI might be considered the height (S/W = H) of the imaginary peak if we regard the signal, represented as ROR value (S), as an imagined peak of normal distribution and the span of 95% CI as the base of its peak (W). A sharp peak or spike with a large H value and a minor W value could be described as a positive signal. H values greater than 0.5 were considered the threshold of a legitimate signal using the ROR exclusion criterion (absolute count $a \ge 3$, the lower end of 95% CI ≥ 1). The higher the peak, the stronger the association between the suspected drug and the adverse effect of concern.

2.4 Data processing and statistical analysis

We took a step further to calculate the total frequencies per 1,000 reports of death, life-threatening events, birth defects, emergency department visits, hospitalizations, extended hospital stays, and disabilities related to vaccination between the three COVID-19 vaccines and all the other vaccines in order to investigate whether there was a statistical difference among the



Report frequency of deaths, life-threatening events, birth defects, disabilities, emergency room visit, hospitalization events, and extended hospital stay events after vaccination of the BNT162b2, Ad26.COV2.S, and mRNA-1273. *means p < 0.05 after the chi-square test.

Covid related events	BNT162b2 (a/b)	Comparators (c/d)									ROR	95% CI	Heigh
	6,605 /439,321	3,285 /3,714,157				Ħ					17.00	(16.30-17.73)	20.24
Covid-19	3,364 /442,562	1,528 /3,715,914				H					18.49	(17.40-19.64)	14.02
Sars-Cov-2 test positive	2,541 /443,385	1,334 /3,716,108				нн					15.96	(14.94-17.06)	12.80
Exposure to Sars-Cov-2	207 /445,719	56 /3,717,386									30.83	(22.95-41.42)	2.84
Covid-19 pneumonia	155 /445,771	171 /3,717,271			 i						7.56	(6.08-9.39)	3.88
Sars-Cov-2 antibody test negative	118 /445,808	71 /3,717,371			F						13.86	(10.32-18.60)	2.84
Suspected Covid-19	105 /445,821	78 /3,717,364			Ē	-					11.22	(8.37-15.05)	2.86
Asymptomatic Covid-19	72 /445,854	22 /3,717,420				-					27.29	(16.93-43.99)	1.71
Occupational exposure to Sars-Cov-2	25 /445,901	4 /3,717,438				-		•			52.11	(18.13-149.72)	0.67
Covid-19 immunisation	14 /445,912	19 /3,717,423		·	-	-					6.14	(3.08-12.25)	1.14
Sars-Cov-2 RNA	4 /445,922	2 /3,717,440		·							16.67	(3.05-91.03)	0.32
		ł	2	4	8	16	32	64	128	256			
	Ad26.COV2.S (a/b) Comparators (c/d)									ROR	95% CI	Heigh
	830 /166,627	8,446 /3,987,465	нн								2.35	(2.19-2.53)	11.88
Covid-19	395 /167,062	4,497 /3,991,414	+++								2.10	(1.89-2.33)	8.24
Sars-Cov-2 test positive	331 /167,126	3,544 /3,992,367	H=H								2.23	(1.99-2.50)	7.52
Suspected Covid-19	68 /167,389	115 /3,995,796			۲						14.12	(10.46-19.05)	2.79
Covid-19 pneumonia	36 /167,421	290 /3,995,621									2.96	(2.10-4.19)	2.40
		1	2	4	8	16	32	64	128	256			
	mRNA-1273 (a/b)	Comparators (c/d)									ROR	95% CI	Height
	2,292 /532,834	7,164 /3,621,078	H								2.17	(2.07-2.28)	18.02
Covid-19	1,026 /534,100	3,866 /3,624,376	H								1.80	(1.68-1.93)	12.32
Sars-Cov-2 test positive	958 /534,168	2,917 /3,625,325	Heri								2.23	(2.07-2.40)	11.62
Covid−19 pneumonia	121 /535,005	205 /3,628,037		⊢ •−1							4.00	(3.20-5.01)	3.75
Post-acute Covid-19 syndrome	122 /535,004	19 /3,628,223									43.55	(26.85-70.61)	1.69
Sars-Cov-2 antibody test negative	48 /535,078	141 /3,628,101	⊢	-							2.31	(1.66-3.20)	2.55
Covid-19 immunisation	17 /535,109	16 /3,628,226		·	•						7.20	(3.64-14.26)	1.15
		1	2	4	8	16	32	64	128	256			
				R	eport	ina Oa	lds Ra	atio					

ROR values and height of the COVID-19 vaccines of BNT162b2-, Ad26.COV2.S-, and mRNA-1273-associated COVID events. a: cases of target COVID events reported concerning the target COVID-19 vaccines; b: cases of other AEFI reported concerning the target COVID-19 vaccines; c: cases of target COVID events reported concerning all the other vaccines; d: cases of other AEFI reported concerning all the other vaccines.

	BNT162b2 (a/b)	Comparators (c/d)		ROR	95% CI	Heig
Arterial thrombosis events	792 /445,134	1,707 /3,715,735	iei	3.87	(3.56-4.21)	10.0
Myocardial infarction	260 /445,666	615 /3,716,827	Heri	3.53	(3.05-4.08)	5.8
Acute myocardial infarction	141 /445,785	175 /3,717,267	→ → →	6.72	(5.38-8.39)	3.8
Transient ischaemic attack	107 /445,819	321 /3,717,121	·⊷	2.78	(2.23-3.46)	3.8
Ischaemic stroke	54 /445,872	118 /3,717,324		3.82	(2.76-5.26)	2.5
Retinal artery occlusion	21 /445,905	34 /3,717,408		5.15	(2.99-8.87)	1.4
Coronary arterial stent insertion	20 /445,906	56 /3,717,386		2.98	(1.79-4.96)	1.5
Arteriogram carotid abnormal	18 /445,908	33 /3,717,409		4.55	(2.56-8.08)	1.4
Cerebral artery occlusion	18 /445,908	29 /3,717,413		5.17	(2.87-9.32)	1.3
Coronary artery occlusion	15 /445,911	48 /3,717,394		2.61	(1.46-4.65)	1.3
Thrombotic thrombocytopenic purpura	14 /445,912	65 /3,717,377		1.80	(1.01-3.20)	1.3
Lacunar infarction	11 /445,915	24 /3,717,418		3.82	(1.87-7.80)	1.1
Peripheral artery thrombosis	11 /445,915	12 /3,717,430		7.64	(3.37-17.32)	0.9
Coronary artery bypass	9 /445,917	18 /3,717,424		4.17	(1.87-9.28)	0.9
Percutaneous coronary intervention	9 /445,917	8 /3,717,434		9.38	(3.62-24.31)	0.7
Stress cardiomyopathy	9 /445,917	26 /3,717,416		2.89	(1.35-6.16)	1.0
Angioplasty	7 /445,919	21 /3,717,421	·	2.78	(1.18-6.54)	0.8
Arterial thrombosis	7 /445,919	9 /3,717,433		6.48	(2.41-17.41)	0.7
Carotid artery occlusion	7 /445,919	22 /3,717,420	••	2.65	(1.13-6.21)	0.8
Basal ganglia infarction	6 /445,920	13 /3,717,429		3.85	(1.46-10.12)	0.7
Cerebral artery thrombosis	6 /445,920	9 /3,717,433		5.56	(1.98-15.61)	0.6
Carotid artery thrombosis	5 /445,921	4 /3,717,438	• • • • • • • • • • • • • • • •	10.42	(2.80-38.81)	0.4
Ischaemic cerebral infarction	5 /445,921	14 /3,717,428		2.98	(1.07-8.27)	0.7
Peripheral artery occlusion	5 /445,921	6 /3,717,436	· · · · · · · · · · · · · · · · · · ·	6.95	(2.12-22.76)	0.5
Thromboembolectomy	5 /445,921	10 /3,717,432		4.17	(1.42-12.20)	0.6
Aortic thrombosis	4 /445,922	3 /3,717,439		11.12	(2.49-49.67)	0.4
Arterial stent insertion	3 /445,923	1 /3,717,441	· · · · · · · · · · · · · · · · · · ·	25.01	(2.60-240.44)	0.1
Basilar artery occlusion	3 /445,923	1 /3,717,441	· · · · · · · · · · · · · · · · · · ·	25.01	(2.60-240.44)	0.1
Carotid endarterectomy	3 /445,923	4 /3,717,438	·	6.25	(1.40-27.94)	0.4
Intra-aortic balloon placement	3 /445,923	2 /3,717,440	• • • • • • • • • • • • • • • • • • •	12.50	(2.09-74.84)	0.2
Renal artery thrombosis	3 /445,923	2 /3,717,440		12.50	(2.09-74.84)	0.2
Vertebral artery occlusion	3 /445,923	4 /3,717,438	·	6.25	(1.40-27.94)	0.4
			1 2 4 8 16 32 64 128 256			
	BNT162b2 (a/b)	Comparators (c/d)		ROR	95% CI	Heig
Venous thrombosis	1,065 /444,861	1,967 /3,715,475	He1	4.52	(4.20-4.87)	
Pulmonary embolism	503 /445,423	950 /3,716,492		4.42	(3.97-4.92)	7.8
Deep vein thrombosis	331 /445,595	656 /3,716,786		4.21	(3.69-4.80)	6.4
Pulmonary thrombosis	95 /445,831	108 /3,717,334		7.33	(5.57-9.66)	3.0
Thrombophlebitis superficial	34 /445,892	62 /3,717,380		4.57	(3.01-6.95)	1.9
Retinal vein occlusion	22 /445,904	20 /3,717,422		9.17	(5.00-16.8)	1.3
Cerebral venous sinus thrombosis	19 /445,907	60 /3,717,382		2.64	(1.58-4.42)	1.5
Portal vein thrombosis	18 /445,908	27 /3,717,415		5.56	(3.06-10.09)	1.3
Pulmonary infarction	13 /445,913	29 /3,717,413		3.74	(1.94-7.19)	1.2
Mesenteric vein thrombosis	8 /445,918	29/3,717,413		3.18	(1.41-7.17)	0.9
		15 /3,717,427		3.10	(1.41 - 7.17)	
	9 ///6 019			4.45	(1 90-10 40)	
Pelvic venous thrombosis	8 /445,918			4.45	(1.89-10.49)	
Pelvic venous thrombosis Superior sagittal sinus thrombosis	6 /445,920	14 /3,717,428		3.57	(1.37-9.30)	0.7
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome	6 /445,920 5 /445,921	14 /3,717,428 4 /3,717,438		3.57 10.42	(1.37-9.30) (2.80-38.81)	0.7 0.4
Pelvic venous thrombosis Superior sagittal sinus thrombosis	6 /445,920	14 /3,717,428		3.57	(1.37-9.30)	0.7 0.4
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome	6 /445,920 5 /445,921 3 /445,923	14 /3,717,428 4 /3,717,438 1 /3,717,441		3.57 10.42 25.01	(1.37-9.30) (2.80-38.81) (2.60-240.44)	0.7 0.4 0.1
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome	6 /445,920 5 /445,921	14 /3,717,428 4 /3,717,438		3.57 10.42	(1.37-9.30) (2.80-38.81)	0.8 0.7 0.4 0.1 Heig
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121	1 2 4 8 16 32 64 128 256	3.57 10.42 25.01 ROR 3.09	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27)	0.7 0.4 0.1 Heig 14.7
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b)	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d)		3.57 10.42 25.01 ROR	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% CI	0.7 0.4 0.1 Heig
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121	M	3.57 10.42 25.01 ROR 3.09	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27)	0.7 0.4 0.1 Heig 14.7 8.6
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034	H	3.57 10.42 25.01 ROR 3.09 3.32	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66)	0.7 0.4 0.1 Heig 14.7 8.6
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,344	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43)	0.7 0.4 0.1 Heig 14.7 8.6 8.1 5.1
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 166 /445,760	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,564	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% CI (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86)	0.7 0.4 0.1 Heig 14.7 8.6 8.1 5.1 3.7
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 166 /445,760 102 /445,824	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,544 878 /3,716,564 277 /3,717,165	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85)	0.7 0.4 0.7 Heig 14.7 8.6 8.7 5.7 3.7 2.6
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound dopler abnormal Cerebral infarction	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,470 166 /445,760 102 /445,824 46 /445,880	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,654 277 /3,717,165 207 /3,717,235	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55)	0.7 0.4 0.1 14.7 8.6 8.1 5.1 3.7 2.6 2.0
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram abnormal	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,386 525 /445,401 166 /445,760 102 /445,824 46 /445,880 38 /445,888	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,344 878 /3,716,564 277 /3,717,165 207 /3,717,235 65 /3,717,377	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85 4.87	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27)	0.1 0.4 0.4 14.7 8.6 8.7 5.1 3.7 2.6 2.0 2.0
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram abnormal Angiogram cerebral abnormal	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,329 560 /445,329 525 /445,301 166 /445,760 102 /445,824 46 /445,888 29 /445,887	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,584 277 /3,717,165 207 /3,717,235 65 /3,717,377 99 /3,717,343	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85 4.87 2.44	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69)	0.1 0.4 0.1 14.1 8.6 8.7 5.7 3.1 2.6 2.0 2.0 1.5
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram abnormal	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,461 166 /445,760 102 /445,824 46 /445,880 38 /445,882 29 /445,887 27 /445,899	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 878 /3,716,564 277 /3,717,165 207 /3,717,235 65 /3,717,377 99 /3,717,343 84 /3,717,358	H	3.57 10.42 25.01 ROR 3.39 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13)	0.1 0.4 0.7 14.7 8.6 8.7 5.7 3.1 2.6 2.0 2.0 1.5 1.6
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound dopler abnormal Cerebral infarction Thrombectomy Angiogram exrebral abnormal Cerebral thrombosis	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 106 /445,824 46 /445,820 38 /445,828 29 /445,829 27 /445,839 22 /445,830	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 207 /3,717,165 207 /3,717,235 65 /3,717,373 99 /3,717,343 84 /3,717,358 49 /3,717,393	H	3.57 10.42 25.01 ROR 3.39 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68 3.74	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.19)	0.7 0.4 0.1 Heig 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 2.0 2.0 2.0 1.5 1.6 1.5
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram cerebral abnormal Cerebral Infarction Cerebral Infarction Cerebral Infarction Cerebral Horombosis Haemorrhagic stroke	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,386 525 /445,401 166 /445,760 102 /445,824 46 /445,880 38 /445,888 29 /445,887 27 /445,897 22 /445,904	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,344 878 /3,716,564 277 /3,717,165 207 /3,717,235 65 /3,717,377 99 /3,717,343 84 /3,717,398	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68 3.74 4.17	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.19) (2.50-6.95)	0.7 0.4 0.1 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 1.5 1.6 1.5 1.5
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral Infarction Thrombectomy Angiogram abnormal Angiogram abnormal Cerebral thrombosis Heamorrhagic stroke	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 560 /445,386 525 /445,401 166 /445,760 102 /445,824 46 /445,888 29 /445,889 27 /445,899 27 /445,899 22 /445,904 12 /445,914	14 /3,717,428 4 /3,717,438 1 /3,717,431 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,364 277 /3,717,165 65 /3,717,375 65 /3,717,375 84 /3,717,398 44 /3,717,398 16 /3,717,426	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68 3.74 4.17 6.25	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.32-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.195) (2.96-13.22)	0.7 0.4 0.1 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 2.0 2.0 1.5 1.6 1.5 1.0 1.0
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram abnormal Angiogram abnormal Angiogram abnormal Cerebral thrombosis Haemorrhagic stroke Embolic stroke Intracardiac thrombus	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 166 /445,760 102 /445,824 46 /445,880 38 /445,882 29 /445,894 22 /445,894 22 /445,894 12 /445,914	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 277 /3,717,165 207 /3,717,165 207 /3,717,235 65 /3,717,343 84 /3,717,343 84 /3,717,398 16 /3,717,398 16 /3,717,426 22 /3,717,420	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68 3.74 4.17 6.25 3.79	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.19) (2.26-6.13.22) (1.79-8.00)	0.7 0.4 0.1 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 2.0 2.0 1.5 1.6 1.5 1.0 1.0 0.8
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound dopler abnormal Cerebral infarction Thrombectomy Angiogram ecrebral abnormal Cerebral anormal Cerebral thrombosis Haemorrhagic stroke Embolic stroke Intracardiac thrombus Angioplasty	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 102 /445,824 46 /445,860 38 /445,880 38 /445,880 29 /445,894 27 /445,894 12 /445,914	14 /3,717,428 4 /3,717,438 1 /3,717,434 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 207 /3,717,235 65 /3,717,175 84 /3,717,358 44 /3,717,358 49 /3,717,393 44 /3,717,398 16 /3,717,420 21 /3,717,421	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68 3.74 4.17 6.25 3.79 2.78	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.19) (2.26-6.19) (2.26-6.1322) (1.79-8.00) (1.18-6.54)	0.7 0.4 0.1 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram cerebral abnormal Carebral thrombosis Heamorrhagic stroke Embolic stroke Intracardiac thrombus Angioplasty Thalamic infarction	6 /445,920 6 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,386 525 /445,401 166 /445,760 102 /445,824 46 /445,880 38 /445,888 29 /445,887 27 /445,889 22 /445,904 12 /445,914 10 /445,915 7 /445,919	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 678 /3,716,584 277 /3,717,165 207 /3,717,255 65 /3,717,377 99 /3,717,358 49 /3,717,358 49 /3,717,358 49 /3,717,398 16 /3,717,398 16 /3,717,420 21 /3,717,421 17 /3,717,425	H	3.57 10.42 25.01 ROR 3.39 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68 3.74 4.17 6.25 3.79 2.78 3.43	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.50-6.95) (2.56-13.22) (1.79-8.00) (1.18-6.54) (1.16-7.46)	0.7 0.4 0.1 Heig 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 2.0 2.0 2.0 2.0 1.5 1.5 1.0 1.0 8.0 8.0 8.0 8.0 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram achormal Angiogram denormal Angiogram denormal Cerebral thrombosis Haemorthagic stroke Intracardiac thrombus Angioglasty Thalamic infarction Basal ganglia stroke Brain stem stroke	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 106 /445,5760 102 /445,624 46 /445,828 29 /445,829 22 /445,894 22 /445,894 22 /445,904 12 /445,914 10 /445,916 7 /445,919 6 /445,920	14 /3,717,428 4 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 207 /3,717,165 207 /3,717,165 207 /3,717,235 65 /3,717,373 84 /3,717,358 49 /3,717,338 44 /3,717,398 16 /3,717,426 22 /3,717,420 21 /3,717,425 17 /3,717,425 17 /3,717,428	H	3.57 10.42 25.01 ROR 3.09 3.32 3.99 1.58 3.07 1.85 4.87 2.44 2.68 3.77 2.44 4.17 6.25 3.79 2.78 3.43 4.94 10.42	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.19) (2.50-6.352) (1.79-8.00) (1.18-6.54) (1.42-8.28) (1.16-7.46) (2.80-38.81)	0.7 0.4 0.1 Heig 8.1 5.1 3.7 2.6 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound dopler abnormal Cerebral infarction Thrombectomy Angiogram abnormal Cerebral infarction Thrombectomy Angiogram cerebral abnormal Cerebral thrombosis Haemorrhagic stroke Embolic stroke Intracardiac thrombus Angioplasty Thalamic infarction Basal ganglia stroke Barian sten stroke Cardiac ventricular thrombosis	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 102 /445,824 46 /445,880 38 /445,888 29 /445,880 38 /445,888 29 /445,890 27 /445,890 27 /445,990 27 /445,919 7 /445,919 7 /445,919 6 /445,921	14 /3,717,428 4 /3,717,438 1 /3,717,431 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 277 /3,717,165 207 /3,717,235 65 /3,717,377 99 /3,717,343 84 /3,717,358 49 /3,717,358 49 /3,717,393 44 /3,717,398 16 /3,717,426 22 /3,717,420 21 /3,717,425 17 /3,717,425 14 /3,717,438 6 /3,717,438	H	3.57 10.42 25.01 ROR 3.32 3.99 1.58 3.07 1.85 3.07 1.85 3.07 1.85 3.07 2.44 2.68 3.74 4.17 2.44 2.68 3.79 2.78 3.43 2.94 2.56	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.19) (2.26-6.19) (2.26-6.19) (2.26-6.132) (1.79-8.00) (1.18-6.54) (1.42-8.28) (1.42-8.28) (1.16-7.46) (2.80-38.81) (1.57-19.69)	0.7 0.4 0.1 Heig 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 1.9 1.6 1.5 1.0 1.0 0.8 0.8 0.7 0.4 0.5
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram cerebral abnormal Cerebral infarction Thrombectomy Angiogram cerebral abnormal Cerebral thrombosis Hemorrhagic stroke Embolic stroke Embolic stroke Embolic stroke Embolic stroke Embolic stroke Embolic stroke Embolic stroke Brain stem stroke Cardriac ventricular thrombosis Cerebral congestion	6 /445,920 5 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 166 /445,760 102 /445,824 46 /445,829 27 /445,824 46 /445,888 29 /445,888 29 /445,897 27 /445,819 12 /445,914 10 /445,914 10 /445,919 6 /445,920 5 /445,921	14 /3,717,428 4 /3,717,438 1 /3,717,438 1 /3,717,441 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 878 /3,716,034 878 /3,716,564 277 /3,717,165 207 /3,717,165 207 /3,717,235 65 /3,717,377 99 /3,717,358 49 /3,717,358 49 /3,717,358 46 /3,717,436 22 /3,717,425 17 /3,717,425 4 /3,717,436 6 /3,717,436 6 /3,717,436	H	3.57 10.42 25.01 ROR 3.09 3.32 3.39 1.58 3.07 1.85 4.87 2.44 4.17 6.25 3.79 3.43 2.94 10.42 5.56 5.50	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.32-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.20-6.195) (2.96-13.22) (1.79-8.00) (1.18-6.54) (1.42-8.28) (1.16-7.46) (2.80-38.81) (1.57-19.69) (1.20-20.93)	0.7 0.4 0.1 Heig 14.7 8.6 8.1 5.1 3.7 2.6 2.0 2.0 1.9 1.6 1.5 1.0 1.0 0.8 0.8 0.7 0.4 0.5 0.4
Pelvic venous thrombosis Superior sagittal sinus thrombosis May-thurner syndrome Ophthalmic vein thrombosis Mixed arterial and venous thrombosis Cerebrovascular accident Thrombosis Hemiparesis Ultrasound doppler abnormal Cerebral infarction Thrombectomy Angiogram abnormal Angiogram abnormal Cerebral thrombosis Haemorrhagic stroke Embolic stroke Intracardiac thrombus Angioplasty Thalamic infarction Basal gangia stroke Brain stem stroke Cardiac ventricular thrombosis	6 /445,920 6 /445,921 3 /445,923 BNT162b2 (a/b) 1,597 /444,329 560 /445,366 525 /445,401 166 /445,620 102 /445,820 38 /445,880 38 /445,880 38 /445,880 22 /445,890 22 /445,904 12 /445,914 10 /445,915 7 /445,919 7 /445,919 6 /445,921 4 /445,922	14 /3,717,428 4 /3,717,438 1 /3,717,431 Comparators (c/d) 4,321 /3,713,121 1,408 /3,716,034 1,098 /3,716,034 1,098 /3,716,034 277 /3,717,165 207 /3,717,235 65 /3,717,377 99 /3,717,343 84 /3,717,358 49 /3,717,358 49 /3,717,393 44 /3,717,398 16 /3,717,426 22 /3,717,420 21 /3,717,425 17 /3,717,425 14 /3,717,438 6 /3,717,438	H	3.57 10.42 25.01 ROR 3.32 3.99 1.58 3.07 1.85 3.07 1.85 3.07 1.85 3.07 2.44 2.68 3.74 4.17 2.44 2.68 3.74 4.24 2.56	(1.37-9.30) (2.80-38.81) (2.60-240.44) 95% Cl (2.92-3.27) (3.01-3.66) (3.60-4.43) (1.34-1.86) (2.45-3.85) (1.35-2.55) (3.27-7.27) (1.61-3.69) (1.74-4.13) (2.26-6.19) (2.26-6.19) (2.26-6.19) (2.26-6.132) (1.79-8.00) (1.18-6.54) (1.42-8.28) (1.42-8.28) (1.16-7.46) (2.80-38.81) (1.57-19.69)	0.7 0.4 0.1 Heig

Reporting Odds Ratio

FIGURE 3

(A) ROR values and height of the COVID-19 vaccines of BNT162b2-associated thrombotic events. a: cases of target thrombotic events reported concerning the BNT162b2 vaccine; b: cases of other adverse events reported concerning the BNT162b2 vaccine; c: cases of target thrombotic events reported concerning all the other vaccines; d: cases of adverse events reported concerning all the other vaccines.

Thrombus and embolic events	Ad26.COV2.S (a/b)	Comparators (c/d)		ROR	95% CI	Height
	·····		[
Arterial thrombosis events	279 /167,178	2,048 /3,993,863		3.25	(2.87-3.69)	6.77
Myocardial infarction	57 /167,400 40 /167,417	818 /3,995,093 388 /3,995,523		1.66 2.46	(1.27-2.18)	3.13 2.56
Transient ischaemic attack Acute myocardial infarction	40/167,417 25/167,432	388 /3,995,523 291 /3,995,620		2.46	(1.78-3.41) (1.36-3.08)	2.56
Ischaemic stroke	25/167,432	291/3,995,820		4.06	(2.66-6.20)	1.94
Arteriogram carotid abnormal	16 /167,441	35 /3,995,876		10.91	(6.04-19.71)	1.36
Coronary arterial stent insertion	14 /167,443	62 /3,995,849	— ••••	5.39	(3.02-9.62)	1.39
Coronary artery occlusion	14 /167,443	49 /3,995,862		6.82	(3.76-12.35)	1.35
Peripheral embolism	14 /167,443	9 /3,995,902		37.12	(16.07-85.77)	0.91
Cerebral artery occlusion	11 /167,446	36 /3,995,875		7.29	(3.71-14.32)	1.17
Carotid artery occlusion	7 /167,450	22 /3,995,889		7.59	(3.24-17.77)	0.89
Coronary artery thrombosis	7 /167,450	11 /3,995,900		15.19	(5.89-39.17)	0.78
Retinal artery occlusion	7 /167,450	48 /3,995,863		3.48	(1.57-7.69)	0.97
Embolism	6 /167,451	21 /3,995,890	·	6.82	(2.75-16.89)	0.82
Lacunar infarction	6 /167,451	29 /3,995,882		4.94	(2.05-11.89)	0.85
Cerebral artery thrombosis	5 /167,452	10 /3,995,901		11.93	(4.08-34.91)	0.66
Thromboembolectomy	5 /167,452	10 /3,995,901		11.93	(4.08-34.91)	0.66
Basal ganglia infarction	4 /167,453	15 /3,995,896		6.36	(2.11-19.17)	0.63
Coronary angioplasty	4 /167,453	7 /3,995,904		13.64	(3.99-46.58)	0.54
Carotid endarterectomy	3 /167,454	4 /3,995,907		17.90	(4.01-79.97)	0.40
Percutaneous coronary intervention	3 /167,454	14 /3,995,897		5.11	(1.47-17.79)	0.53
Peripheral artery thrombosis Pulmonary artery thrombosis	3 /167,454 3 /167,454	20 /3,995,891 2 /3,995,909		3.58 35.79	(1.06-12.05) (5.98-214.22)	0.55 0.29
annonary artery thrombosis	57107,434	210,000,000		1	(0.00 214.22)	0.29
			1 2 4 8 16 32 64 128 2			
	Ad26.COV2.S (a/b)	Comparators (c/d)	·r	ROR	95% CI	Height
Venous thrombosis	887 /166,570	2,474 /3,993,437	H	8.60	(7.96-9.28)	11.04
Pulmonary embolism	298 /167,159	1,155 /3,994,756	Hel	6.17	(5.43-7.00)	6.65
Deep vein thrombosis	281 /167,176	706 /3,995,205	H	9.51	(8.28-10.92)	6.12
Pulmonary thrombosis	55 /167,402	148 /3,995,763	H+	8.87	(6.51-12.09)	2.70
Thrombophlebitis superficial	43 /167,414	53 /3,995,858	⊢ ⊷−	19.36	(12.95-28.96)	2.06
Cerebral venous sinus thrombosis	41 /167,416	38 /3,995,873		25.75	(16.56-40.04)	1.86
Venogram abnormal	19 /167,438	23 /3,995,888		19.71	(10.74-36.20)	1.32
Transverse sinus thrombosis	14 /167,443	11 /3,995,900		30.37	(13.79-66.90)	0.97
Portal vein thrombosis	13 /167,444	32 /3,995,879		9.69	(5.09-18.47)	1.23
Jugular vein thrombosis	11 /167,446	11 /3,995,900		23.86	(10.35-55.04)	0.91
Superior sagittal sinus thrombosis Cerebral venous thrombosis	11 /167,446 10 /167,447	9 /3,995,902 20 /3,995,891		29.17 11.93	(12.09-70.39) (5.59-25.49)	0.85 1.02
Pulmonary infarction	8 /167,449	34 /3,995,891		5.61	(2.60-12.13)	1.02
Thrombophlebitis	8 /167,449	48 /3,995,863		3.98	(1.88-8.41)	1.04
Embolism venous	6 /167,451	15 /3,995,896		9.55	(3.70-24.60)	0.78
Peripheral vein occlusion	6 /167,451	4 /3,995,907	· · · · · · · · · · · · · · · · · · ·	35.79	(10.10-126.85)	0.52
Retinal vein occlusion	6 /167,451	36 /3,995,875		3.98	(1.68-9.44)	0.87
Subclavian vein thrombosis	6 /167,451	12 /3,995,899		11.93	(4.48-31.79)	0.74
Venous occlusion	6 /167,451	6 /3,995,905	·	23.86	(7.70-73.99)	0.61
Venous thrombosis	6 /167,451	28 /3,995,883	·	5.11	(2.12-12.35)	0.85
Venous thrombosis limb	6 /167,451	10 /3,995,901	·	14.32	(5.20-39.40)	0.71
Mesenteric vein thrombosis	5 /167,452	24 /3,995,887		4.97	(1.90-13.03)	0.76
Pelvic venous thrombosis	5 /167,452	18 /3,995,893		6.63	(2.46-17.85)	0.73
Vena cava filter insertion	5 /167,452	6 /3,995,905	·	19.89	(6.07-65.16)	0.57
Axillary vein thrombosis	4 /167,453	8 /3,995,903	·	11.93	(3.59-39.62)	0.56
Cavernous sinus thrombosis	4 /167,453	3 /3,995,908		31.82	(7.12-142.16)	0.40
Hepatic vein thrombosis	4 /167,453	4 /3,995,907		23.86	(5.97-95.42)	0.45
Peripheral vein thrombus extension Splenic vein thrombosis	3 /167,454 3 /167,454	3 /3,995,908 9 /3,995,902		23.86 7.95	(4.82-118.23) (2.15-29.38)	0.36 0.50
Spieriic vein unombosis	37107,404	975,995,902		,	(2.10-29.00)	0.50
			1 2 4 8 16 32 64 128 2			
	Ad26.COV2.S (a/b)	Comparators (c/d)		ROR	95% CI	Height
Mixed arterial and venous thrombosi		4,948 /3,990,963		5.00	(4.68-5.35)	12.62
Thrombosis	456 /167,001	1,167 /3,994,744			(8.39-10.42)	7.83
			141	9.35		
Cerebrovascular accident	196 /167,261	1,772 /3,994,139	iei iei	2.64	(2.28-3.06)	5.73
Cerebrovascular accident Ultrasound doppler abnormal	196 /167,261 107 /167,350	1,772 /3,994,139 272 /3,995,639	101 	2.64 9.39	(2.28-3.06) (7.51-11.75)	5.73 3.77
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis	196 /167,261 107 /167,350 71 /167,386	1,772 /3,994,139 272 /3,995,639 973 /3,994,938)ee(-==-(-==-(2.64 9.39 1.74	(2.28-3.06) (7.51-11.75) (1.37-2.22)	5.73 3.77 3.49
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal	196 /167,261 107 /167,350 71 /167,386 48 /167,409	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848	₩ ₩ ₩ ₩ ₩	2.64 9.39 1.74 18.19	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47)	5.73 3.77 3.49 2.21
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy	196 /167,261 107 /167,350 71 /167,386 48 /167,409 26 /167,431	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834		2.64 9.39 1.74 18.19 8.06	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57)	5.73 3.77 3.49 2.21 1.85
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral infarction	196 /167,261 107 /167,350 71 /167,386 48 /167,409 26 /167,431 19 /167,438	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834 234 /3,995,677		2.64 9.39 1.74 18.19 8.06 1.94	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09)	5.73 3.77 3.49 2.21 1.85 1.75
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral infarction Cerebral thrombosis	196 /167,261 107 /167,350 71 /167,386 48 /167,409 26 /167,431 19 /167,438 18 /167,439	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834 234 /3,995,677 53 /3,995,858		2.64 9.39 1.74 18.19 8.06 1.94 8.10	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83)	5.73 3.77 3.49 2.21 1.85 1.75 1.52
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombedomy Cerebral Infarction Cerebral Informbosis Angiogram abnormal	196 /167,261 107 /167,350 71 /167,386 48 /167,409 26 /167,431 19 /167,438 18 /167,439 15 /167,442	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834 234 /3,995,677 53 /3,995,858 113 /3,995,798		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83) (1.85-5.43)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral infarction Cerebral thrombosis	196 /167,261 107 /167,350 71 /167,386 48 /167,409 26 /167,431 19 /167,438 18 /167,439	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834 234 /3,995,677 53 /3,995,858		2.64 9.39 1.74 18.19 8.06 1.94 8.10	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83) (1.85-5.43) (5.14-22.91)	5.73 3.77 3.49 2.21 1.85 1.75 1.52
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Anglogram cerebral abnormal Thrombectomy Cerebral Infarction Carebral Intrombosis Anglogram abnormal Intracardiac thrombus	196 /167,261 107 /167,350 71 /167,386 48 /167,409 26 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,447	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834 234 /3,995,677 53 /3,995,858 113 /3,995,798 22 /3,995,889		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83) (1.85-5.43)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Inferction Cerebral Inferction Cerebral Inferction Angiogram abnormal Infracardiac thrombus Embolic stroke	196 /167,261 107 /167,350 71 /167,358 48 /167,409 26 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,444 8 /167,449	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,854 234 /3,995,858 113 /3,995,798 22 /3,995,889 20 /3,995,891		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83) (1.85-5.43) (5.14-22.91) (4.20-21.67)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral infarction Cerebral infraction Cerebral thrombosis Angiogram abnormal Intracardiac thrombus Embolic stroke Coronary artery thrombosis	196 /167,261 107 /167,350 71 /167,350 48 /167,409 26 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,447 8 /167,449 7 /167,450	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,848 234 /3,995,677 53 /3,995,858 113 /3,995,798 22 /3,995,889 20 /3,995,891 11 /3,995,900		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83) (1.85-5.43) (5.14-22.91) (4.20-21.67) (5.89-39.17)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Infarction Cerebral Intrombosis Angiogram abnormal Intracardiac thrombus Embolic stroke Coronary artery thrombosis Haemorrhagic stroke	196 /167,261 107 /167,350 71 /167,386 48 /167,409 26 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,447 8 /167,449 7 /167,450	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,844 234 /3,995,874 234 /3,995,858 113 /3,995,798 22 /3,995,899 20 /3,995,891 11 /3,995,900 59 /3,995,852		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83) (1.85-5.43) (5.14-22.91) (4.20-21.67) (5.88-39.17) (1.29-6.20)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.98
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Inforction Cerebral Inforction Cerebral Inforction Cerebral Inforction Carebral Inforction Infracardicat Enhombus Embolics stroke Coronary artery thrombosis Heamorrhagic stroke Embolism	196 /167,261 107 /167,386 48 /167,409 26 /167,431 19 /167,438 18 /167,439 15 /167,432 10 /167,443 7 /167,445 7 /167,450 6 /167,451	$\begin{array}{c} 1,772/3,994,139\\ 272/3,995,639\\ 973/3,995,834\\ 63/3,995,848\\ 77/3,995,834\\ 224/3,995,858\\ 113/3,995,858\\ 113/3,995,858\\ 122/3,995,858\\ 20/3,995,899\\ 20/3,995,891\\ 11/3,395,800\\ 59/3,995,852\\ 21/3,3995,890\\ \end{array}$		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.82	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (1.21-3.09) (4.75-13.83) (1.85-5.43) (5.14-22.91) (4.20-21.67) (5.89-39.17) (1.29-6.20) (2.75-16.89)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.98 0.82
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Infarction Cerebral Informotosis Angiogram abnormal Infraerdiac thrombus Embolic stroke Coronary artery thrombosis Haemorrhagic stroke Embolism	196 /167,261 107 /167,350 48 /167,409 28 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,442 8 /167,449 7 /167,450 7 /167,450 6 /167,451 5 /167,452	1,772 /3,994,139 272 /3,995,639 973 /3,995,834 63 /3,995,848 77 /3,995,844 234 /3,995,677 53 /3,995,858 113 /3,995,788 20 /3,995,889 20 /3,995,891 11 /3,995,900 59 /3,995,892 21 /3,995,890 3 /3,995,908		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.82 39.77	(2.28-3.06) (7.51-11.75) (1.37-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.09) (4.75-13.83) (1.85-5.43) (5.14-22.91) (4.20-21.67) (5.88-39.17) (1.29-6.20) (2.75-16.89) (9.50-166.43)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.98 0.82 0.43
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Infraction Cerebral Infraction Cerebral Infrombosis Angiogram abnormal Infracardiac thrombus Embolics stroke Coronary aftery thrombosis Haemorrhagic stroke Embolism Haemorrhagic strombosed Splenic infarction	196 /167,261 107 /167,380 71 /167,380 48 /167,409 26 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,442 7 /167,450 6 /167,451 5 /167,452 5 /167,452	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834 234 /3,995,677 53 /3,995,858 113 /3,995,798 22 /3,995,899 20 /3,995,891 11 /3,995,890 59 /3,995,895 21 /3,995,895		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.82 39.77 7.46	(2.28-3.06) (7.51-11.75) (13.7-2.22) (12.49-26.47) (5.17-12.57) (1.21-3.08) (4.75-13.83) (1.85-5.43) (5.14-22.91) (4.20-21.67) (5.88-39.17) (1.29-6.20) (2.75-16.83) (9.50-166.43) (2.73-20.36)	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.98 0.82 0.43 0.72
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Infraction Cerebral Infraction Cerebral Infraction Untracardiac thrombus Embolics stroke Coronary artery thrombosis Heamorrhagic stroke Embolism Heamorrhoids thrombosed Splenic infarction Thrombolysis	196 /167,261 107 /167,350 48 /167,409 28 /167,439 19 /167,438 18 /167,439 15 /167,432 10 /167,449 7 /167,450 7 /167,450 5 /167,452 5 /167,452	1,772 /3,994,139 272 /3,995,639 973 /3,995,834 63 /3,995,848 77 /3,995,834 224 /3,995,858 113 /3,995,858 113 /3,995,858 20 /3,995,899 11 / 13,995,890 59 /3,995,852 21 /3,995,850 3 /3,995,895 16 /3,995,895	· · · · · · · · · · · · · · · · · · ·	2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.82 39.77 7.46 9.18	$\begin{array}{c} (2.28-3.06)\\ (7.51-11.78)\\ (1.37-2.22)\\ (12.49-26.47)\\ (5.17-12.57)\\ (1.21-3.09)\\ (4.75-13.83)\\ (1.85-5.43)\\ (5.14-22.91)\\ (5.20-21.67)\\ (5.89-39.17)\\ (1.29-6.20)\\ (2.75-16.89)\\ (9.50-166.43)\\ (2.73-20.36)\\ (3.27-25.78) \end{array}$	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.98 0.82 0.43 0.72 0.69
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Infraction Cerebral Infraction Cerebral Infraction Untracardicat Infrombus Embolics stroke Coronary artery thrombosis Heamorrhogic stroke Embolism Heamorrhogic stroke Embolism Thormbolysis Coronary angioplasty Renal Infarcti Cardiac ventricular thrombosis	196 /167,261 107 /167,380 48 /167,409 28 /167,439 15 /167,439 15 /167,439 15 /167,442 10 /167,447 8 /167,449 7 /167,450 7 /167,450 5 /167,452 5 /167,452 5 /167,452 5 /167,452	1,772 /3,994,139 272 /3,995,639 973 /3,995,834 63 /3,995,848 77 /3,995,834 224 /3,995,858 113 /3,995,858 123 /3,995,858 20 /3,995,899 20 /3,995,892 20 /3,995,892 21 /3,995,892 3 /3,995,892 3 /3,995,895 13 /3,995,895 7 /3,995,904		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.82 39.77 7.46 9.18 9.18 13.64	$\begin{array}{c} (2.28-3.06)\\ (7.51-11.75)\\ (1.37-2.22)\\ (12.49-26.47)\\ (5.17-12.57)\\ (1.21-3.09)\\ (4.75-13.83)\\ (1.85-5.43)\\ (5.14-22.91)\\ (5.14-22.91)\\ (4.20-21.67)\\ (5.89-39.17)\\ (1.29-6.20)\\ (2.75-16.89)\\ (2.75-16.89)\\ (2.75-20.36)\\ (3.27-25.75)\\ (3.99-46.58)\\ (3.27-34.44)\\ (2.64-39.55) \end{array}$	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.98 0.82 0.43 0.72 0.69 0.54
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombeetomy Cerebral Infraction Cerebral Infraction Cerebral Infrombosis Angiogram abnormal Intracardiac thrombus Embolis entoke Coronary artery thrombosis Haemorrhoids thrombosed Splenic Infraction Thrombolysis Coronary angioplasty Renal Infract Cardiac ventricular thrombosis	196 /167,261 107 /167,380 48 /167,409 28 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,447 8 /167,449 7 /167,450 5 /167,451 5 /167,452 5 /167,452 5 /167,452 4 /167,453 3 /167,454	1,772 /3,994,139 272 /3,995,639 973 /3,995,834 63 /3,995,848 77 /3,995,834 234 /3,995,677 53 /3,995,858 113 /3,995,858 113 /3,995,889 20 /3,995,889 21 /3,995,895 21 /3,995,895 13 /3,995,898 16 /3,995,898 7 /3,995,904 9 /3,995,904 7 /3,995,904		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.827 7.46 9.18 13.64 10.61 10.23	$\begin{array}{c} (2.28-3.06)\\ (7.51-11.75)\\ (1.37-2.22)\\ (12.49-26.47)\\ (5.17-12.57)\\ (1.21-3.09)\\ (4.75-13.83)\\ (1.85-5.43)\\ (5.14-22.91)\\ (4.20-21.67)\\ (5.89-39.17)\\ (1.29-6.20)\\ (2.75-16.89)\\ (9.50-166.43)\\ (2.75-16.89)\\ (9.50-166.43)\\ (2.73-20.36)\\ (3.27-25.75)\\ (3.99-46.58)\\ (3.27-24.44)\\ (2.64-39.55)\\ (2.64-39.55)\\ (2.64-39.55)\\ \end{array}$	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.93 0.43 0.72 0.69 0.54 0.58 0.47 0.58
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombectomy Cerebral Inforction Cerebral Inforction Cerebral Inforction Cerebral Inforction Cerebral Inforction Intracardiac Hrombuss Embolic stroke Coronary artery thrombosis Heamorrhagic stroke Emboliem Haemorrhagic stroke Emboliem Haemorrhagic stroke Emboliem Haemorrhagic stroke Emboliem Haemorrhoids thrombosed Splenic Infarction Thrombolysis Coronary angioplasty Cardiac ventricular thrombosis Heparin-induced thrombocytopenia Injection site thrombosis	196 /167,261 107 /167,350 48 /167,409 26 /167,438 18 /167,438 16 /167,438 16 /167,438 16 /167,438 16 /167,449 7 /167,450 6 /167,451 5 /167,452 5 /167,452 4 /167,453 3 /167,454 3 /167,454	1,772 /3,994,139 272 /3,995,639 973 /3,994,938 63 /3,995,848 77 /3,995,834 234 /3,995,877 53 /3,995,889 20 /3,995,889 20 /3,995,889 20 /3,995,890 3 /3,995,900 3 /3,995,908 16 /3,995,908 16 /3,995,904 9 /3,995,904 9 /3,995,904 5 /3,995,904 5 /3,995,904 5 /3,995,904		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.82 39.77 7.46 9.18 13.64 10.61 10.23 10.23 14.32	$\begin{array}{c} (2.28-3.06)\\ (7.51-11.78)\\ (1.37-2.22)\\ (12.49-26.47)\\ (5.17-12.57)\\ (1.21-3.09)\\ (4.75-13.83)\\ (1.85-5.43)\\ (5.14-22.91)\\ (4.20-21.67)\\ (5.29-39.17)\\ (1.29-6.20)\\ (2.75-16.89)\\ (3.27-25.78)\\$	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.98 0.43 0.72 0.69 0.54 0.43 0.58 0.47 0.47 0.43
Cerebrovascular accident Ultrasound doppler abnormal Hemiparesis Angiogram cerebral abnormal Thrombeetomy Cerebral Infraction Cerebral Infraction Cerebral Infrombosis Angiogram abnormal Intracardiac thrombus Embolis entoke Coronary artery thrombosis Haemorrhoids thrombosed Splenic Infraction Thrombolysis Coronary angioplasty Renal Infract Cardiac ventricular thrombosis	196 /167,261 107 /167,380 48 /167,409 28 /167,431 19 /167,438 18 /167,439 15 /167,442 10 /167,447 8 /167,449 7 /167,450 5 /167,451 5 /167,452 5 /167,452 5 /167,452 4 /167,453 3 /167,454	1,772 /3,994,139 272 /3,995,639 973 /3,995,834 63 /3,995,848 77 /3,995,834 234 /3,995,677 53 /3,995,858 113 /3,995,858 113 /3,995,889 20 /3,995,889 21 /3,995,895 21 /3,995,895 13 /3,995,898 16 /3,995,898 7 /3,995,904 9 /3,995,904 7 /3,995,904		2.64 9.39 1.74 18.19 8.06 1.94 8.10 3.17 10.85 9.55 15.19 2.83 6.827 7.46 9.18 13.64 10.61 10.23	$\begin{array}{c} (2.28-3.06)\\ (7.51-11.75)\\ (1.37-2.22)\\ (12.49-26.47)\\ (5.17-12.57)\\ (1.21-3.09)\\ (4.75-13.83)\\ (1.85-5.43)\\ (5.14-22.91)\\ (4.20-21.67)\\ (5.89-39.17)\\ (1.29-6.20)\\ (2.75-16.89)\\ (9.50-166.43)\\ (2.75-16.89)\\ (9.50-166.43)\\ (2.73-20.36)\\ (3.27-25.75)\\ (3.99-46.58)\\ (3.27-24.44)\\ (2.64-39.55)\\ (2.64-39.55)\\ (2.64-39.55)\\ \end{array}$	5.73 3.77 3.49 2.21 1.85 1.75 1.52 1.50 1.04 0.93 0.78 0.93 0.43 0.72 0.69 0.54 0.58 0.47 0.58

FIGURE 3 (Continued)

(B) ROR values and height of the COVID-19 vaccines of Ad26.COV2.S-associated thrombotic events. a: cases of target thrombotic events reported concerning the Ad26.COV2.S vaccine; b: cases of other adverse events reported concerning the Ad26.COV2.S vaccine; c: cases of target thrombotic events reported concerning all the other vaccines; d: cases of adverse events reported concerning all the other vaccines.

Reporting Odds Ratio

Thrombus and embolic events	mRNA-1273 (a/b)	Comparators (c/d)		ROR	95% CI	Heig
Arterial thrombosis events	517 /534,609	1,549 /3,626,693	iei	2.26	(2.05-2.50)	8.5
Myocardial infarction	171 /534,955	704 /3,627,538	H=H	1.65	(1.39–1.95)	5.0
Transient ischaemic attack	117 /535,009	311 /3,627,931	·+ ≠ -1	2.55	(2.06-3.16)	3.9
Acute myocardial infarction	100 /535,026	216 /3,628,026	⊢ ∎-1	3.14	(2.48-3.98)	3.5
Ischaemic stroke	47 /535,079	125 /3,628,117	⊢ •−1	2.55	(1.82-3.57)	2.4
Coronary arterial stent insertion	23 /535,103	53 /3,628,189	⊢− −−1	2.94	(1.80-4.80)	1.6
Arteriogram carotid abnormal	12 /535,114	39 /3,628,203	F	2.09	(1.09-3.98)	1.2
Cerebral artery occlusion	12 /535,114	35 /3,628,207		2.32	(1.21-4.48)	1.2
Lacunar infarction	11 /535,115	24 /3,628,218	⊢	3.11	(1.52-6.34)	1.1
Angioplasty	10 /535,116	18 /3,628,224	·	3.77	(1.74-8.16)	1.0
Peripheral artery thrombosis	7 /535,119	16 /3,628,226	·	2.97	(1.22-7.21)	0.8
Peripheral arterial occlusive disease	4 /535,122	5 /3,628,237	+	5.42	(1.46-20.2)	0.4
Embolism arterial	3 /535,123	3 /3,628,239	·	6.78	(1.37-33.59)	0.3
			1 2 4 8 16 32 64 128 256		· · · · ·	
	mRNA-1273 (a/b)	Comparators (c/d)		ROR	95% CI	Heig
Venous thrombosis	762 /534,364	2,044 /3,626,198	iei	2.53	(2.33–2.75)	10.1
Pulmonary embolism	439 /534,687	1,014 /3,627,228	Heri	2.94	(2.63-3.29)	7.5
Deep vein thrombosis	223 /534,903	764 /3,627,478	He-I	1.98	(1.71-2.30)	5.6
Pulmonary thrombosis	42 /535,084	161 /3,628,081	⊢ •−1	1.77	(1.26-2.48)	2.4
Pulmonary infarction	15 /535,111	27 /3,628,215	↓ → → →	3.77	(2.00-7.08)	1.2
Mesenteric vein thrombosis	12 /535,114	17 /3,628,225	↓ ■ ↓	4.79	(2.29-10.02)	1.0
Venogram abnormal	11 /535,115	31 /3,628,211		2.41	(1.21-4.79)	1.1
Embolism venous	6 /535,120	15 /3,628,227	HH	2.71	(1.05-6.99)	0.7
Splenic vein thrombosis	6 /535,120	6 /3,628,236		6.78	(2.19-21.02)	0.6
May-thurner syndrome	4 /535,122	5 /3,628,237		5.42	(1.46-20.2)	0.4
Vena cava thrombosis	4 /535,122	4 /3,628,238	• • • • • • • • • • • • • • • • • • •	6.78	(1.70-27.11)	0.4
			1 2 4 8 16 32 64 128 256			
	mRNA-1273 (a/b)	Comparators (c/d)		ROR	95% CI	Heig
Mixed arterial and venous thrombosis	1,058 /534,068	3,450 /3,624,792		2.08	(1.94-2.23)	12.3
Cerebrovascular accident	519 /534,607	1,449 /3,626,793	Heri	2.43	(2.20-2.69)	8.4
Thrombosis	298 /534,828	1,325 /3,626,917	H=-1	1.53	(1.35-1.73)	6.7
Ultrasound doppler abnormal	74 /535,052	305 /3,627,937		1.65	(1.28-2.12)	3.3
Thrombectomy	30 /535,096	73 /3,628,169		2.79	(1.82-4.26)	1.9
Angiogram cerebral abnormal	24 /535,102	87 /3,628,155		1.87	(1.19-2.94)	1.8
Haemorrhagic stroke	22 /535,104	44 /3,628,198		3.39	(2.03-5.66)	1.5
		, ,			(1.46-4.19)	1.5
Cerebral thrombosis	19 /535,107	52 /3.628.190		2.48		
Cerebral thrombosis Brain stem infarction	19 /535,107 12 /535,114	52 /3,628,190 13 /3 628 229		2.48 6.26	. ,	0.9
Brain stem infarction	12 /535,114	13 /3,628,229		6.26	(2.86-13.72)	
Brain stem infarction Thalamic infarction	12 /535,114 11 /535,115	13 /3,628,229 13 /3,628,229		6.26 5.74	(2.86–13.72) (2.57–12.81)	0.9
Brain stem infarction Thalamic infarction Angioplasty	12 /535,114 11 /535,115 10 /535,116	13 /3,628,229 13 /3,628,229 18 /3,628,224		6.26 5.74 3.77	(2.86–13.72) (2.57–12.81) (1.74–8.16)	0.9 1.0
Brain stem infarction Thalamic infarction Angioplasty Basal ganglia stroke	12 /535,114 11 /535,115 10 /535,116 9 /535,117	13 /3,628,229 13 /3,628,229 18 /3,628,224 14 /3,628,228		6.26 5.74 3.77 4.36	(2.86-13.72) (2.57-12.81) (1.74-8.16) (1.89-10.07)	0.9 1.0 0.9
Brain stem infarction Thalamic infarction Angioplasty Basal ganglia stroke Intracardiac thrombus	12 /535,114 11 /535,115 10 /535,116 9 /535,117 8 /535,118	13 /3,628,229 13 /3,628,229 18 /3,628,224 14 /3,628,228 24 /3,628,218		6.26 5.74 3.77 4.36 2.26	(2.86-13.72) (2.57-12.81) (1.74-8.16) (1.89-10.07) (1.02-5.03)	0.9 1.0 0.9 0.9
Brain stem infarction Thalamic infarction Angioplasty Basal ganglia stroke Intracardiac thrombus Splenic infarction	12 /535,114 11 /535,115 10 /535,116 9 /535,117 8 /535,118 7 /535,119	13 /3,628,229 13 /3,628,229 18 /3,628,224 14 /3,628,228 24 /3,628,218 14 /3,628,228		6.26 5.74 3.77 4.36 2.26 3.39	(2.86-13.72) (2.57-12.81) (1.74-8.16) (1.89-10.07) (1.02-5.03) (1.37-8.40)	0.9 1.0 0.9 0.9
Brain stem infarction Thalamic infarction Angioplasty Basal ganglia stroke Intracardiac thrombus Splenic infarction Thrombolysis	12 /535,114 11 /535,115 10 /535,116 9 /535,117 8 /535,118 7 /535,119 6 /535,120	13 /3,628,229 13 /3,628,229 18 /3,628,224 14 /3,628,228 24 /3,628,218 14 /3,628,228 12 /3,628,230		6.26 5.74 3.77 4.36 2.26 3.39 3.39	(2.86-13.72) (2.57-12.81) (1.74-8.16) (1.89-10.07) (1.02-5.03) (1.37-8.40) (1.27-9.03)	0.9 1.0 0.9 0.9 0.8 0.7
Brain stem infarction Thalamic infarction Angioplasty Basal ganglia stroke Intracardiac thrombus Splenic infarction	12 /535,114 11 /535,115 10 /535,116 9 /535,117 8 /535,118 7 /535,119	13 /3,628,229 13 /3,628,229 18 /3,628,224 14 /3,628,228 24 /3,628,218 14 /3,628,228		6.26 5.74 3.77 4.36 2.26 3.39	(2.86-13.72) (2.57-12.81) (1.74-8.16) (1.89-10.07) (1.02-5.03) (1.37-8.40)	0.9 0.9 1.0 0.9 0.9 0.8 0.7 0.2 0.1

Reporting Odds Ratio

FIGURE 3 (Continued)

(C) ROR values and height of the COVID-19 vaccines of mRNA-1273-associated thrombotic events. a: cases of target thrombotic events reported concerning the mRNA-1273 vaccine; b: cases of other adverse events reported concerning the mRNA-1273 vaccine; c: cases of target thrombotic events reported concerning all the other vaccines; d: cases of adverse events reported concerning all the other vaccines.

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three vaccines. Serious adverse events and main complications following immunization associated with the three COVID-19 vaccines were also analyzed in order to observe the effects of serious AEFI. In order to study the occurrence of thrombosis with hemorrhage and thrombocytopenia, the number of hemorrhage and thrombocytopenia events occurring simultaneously with thrombosis was analyzed. The median value of time from the vaccination to the onset (TTO) for the COVID-19 vaccines BNT162b2, Ad26.COV2.S, and mRNA-1273 was analyzed. When the TTO was statistically described, cases with TTO \geq 957 days were cast as error data (count from the first reported case on 27 December 2019 until now), and TTO \geq 365 days was kept but with doubts.

In the data mining process, malignancy PTs were automatically compared and analyzed by MATLAB version R2019a (MathWorks, USA). The statistical package SPSS version 19.0 (Statistical Product and Service Solutions) was used for statistical analyses. Using the chi-square test, *p*-values < 0.05 were considered statistically significant. RORs, 95% CIs, and the frequencies of AEFI reports associated with the three COVID-19 vaccines were calculated using SPSS.

3 Results

3.1 Descriptive analyses of serious AEFI related to BNT162b2, Ad26.COV2.S, and mRNA-1273

A total of 445,926, 167,457, and 535,126 cases of AEFI were reported after vaccination with BNT162b2, Ad26.COV2.S, and mRNA-1273, respectively. Among the serious AEFI associated with the COVID-19 vaccine, people who died after the vaccination accounted for 1,963 cases (4.40 per 1,000, 1,963/ 445,926) for BNT162b2, 345 cases (2.06 per 1,000, 345/167,457) for Ad26.COV2.S, and 2,077 cases (3.88 per 1,000, 2,077/ 535,126) for mRNA-1273. The frequency of deaths was statistically different between Ad26.COV2.S and the other two vaccines (p < 0.05). Regarding birth defects associated with the COVID-19 vaccines, 79 cases (0.18 per 1,000) for BNT162b2, 10 cases (0.06 per 1,000) for Ad26.COV2.S, and 53 cases (0.10 per 1,000) for mRNA-1273 were reported. The reported frequency of birth defects was statistically different between Ad26.COV2.S and BNT162b2 (p < 0.05). A total of 16,737 patients who went to the emergency room (37.53 per 1,000) for BNT162b2, 4,494 (26.84 per 1,000) for Ad26.COV2.S, and 13,092 (24.46 per 1,000) for mRNA-1273 were reported. The reported frequency of emergency room visits was statistically different between Ad26.COV2.S and BNT162b2 (p < 0.05). For the reported frequency of life-threatening AEFI, hospitalization, extended hospital stays, and disability related to vaccination, no statistical difference was observed among the three vaccines, which is shown in Figure 1.

Among the 1,963 people who died after receiving the BNT162b2 vaccine, the most common combined AEFI were dyspnea (accounting for 12.48% of the 1,963 people who died after the vaccination), cardiac arrest (8.51%), and lack of response to stimuli (7.74%). One hundred and forty-eight patients died of COVID-19 (7.54%), and 140 patients showed a positive SARS-CoV-2 test (7.13%). 2221 people (4.98 per 1,000, 2,221/445,926) suffered from life-threatening AEFI, with dyspnea (19.18%), pulmonary embolism (11.80%), and headache (9.32%) reported with high frequency. The numbers of patients who went to the emergency room and were hospitalized after vaccination were 16,737 (37.53 per 1,000, 16,737/445,926) and 7,151 (16.04 per 1,000, 7,151/445,926), respectively, because of dizziness (18.30%), dyspnea (15.57%, with 15.84% for hospital visits), headache (13.16%), and nausea (12.03%). The serious AEFI associated with the three vaccines and the main complications are presented in Supplementary Tables S11-S13.

The median values of TTO associated with the three vaccinations were similar, and this is illustrated in Supplementary Table S14.

3.2 COVID-related events

A total of 6605 vaccine recipients suffered from COVID-19related symptoms (ROR 17.00, 95% CI 16.30-17.73, height 20.24), accounting for 1.48% of all the AEFI reported for BNT162b2 (6,605/445,926). A total of 3,364 cases of people suffering from COVID-19 symptoms were reported (ROR 18.49, 95% CI 17.40-19.64, height 14.02). A total of 155 patients were diagnosed with COVID-19 pneumonia (ROR 7.56, 95% CI 6.08-9.39, height 3.88), 105 patients were suspected COVID-19 (ROR 11.22, 95% CI 8.37-15.05, height 2.86), and there were 72 cases of asymptomatic COVID-19 (ROR 27.29, 95% CI 16.93-43.99, height 1.71) after vaccination with BNT162b2. A total of 2,541 cases of a positive SARS-CoV-2 test were reported (ROR 15.96, 95% CI 14.94-17.06, height 12.80), accounting for 0.57% of all the AEFI reported for BNT162b2 (2,541/445,926), and 118 cases showed a negative SARS-CoV-2 antibody test (ROR 13.86, 95% CI 10.32-18.60, height 2.84) after vaccination with BNT162b2. A total of 830 vaccine recipients suffered from COVID-19-related symptoms (ROR 2.35, 95% CI 2.19-2.53, height 11.88) after vaccination with Ad26.COV2.S. A total of 395 reported cases of COVID-19 (ROR 2.10, 95% CI 1.89-2.33, height 8.24), 331 cases of positive SARS-CoV-2 tests (ROR 2.23, 95% CI 1.99-2.50, height 7.52), 36 cases of COVID-19 pneumonia (ROR 2.96, 95% CI 2.10-4.19, height 2.40), and 68 cases of suspected COVID-19 (ROR 14.12, 95% CI 10.46-19.05, height 2.79) after vaccination with Ad26.COV2.S were reported. In total, 2,292 COVID-19-related symptoms were reported related to mRNA-1273 (ROR 2.17, 95% CI 2.07-2.28, height 18.02). A total of 1026 cases of COVID-19 (ROR 1.80, 95% CI 1.68–1.93, height 12.32), 958 cases of positive SARS-CoV-2 tests (ROR 2.23, 95% CI 2.07–2.40, height 11.62), 121 cases of COVID-19 pneumonia (ROR 4.00, 95% CI 3.20–5.01, height 3.75), 122 cases of post-acute COVID-19 syndrome (ROR 43.55, 95% CI 26.85–70.61, height 1.69), and 48 cases of negative SARS-CoV-2 antibody tests were reported (ROR 2.31, 95% CI 1.66–3.20, height 2.55) after vaccination with mRNA-1273. The COVID-related events associated with the three vaccines are shown in Figure 2.

3.3 Coagulation disorder-related events

3.3.1 Thrombotic events

Thrombotic events were shown to be associated with BNT162b2, Ad26.COV2.S, and mRNA-1273 vaccines (Figures 3A-C). A total of 3,454 cases of thrombotic events were associated with the BNT162b2 vaccine (with a frequency of 7.75 per 1,000, 3,454/445,926), including 792 cases of arterial thrombotic events with an ROR of 3.87 (95% CI 3.56-4.21, height 10.06), ranked by the absolute number of cases including myocardial infarction (ROR 3.53, 95% CI 3.05-4.08, height 5.84, 260 cases), acute myocardial infarction (ROR 6.72, 95% CI 5.38-8.39, height 3.80, 141 cases), and transient ischemic attack (ROR 2.78, 95% CI 2.23-3.46, height 3.85, 107 cases). In total, 1,065 cases of venous thrombosis were associated with BNT162b2 vaccines with an ROR of 4.52 (95% CI 4.20-4.87, height 11.37), including pulmonary embolism (ROR 4.42, 95% CI 3.97-4.92, height 7.84, 503 cases), deep vein thrombosis (ROR 4.21, 95% CI 3.69-4.80, height 6.41, 331 cases), and pulmonary thrombosis (ROR 7.33, 95% CI 5.57-9.66, height 3.04, 95 cases). A total of 1,597 cases of mixed arterial and venous thrombosis were reported for BNT162b2 vaccines with an ROR of 3.09 (95% CI 2.92-3.27, height 14.77), with the top three absolute number of cases including cerebrovascular accident (ROR 3.32, 95% CI 3.01-3.66, height 8.66, 560 cases), thrombosis (ROR 3.99, 95% CI 3.60-4.43, height 8.15, 525 cases), and hemiparesis (ROR 1.58, 95% CI 1.34-1.86, height 5.10, 166 cases).

A total of 2198 cases of thrombotic events were associated with the Ad26.COV2.S vaccine, with a frequency of 13.13 per 1,000 (2,198/167,457). A total of 279 cases of arterial thrombosis events with an ROR value of 3.25 (95% CI 2.87–3.69, height 6.77) including myocardial infarction (ROR 1.66, 95% CI 1.27–2.18, height 3.13, and 57 cases) and transient ischemic attack (ROR 2.46, 95% CI 1.78–3.41, height 2.56) were reported at the top. A total of 887 cases of venous thrombosis with an ROR of 8.60 (95% CI 7.96–9.28, height 11.04), including pulmonary embolism with an ROR value of 6.17 (95% CI 5.43–7.00, height 6.65, 298 cases) and deep vein thrombosis with an ROR of 9.51 (95% CI 8.28–10.92, height 6.12, 281 cases) were ranked in the top. For mixed arterial and venous thrombosis, 1,032 cases were reported (ROR 5.00, 95% CI 4.68–5.35, height 12.62),

including thrombosis (ROR 9.35, 95% CI 8.39–10.42, height 7.83, 456 cases), cerebrovascular accident (ROR 2.64, 95% CI 2.28–3.06, height 5.73, 196 cases), and abnormal ultrasound (ROR 9.39, 95% CI 7.51–11.75, height 3.77, 107 cases).

A total of 2,337 cases of thrombotic events were associated with mRNA-1273, with a frequency of 4.37 per 1,000 (2,337/ 535,126). A total of 517 cases of arterial thrombosis events with an ROR value of 2.26 (95% CI 2.05-2.50, height 8.52), including myocardial infarction (ROR 1.65, 95% CI 1.39-1.95, height 5.06, 171 cases), transient ischemic attack (ROR 2.55, 95% CI 2.06-3.16, height 3.97, 117 cases), and acute myocardial infarction (ROR 3.14, 95% CI 2.48-3.98, height 3.55, 100 cases), were reported. A total of 762 cases of venous thrombosis, with an ROR of 2.53 (95% CI 2.33-2.75, height 10.19) and pulmonary embolism with an ROR value of 2.94 (95% CI 2.63-3.29, height 7.57, 439 cases) and deep vein thrombosis with an ROR of 1.98 (95% CI 1.71-2.30, height 5.67, 223 cases) were ranked in the top. A total of 1,058 cases of mixed arterial and venous thrombosis reported (ROR 2.08, 95% CI 1.94-2.23, height 12.31); cerebrovascular accident (ROR 2.43, 95% CI 2.20-2.69, height 8.46, 519 cases) and thrombosis (ROR 1.53, 95% CI 1.35-1.73, height 6.74, 298 cases) were ranked in the top.

3.3.2 Hemorrhage events

Hemorrhage events were reported and showed association with the three COVID-19 vaccines, as shown in Figure 4. A total of 1,349 cases of hemorrhage events were associated with BNT162b2, with an ROR of 2.26 (95% CI 2.13–2.40, height 14.10), and epistaxis (ROR 1.69, 95% CI 1.51–1.90, height 7.34, 347 cases) and vaginal hemorrhage (ROR 2.32, 95% CI 1.94–2.78, height 4.73, 154 cases) were ranked in the top two. A total of 876 cases of hemorrhage events were reported to be associated with Ad26.COV2.S, with an ROR of 2.15 (95% CI 2.00–2.30, height 12.25), and contusion (ROR 1.60, 95% CI 1.43–1.79, height 7.73, 341 cases) and epistaxis (ROR 2.57, 95% CI 2.22–2.98, height 5.80, 200 cases) were reported with high frequency. In total, 1,110 hemorrhage events were associated with mRNA-1273 (ROR 1.71, 95% CI 1.60–1.83, height 12.88), and injection site bruising (ROR 1.55, 95% CI 1.42–1.69, height 9.94, 648 cases) was the most frequent event.

3.3.3 Thrombocytopenia events

In total, 509 cases of thrombocytopenia events were associated with BNT162b2, with an ROR of 1.24 (95% CI 1.11–1.40, height 7.41), 267 cases were associated with Ad26.COV2.S (ROR 1.66, 95% CI 1.45–1.90, height 6.20), and 70 cases of immune thrombocytopenia events were associated with mRNA-1273 (ROR 3.32, 95% CI 2.49–4.42, height 2.93), as shown in Figure 5.

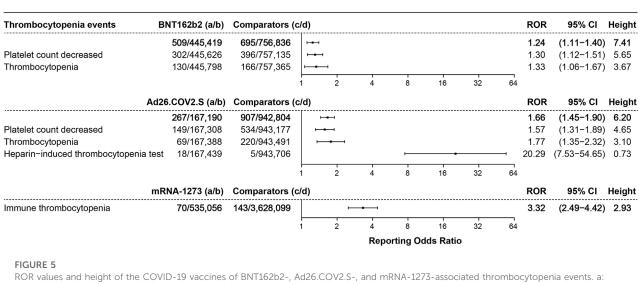
3.3.4 Concurrent thrombosis with hemorrhage or thrombocytopenia

A total of 329 cases of hemorrhage events occurred during the course of thrombosis, including 81, 77, 42, 33, 22, 18, and

	BNT162b2 (a/b)	Comparators (c/d)		ROR	95% CI	Height
	1,349 /444,577	4,991 /3,712,451	×	2.26	(2.13-2.40)	14.10
pistaxis	347 /445,579	1,708 /3,715,734	Her .	1.69	(1.51-1.90)	7.34
Vaginal haemorrhage	154 /445,772	553 /3,716,889	Heri	2.32	(1.94-2.78)	4.73
Blood urine present	88 /445,838	462 /3,716,980	H#H	1.59	(1.26-1.99)	3.69
Cerebral haemorrhage	83 /445,843	304 /3,717,138		2.28	(1.79-2.90)	3.47
Eye haemorrhage	74 /445,852	191 /3,717,251	·	3.23	(2.47-4.22)	3.13
Haemoptysis	71 /445,855	300 /3,717,142		1.97	(1.52-2.56)	3.25
Immune thrombocytopenia	71 /445,855	142 /3,717,300		4.17	(3.14-5.54)	2.94
Gastrointestinal haemorrhage	61 /445,865	331 /3,717,111		1.54	(1.17-2.02)	3.07
accination site bruising	61 /445,865	140 /3,717,302		3.63	(2.69-4.91)	2.78
vaccination site haemorrhage	43 /445,883	56 /3,717,386		6.40	(4.30-9.53)	2.08
Conjunctival haemorrhage	28 /445,898	97 /3,717,345		2.41	(1.58-3.66)	1.96
Eye contusion	24 /445,902	57 /3,717,385		3.51	(2.18-5.66)	1.72
Postmenopausal haemorrhage	24 /445,902	35 /3,717,407		5.72	(3.40-9.61)	1.56
Subarachnoid haemorrhage	24 /445,902	88 /3,717,354		2.27	(1.45-3.57)	1.82
Haemorrhagic stroke	22 /445,904	44 /3,717,398		4.17	(2.50-6.95)	1.59
Subdural haematoma	21 /445,905	108 /3,717,334	⊢ •1	1.62	(1.02-2.59)	1.75
Haemorrhage intracranial	18 /445,908	82 /3,717,360		1.83	(1.10-3.05)	1.60
laemorrhage urinary tract	17 /445,909	43 /3,717,399		3.30	(1.88-5.78)	1.44
hrombotic thrombocytopenic purpura	14 /445,912	65 /3,717,377		1.80	(1.01-3.20)	1.39
nternal haemorrhage	9 /445,917	19 /3,717,423		3.95	(1.79-8.73)	0.97
Anal haemorrhage	8 /445,918	18 /3,717,424	,,	3.71	(1.61-8.52)	0.91
Cerebellar haemorrhage	8 /445,918	7 /3,717,435	↓ → → →	9.53	(3.45-26.27)	0.71
Uterine haemorrhage	8 /445,918	28 /3,717,414	F	2.38	(1.09-5.23)	0.98
_ower gastrointestinal haemorrhage	7 /445,919	5 /3,717,437		11.67	(3.70-36.77)	0.60
Oral blood blister	7 /445,919	9 /3,717,433	·	6.48	(2.41-17.41)	0.73
Ruptured cerebral aneurysm	6 /445,920	6 /3,717,436		8.34	(2.69-25.85)	0.61
Upper gastrointestinal haemorrhage	6 /445,920	13 /3,717,429		3.85	(1.46-10.12)	0.75
Wound haemorrhage	6 /445,920	16 /3,717,426	·	3.13	(1.22-7.99)	0.79
Basal ganglia haemorrhage	5 /445,921	8 /3,717,434		5.21	(1.70-15.93)	0.62
Brain contusion	5 /445,921	9/3,717,433		4.63	(1.55-13.82)	0.64
Oral contusion	5 /445,921	14 /3,717,428		2.98	(1.07-8.27)	0.70
/ein rupture	5 /445,921	10 /3,717,432		4.17	(1.42-12.20)	0.66
Blood loss anaemia	4 /445,922	1/3,717,441	· · · · · · · · · · · · · · · · · · ·	33.35	(3.73-298.36)	0.19
Cerebral microhaemorrhage	4 /445,922	2/3,717,440	·	16.67	(3.05-91.03)	0.32
Eyelid contusion	4 /445,922	5/3,717,437	·	6.67	(1.79-24.84)	0.49
laemarthrosis	4 /445,922	9/3,717,433		3.71	(1.14-12.03)	0.58
laemothorax	3 /445,923	6 /3,717,436	•••••	4.17	(1.04-16.67)	0.45
			1 2 4 8 16 32 64 128 256 512		()	
	26 COV2 6 (-/h)	C (-(-))	1 2 4 8 16 32 64 128 256 512	ROR	0.5% (1)	Li - la la la d
Aa	26.COV2.S (a/b)	Comparators (c/d)			95% CI	Height
	876 /166,581	9,756 /3,986,155		2.15	(2.00-2.30)	12.25
ontusion	341 /167,116	5,087 /3,990,824	iei	1.60	(1.43-1.79)	7.73
pistaxis	200 /167,257	1,855 /3,994,056	H=1	2.57	(2.22-2.98)	5.80
aginal haemorrhage	67 /167,390	640 /3,995,271	H=H	2.50	(1.94-3.21)	3.34
Cerebral haemorrhage	47 /167,410	340 /3,995,571		3.30	(2.43-4.48)	2.74
Blood urine present	42 /167,415	508 /3,995,403		1.97	(1.44-2.70)	2.66
laemoptysis	34 /167,423	337 /3,995,574	→ • →	2.41	(1.69-3.43)	2.36
Eye haemorrhage	23 /167,434	242 /3,995,669		2.27	(1.48-3.48)	1.93
mmune thrombocytopenia	21 /167,436	192 /3,995,719		2.61	(1.66-4.10)	1.82
minune unombooytopenia	40 /407 400	93 /3,995,818	⊢ •−•	4.88	(2.98-7.99)	1.65
	19 /167,438				(5.00-15.76)	1.40
Subarachnoid haemorrhage		43 /3,995,868		8.88		
Subarachnoid haemorrhage Postmenopausal haemorrhage	16 /167,441 12 /167,445	43 /3,995,868 70 /3,995,841		8.88 4.09	(2.22-7.55)	1.30
Subarachnoid haemorrhage Postmenopausal haemorrhage Blood blister	16 /167,441					1.30 1.19
Subarachnoid haemorrhage Rostmenopausal haemorrhage Blood blister Eye contusion	16 /167,441 12 /167,445 10 /167,447	70 /3,995,841 71 /3,995,840		4.09	(2.22-7.55) (1.73-6.52)	
subarachnoid haemorrhage Rostmenopausal haemorrhage Nood blister Eye contusion Iaemorrhage urinary tract	16 /167,441 12 /167,445 10 /167,447 10 /167,447	70 /3,995,841 71 /3,995,840 50 /3,995,861		4.09 3.36 4.77	(2.22-7.55) (1.73-6.52) (2.42-9.41)	1.19
Subarachnoid haemorrhage Postmenopausal haemorrhage Blood blister Eye contusion Iaemorrhage urinary tract Subdural haematoma	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792		4.09 3.36 4.77 2.01	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82)	1.19 1.16 1.23
Subarachnoid haemorrhage Postmenopausal haemorrhage Blood blister Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894		4.09 3.36 4.77 2.01 9.83	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69)	1.19 1.16 1.23 0.85
Subarachnoid haemorrhage Postmenopausal haemorrhage 3lood blister Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebrah haematoma Haemorrhagic stroke	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894 59 /3,995,852		4.09 3.36 4.77 2.01 9.83 2.83	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20)	1.19 1.16 1.23 0.85 0.98
Subarachnoid haemorrhage Postmenopausal haemorrhage Slood blister Eye contusion Haemorrhage urinary tract Subdural haematoma Zerebral haematoma Haemorrhagic stroke ntraventricular haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 4 /167,453	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894 59 /3,995,852 16 /3,995,895		4.09 3.36 4.77 2.01 9.83 2.83 5.97	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84)	1.19 1.16 1.23 0.85 0.98 0.64
Subarachnoid haemorrhage Yostmenopausal haemorrhage Jood Dilater Eye contusion Iaemorrhage urinary tract Jubdural haematoma Derebral haematoma Iaemorrhagic stroke ntraventricular haemorrhage Bastric haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 4 /167,453 3 /167,454	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894 59 /3,995,855 16 /3,995,895 14 /3,995,897		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79)	1.19 1.16 1.23 0.85 0.98 0.64 0.53
subarachnoid haemorrhage Vostmenopausal haemorrhage Jood bliater Sye contusion Iaemorrhage urinary tract Jubdural haematoma Derebral haematoma Iaemorrhagic stroke ntraventricular haemorrhage Satric haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 4 /167,453	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894 59 /3,995,852 16 /3,995,895		4.09 3.36 4.77 2.01 9.83 2.83 5.97	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84)	1.19 1.16 1.23 0.85 0.98 0.64
ubarachnoid haemorrhage ostimenopausal haemorrhage diood blieter ye contusion laemorrhage urinary tract ubdural haematoma terebral haematoma laemorrhagic stroke trraventricular haemorrhage astric haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 4 /167,453 3 /167,454	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894 59 /3,995,855 16 /3,995,895 14 /3,995,897		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79)	1.19 1.16 1.23 0.85 0.98 0.64 0.53
ubarachnoid haemorrhage ostimenopausal haemorrhage diodo blister ye contusion laemorrhage urinary tract ubdural haematoma terebral haematoma laemorrhagic stroke traventricular haemorrhage bastric haemorrhage plenic haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 4 /167,453 3 /167,454	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894 59 /3,995,855 16 /3,995,895 14 /3,995,897	1 2 4 8 16 32 64 128 256 512	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79)	1.19 1.16 1.23 0.85 0.98 0.64 0.53
Subarachnoid haemorrhage Postmenopausal haemorrhage Jood Dilater Eye contusion Iaemorrhage urinary tract Jubdural haematoma Derebral haematoma Iaemorrhagic stroke Intaventricular haemorrhage Bastric haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 7 /167,450 7 /167,450 4 /167,453 3 /167,454 3 /167,454	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,792 17 /3,995,895 16 /3,995,895 14 /3,995,897 3 /3,995,908 Comparators (c/d)		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 955% Cl	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36
Subarachnoid haemorrhage Postmenopausal haemorrhage Biodo blister Eye contusion -Iaemorrhage urinary tract Subdural haematoma Cerebral haematoma -Beamorrhagic stroke ntraventricular haemorrhage Sastric haemorrhage Splenic haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,453 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,895 14 /3,995,852 16 /3,995,855 14 /3,995,895 3 / 3,995,908 Comparators (c/d) 4,399 /3,623,843		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 955% Cl (1.60-1.83)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88
Subarachnoid haemorrhage Postmenopausal haemorrhage Sidood bilster Eye contusion Iaemorrhage urinary tract Subdural haematoma Derebral haematoma Iaemorrhagic stoke Inteventricular haemorrhage Sastric haemorrhage Splenic haemorrhage Splenic haemorrhage	16/167,441 12/167,445 10/167,447 10/167,447 7/167,450 4/167,453 3/167,454 3/167,454 3/167,454 3/167,454 3/167,454	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,894 59 /3,995,895 16 /3,995,895 14 /3,995,895 14 /3,995,895 3 /3,995,908 Comparators (c/d) 4,399 /3,623,843 2,838 /3,625,404		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94
Subarachnoid haemorrhage Postmenopausal haemorrhage Sigo ob blieter Eye contusion Iaemorrhage urinary tract Subdural haematoma Derebral haematoma demorrhagic stroke ntraventricular haemorrhage Splenic haemorrhage Splenic haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 7 /167,450 4 /167,450 3 /167,454 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /533,036	70 /3,995,841 71 /3,995,840 50 /3,995,840 119 /8,995,792 17 /3,995,892 16 /3,995,895 14 /3,995,895 14 /3,995,895 3 /3,995,908 Comparators (c/d) 4,399 /3,623,843 2,833 /3,625,404 460 /3,627,782		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.06-1.66)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73
Subarachnoid haemorrhage Postmenopausal haemorrhage Siodo blister Eye contusion faemorrhage urinary tract Subdural haematoma Jerebral haematoma Jerebral haematoma Jerebral haemorrhage Splenic haemorrhage Splenic haemorrhage mijection site bruising Siodo urine present Jerebral haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 7 /167,450 4 /167,453 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,792 17 /3,995,894 59 /3,996,842 16 /3,995,895 14 /3,995,895 14 /3,995,905 Comparators (c/d) 4,399 /3,625,404 460 /3,627,762		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.06-1.68) (1.16-1.94)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25
Subarachnoid haemorrhage Postmenopausal haemorrhage Sodo blister Eye contusion Iaemorrhage urinary tract Subdural haematoma Derebral haematoma Iaemorrhagic stoke Intaventricular haemorrhage Bastric haemorrhage Sastric haemorrhage mijection site bruising Slood urine present Zerberal haemorrhage mmune thrombocytopenia	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /536,056 70 /535,056	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,895 14 /3,995,895 14 /3,995,895 14 /3,995,908 Comparators (c/d) 4,399 /3,623,843 2,838 /3,625,404 400 /3,627,782 143 /3,628,099	* * *	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32	(2.22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.06-1.64) (1.16-1.94) (2.49-4.42)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93
Subarachnoid haemorrhage Postmenopausal haemorrhage Sidood bilster Eye contusion Iaemorrhage urinary tract Subdural haematoma Derebral haematoma Jastich haemorrhage Spilenic haemorrhage Spilenic haemorrhage mijection site bruising 3lood urine present Zerebral haemorrhage mmune thrombocytopenia Eye haemorrhage	16/167,441 12/167,445 10/167,447 10/167,447 10/167,447 7/167,450 4/167,453 3/167,454 3/167,454 3/167,454 1,110/534,016 648/534,478 90/535,056 70/535,056	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,792 17 /3,995,892 59 /3,995,892 16 /3,995,895 14 /3,995,895 14 /3,995,895 3 /3,995,906 Comparators (c/d) 4,399 /3,623,443 2,838 /3,625,404 460 /3,627,782 317 /3,627,925 143 /3,622,826 143 /3,622,805		4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98	(2 22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-7.84) (1.29-7.84) (1.29-7.84) (1.29-7.84) (1.29-7.84) (1.29-7.85) (1.20	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91
Subarachnoid haemorrhage Sostmenopausal haemorrhage Siodo blister Siye contusion faemorrhage urinary tract subdural haematoma Jarebral haematoma Jarebral haematoma Jarebral haemorrhage Splenic haemorrhage splenction site bruising Slood urine present arebral haemorrhage mmune thrombocytopenia Siye haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 7 /167,450 4 /167,450 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /53,478 90 /535,036 70 /535,056 70 /535,056 60 /535,056 24 /535,102	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,792 17 /3,995,894 59 /3,996,845 216 /3,995,895 14 /3,995,895 14 /3,995,905 2,833 /3,825,404 4,399 /3,825,404 460 /3,627,305 14 /3,3625,404 400 /3,627,925 14 /3,628,037 101 /3,628,037	* * *	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98 1.61	(2 22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.39-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.16-1.94) (2.49-4.42) (1.49-2.51)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85
Subarachnoid haemorrhage Postmenopausal haemorrhage Sod bilstor Eye contusion Iaemorrhage urinary tract Subdural haematoma Derebral haematoma Iaemorrhagic stroke Intaventricular haemorrhage Sastric haemorrhage Sastric haemorrhage Injection site bruising Slood urine present Zerberlan haemorrhage Conjunctival haemorrhage Sonjunctival haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 70 /535,056 60 /535,056 60 /535,052 24 /535,102	T0 (3, 995, 841 71 / 3, 995, 841 50 / 3, 995, 841 119 / 3, 995, 792 17 / 3, 995, 792 17 / 3, 995, 592 16 / 3, 995, 592 14 / 3, 995, 592 14 / 3, 995, 592 2, 638 / 3, 625, 644 400 / 3, 627, 782 317 / 3, 627, 925 143 / 3, 622, 049 205 / 3, 628, 037 101 / 3, 628, 141 44 / 3, 528, 149	* * *	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98 1.61 3.39	(2 22-7.55) (1.78-6.52) (2.42-9.41) (1.05-3.82) (4.07-23.69) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% Cl (1.60-1.83) (1.42-1.69) (1.06-1.86) (1.06-1.84) (1.06-1.84) (1.06-2.85) (1.02-2.51) (2.03-5.66)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85 1.59
Subarachnoid haemorrhage Sostmenopausal haemorrhage Siodo blister Siye contusion faemorrhage urinary tract Subdural haematoma Jaemorrhagic stroke traventricular haemorrhage gastric haemorrhage splenic haemorrhage mine thrombocytopenia Sie haemorrhage Terment haemorrhage Terment haemorrhage Terment haemorrhage Sonjunctival haemorrhage Jaemorrhagic stroke Jaemorrhagic stroke Jaemorrhagic stroke Jae contusion	16 /167,441 12 /167,445 10 /167,447 10 /167,447 7 /167,450 4 /167,450 3 /167,454 3 /167,454 3 /167,454 3 /167,454 9 (753,056 6 (48),53,056 70 /535,056 00 /535,056 24 /535,106 24 /535,105	70 /3,995,541 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,592 16 /3,995,582 16 /3,995,585 14 /3,995,585 14 /3,995,595 Comparators (c/d) 4,399 /5,623,843 2,838 /3,625,404 460 /3,627,782 317 /3,622,925 143 /3,628,037 101 /3,628,037 101 /3,628,182	* * *	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98 1.61 3.39 2.37	(2 22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.39-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.16-1.94) (2.49-4.42) (1.49-2.51)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85 1.59 1.64
Subarachnoid haemorrhage Postmenopausal haemorrhage Sodo blister Eye contusion Haemorrhage urinary tract Subdural haematoma Jerebral haematoma Jerebral haematoma Jerebral haematoma Jerebral haemorrhage Splenic haemorrhage Splenic haemorrhage minuet bruising Blood urine present Zerebral haemorrhage Eye haemorrhage Eye haemorrhage Laemorrhage Laemorrhage Eye notusion Jood blister	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 70 /535,056 70 /535,056 60 /535,066 24 /535,102 22 /535,104 21 /535,105	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,792 17 /3,995,894 59 /3,996,842 16 /3,995,895 14 /3,995,895 14 /3,995,905 20 /3,995,905 2,833 /3,625,404 4,399 /3,625,404 460 /3,627,925 143 /3,625,404 400 /3,627,925 143 /3,628,407 101 /3,628,182 00 /3,628,182 00 /3,628,182	* * *	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98 1.61 3.39 2.37 2.19	(2 22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.39-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.16-1.94) (2.49-4.42) (1.09-7.65) (1.03-2.51) (2.05-5.66) (1.12-3.62)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85 1.59 1.64 1.62
Subarachnoid haemorrhage Postmenopausal haemorrhage Sodo blister Eye contusion Haemorrhage urinary tract Subdural haematoma Jerebral haematoma Jerebral haematoma Jerebral haematoma Jerebral haemorrhage Splenic haemorrhage Splenic haemorrhage minuet bruising Blood urine present Zerebral haemorrhage Eye haemorrhage Eye haemorrhage Laemorrhage Laemorrhage Eye notusion Jood blister	16 /167,441 12 /167,445 10 /167,447 10 /167,447 7 /167,450 4 /167,450 3 /167,454 3 /167,454 3 /167,454 3 /167,454 9 (753,056 6 (48),53,056 70 /535,056 00 /535,056 24 /535,106 24 /535,105	T0 (3, 995, 841 71 / 3, 995, 841 50 / 3, 995, 841 119 / 3, 995, 792 17 / 3, 995, 792 17 / 3, 995, 852 16 / 3, 995, 852 16 / 3, 995, 895 14 / 3, 995, 897 14 / 3, 995, 997 3 / 3, 995, 908 Comparators (c/d) 4, 399 / 3, 623, 843 2, 838 / 3, 623, 843 2, 838 / 3, 623, 843 2, 838 / 3, 623, 843 460 / 3, 627, 782 317 / 3, 627, 945 460 / 3, 627, 782 317 / 3, 627, 945 460 / 3, 627, 782 317 / 3, 627, 945 460 / 3, 627, 945 460 / 3, 627, 845 460 / 3, 628, 182 60 / 3, 628, 182 60 / 3, 628, 182 62 / 3, 628, 182 62 / 3, 628, 200	* * **	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98 1.61 3.39 2.37	(222-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% Cl (1.42-18.23) (1.42-18.23) (1.42-18.23) (1.42-18.23) (1.42-18.23) (1.42-18.23) (1.42-18.23) (1.42-2.51) (2.49-4.42) (1.43-2.51) (2.03-5.66) (1.44-3.90)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85 1.59 1.64
Subarachnoid haemorrhage Postmenopausal haemorrhage Sod bilstor Eye contusion Iaemorrhage urinary tract Jubdural haematoma Derebral haematoma Derebral haematoma Iaemorrhagic stroke Interventricular haemorrhage Sastric haemorrhage Sastric haemorrhage Injection site bruising Slood urine present Derebral haemorrhage Sonjunctival haemorrhage Donjunctival haemorrhage Sodou bilster Iaemorrhage urinary tract	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 7 /167,450 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 70 /535,056 70 /535,056 60 /535,066 24 /535,102 22 /535,104 21 /535,105	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,792 17 /3,995,894 59 /3,996,842 16 /3,995,895 14 /3,995,895 14 /3,995,905 20 /3,995,905 2,833 /3,625,404 4,399 /3,625,404 460 /3,627,925 143 /3,625,404 400 /3,627,925 143 /3,628,407 101 /3,628,182 00 /3,628,182 00 /3,628,182	* * **	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98 1.61 3.39 2.37 2.19	(2 22-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.39-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.16-1.94) (2.49-4.42) (1.09-7.65) (1.03-2.51) (2.05-5.66) (1.12-3.62)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85 1.59 1.64 1.62
Subarachnoid haemorrhage Postmenopausal haemorrhage Slood blister Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma Haemorrhagic stroke ntraventricular haemorrhage Sastric haemorrhage Splenic haemorrhage Splenic haemorrhage minue thombocytopenia Eye haemorrhage Conjunctival haemorrhage Conjunctival haemorrhage Haemorrhage Haemorrhage Stroke Eye contusion Slood blister Haemorrhage urinary tract	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 70 /535,056 70 /535,056 60 /535,056 24 /535,102 21 /535,106	T0 (3, 995, 841 71 / 3, 995, 841 50 / 3, 995, 841 119 / 3, 995, 792 17 / 3, 995, 792 17 / 3, 995, 852 16 / 3, 995, 852 16 / 3, 995, 895 14 / 3, 995, 897 14 / 3, 995, 997 3 / 3, 995, 908 Comparators (c/d) 4, 399 / 3, 623, 843 2, 838 / 3, 623, 843 2, 838 / 3, 623, 843 2, 838 / 3, 623, 843 460 / 3, 627, 782 317 / 3, 627, 925 205 / 3, 628, 937 101 / 3, 629, 941 44 / 3, 622, 198 60 / 3, 628, 182 62 / 3, 628, 182 63 / 3, 628, 182 63 / 3, 628, 182 64 / 3, 628, 182 64 / 3, 628, 182 65 / 3, 628, 182 67 / 3, 62	* * **	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.98 1.61 3.39 2.37 2.19 2.91	(222-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.29-6.20) (1.9-17.84) (1.42-1.82) (1.42-1.82) (1.60-1.83) (1.42-1.69) (1.06-1.86) (1.16-1.94) (2.49-4.42) (1.09-2.65) (1.02-2.51) (2.02-5.62) (1.32-3.62)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85 1.59 1.64 1.46
Subarachnoid haemorrhage Postmenopausal haemorrhage Sodo blistor Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma Haemorrhagic stroke rutaventricular haemorrhage Splenic haemorrhage Splenic haemorrhage reterlari haemorrhage Eye haemorrhage Eye haemorrhage Eye haemorrhage Eye ontusion Siood blister Haemorrhage urinary tract Postmenopausal haemorrhage Haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 7 /167,450 4 /167,450 3 /167,454 3 /167,454 3 /167,454 3 /167,454 9 (753,056 6 (48),53,036 70 /535,056 0 /535,056 24 /535,102 21 /535,106 18 /535,108	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,792 17 /3,995,852 16 /3,995,852 16 /3,995,852 14 /3,995,855 14 /3,995,895 20,995,908 20,90	* * **	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR ROR ROR ROR 1.71 1.55 1.33 1.50 3.32 1.98 2.37 2.19 2.291 2.11	(222-7.55) (173-6.52) (242-9.41) (105-3.82) (129-6.20) (139-17.84) (142-17.79) (4.82-118.23) 95% Cl (1.60-1.83) (1.42-1.69) (1.08-1.66) (1.08-1.66) (1.08-1.66) (1.08-2.51) (2.03-5.66) (1.43-2.362) (1.67-5.05) (1.16-3.84)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.93 2.93 1.85 1.59 1.64 1.62 1.46 1.33
Subarachnoid haemorrhage Postmenopausal haemorrhage Siodo blister Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma Cerebral haematoma Cerebral haematoma Sastric haemorrhage Sastric haemorrhage Sastric haemorrhage Injection site bruising Slood urine present Cerebral haemorrhage Haemorrhage toke Eye contusion Slood blister Haemorrhage urinary tract Postmenopausal haemorrhage Internal haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 60 /535,056 60 /535,056 60 /535,056 12 /1535,102 22 /535,104 21 /535,105 18 /535,108	T0 (3,995,841 71 /3,995,840 50 /3,995,840 119 /3,995,792 17 /3,995,892 16 /3,995,892 16 /3,995,892 14 /3,995,892 14 /3,995,895 14 /3,995,895 14 /3,995,895 14 /3,995,895 2,338 /3,623,843 2,838 /3,623,843 2,838 /3,623,843 460 /3,627,782 317 /3,627,925 460 /3,627,782 317 /3,627,925 460 /3,627,782 317 /3,627,945 460 /3,628,182 460 /3,628,182 460 /3,628,182 47 /3,628,200 47 /3,628,197 18 /3,628,218	* * **	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.55 3.32 1.50 3.32 2.37 1.61 3.39 2.37 2.19 2.91 2.91 2.91 2.91	(222-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.29-6.20) (1.29-7.20) (1.42-17.79) (4.82-118.20) (4.82-118.20) (1.42-169) (1.06-1.86) (1.46-1.86) (1.49-2.65) (1.	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height 12.88 9.94 3.73 3.25 2.93 2.91 1.85 1.59 1.64 1.62 1.46 1.33 0.00 1.01
Subarachnoid haemorrhage Prostmenopausal haemorrhage Biodo blister Eye oontusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma Cerebral haematoma Haemorrhagic stroke Intraventricular haemorrhage Splenic haemorrhage Splenic haemorrhage Splenic haemorrhage Biodo urine present Carebral haemorrhage Conjunctival haemorrhage Conjunctival haemorrhage Haemorrhage torke Eye contusion Biodo blister Haemorrhage urinary tract Postmenopausal haemorrhage Internan haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 11 /167,450 7 /167,450 3 /167,450 3 /167,454 3 /167,454 3 /167,454 9 (733,056 6 (48),533,056 70 /535,056 00 /535,056 20 /535,066 24 /535,102 21 /535,106 20 /535,108 14 /535,112 10 /535,116 9 /535,117 7 /535,119	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,592 17 /3,995,592 16 /3,995,592 16 /3,995,595 14 /3,995,595 14 /3,995,595 20 /3,995,590 20 /3,995,590 2	* * **	4.09 3.36 4.77 2.01 9.83 2.83 5.97 2.3.86 ROR 1.71 1.55 3.32 1.98 3.32 1.98 3.32 1.98 2.37 2.19 2.11 3.37 2.19 2.11 2.11	(222-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% Cl (1.60-1.83) (1.42-1.69) (1.08-1.66) (1.18-1.94) (2.49-4.42) (1.08-1.66) (1.18-2.51) (2.23-5.66) (1.48-2.36) (1.67-5.05) (1.18-5.47) (1.18-5.47) (1.18-5.47)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height Height Height 12.88 9.94 3.73 3.25 2.93 3.25 1.59 1.62 1.62 1.62 1.62 1.62 1.63 1.62 1.63 1.62 1.64 1.63 1.64 1.63 1.64 1.63 1.64 1.63 1.64 1.64 1.63 1.64 1.65 1.65 1.65 1.65 1.62
Subarachnoid haemorrhage Postmenopausal haemorrhage Biodo blister Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma Cerebral haematoma Haemorrhagic stroke Initraventricular haemorrhage Saferic haemorrhage Splenic haemorrhage Biodo urine present Cerebral haemorrhage Haemorrhagic stroke Eye achusion Biodo blister Haemorrhage urinary tract Postmenopausal haemorrhage Haemorrhage Haemorrhage in pregnancy Oral biodo blister Vein rupture	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 7 /167,450 3 /167,454 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 70 /535,056 70 /535,056 60 /535,056 80 /535,056 80 /535,056 80 /535,056 80 /535,056 80 /535,056 80 /535,056 81 /535,102 21 /535,103 14 /535,112 9 /535,117 7 /535,119	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,842 17 /3,995,842 16 /3,995,842 16 /3,995,842 3 /3,995,842 3 /3,995,908 2 (200,000,000,000,000,000,000,000,000,000	* * **	4.09 3.36 4.77 2.01 9.83 2.83 5.97 5.11 23.86 ROR 1.71 1.33 1.50 1.33 1.50 1.33 2.198 1.61 3.392 2.37 2.19 2.91 1.3.77 2.19 2.91 2.91 2.91 4.52	(222-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.39-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.08-1.66) (1.08-1.66) (1.08-1.65) (1.09-2.51) (2.05-5.66) (1.32-3.62) (1.44-3.90) (1.32-3.62) (1.47-6.547) (1.48-4.816) (1.18-5.47) (1.18-5.47) (1.65-4.12,70)	1.19 1.16 1.23 0.85 0.86 0.63 0.36 0.36 9.94 3.73 3.25 2.93 3.25 2.93 3.25 2.93 1.85 1.59 1.64 1.62 1.42 1.42 0.43 1.00 0.01 0.10 0.03 0.00 0.04 0.05 0.04 0.05 0.04 0.05 0.05
Subarachnoid haemorrhage Postmenopausal haemorrhage Biodo blister Eye contusion Haemorrhage urinary tract Subdural haematatoma Cerebral haematoma Cerebral haematoma Cerebral haemorrhage Gastric haemorrhage Gastric haemorrhage Injection site bruising Biod urine present Cerebral haemorrhage Immune thrombocytopenia Eye haemorrhage Haemorrhage stroke Haemorrhage stroke Haemorrhage stroke Haemorrhage stroke Haemorrhage stroke Haemorrhage in pregnancy Oral blod blister Vein rupture Haemornage in pregnancy Oral blod blister	16 /167,441 12 /167,445 10 /167,447 10 /167,447 11 /167,450 7 /167,450 3 /167,453 3 /167,454 3 /167,454 3 /167,454 0 /536,036 70 /536,036 70 /536,036 70 /536,036 20 /536,036 24 /535,102 22 /535,104 21 /535,106 18 /535,108 14 /535,112 10 /535,119 6 /535,121	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,792 17 /3,995,892 16 /3,995,895 14 /3,995,895 14 /3,995,895 20 /3,995,905 20 /3,995,905 20 /3,995,905 20 /3,823,843 2,838 /3,623,843 2,838 /3,623,843 2,838 /3,623,843 460 /3,627,782 317 /3,627,925 400 /3,627,925 400 /3,628,182 400 /3,628,182 40 /3,628,182 40 /3,628,182 42 /3,628,197 18 /3,628,241 9 /3,628,233 9 /3,628,233 9 /3,628,233	* * **	4.09 3.36 4.77 2.01 9.83 2.83 2.83 5.97 5.11 1.23.86 ROR 1.71 1.55 1.33 3.32 1.99 3.32 1.50 3.32 1.99 1.61 3.39 2.37 2.91 2.91 2.91 2.91 2.91 2.91 2.91 2.91	$\begin{array}{l}(222-7,55)\\(1.73-6,52)\\(2.42-9.41)\\(1.05-3.82)\\(4.07-23.89)\\(1.29-6,20)\\(1.99-17.84)\\(1.47-17.79)\\(4.82-118.23)\\\hline 95\%,C1\\(1.67-1.83)\\(1.42-169)\\(1.42-169)\\(1.42-169)\\(1.42-2.51)\\(2.49-4.42)\\(1.49-2.65)\\(1.49-2.65)\\(1.67-5.05)\\(1.67-5.05)\\(1.67-3.49)\\(1.42-3.62)\\(1.48-3.49)\\($	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height Height 12.88 9.94 12.88 9.94 12.89 1.62 1.65 1
Subarachnoid haemorrhage Postmenopausal haemorrhage Biodo blistor Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma Cerebral haematoma Haemorrhagic stroke Intraventricular haemorrhage Gastric haemorrhage Splenic haemorrhage Injection site bruising Biodu drine present Cerebral haemorrhage Immune thrombocytopenia Eye haemorrhage Conjunctival haemorrhage Haemorrhage troke Eye contusion Biodo blister Haemorrhage in pregnancy Oral blodo blister Periorbital haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 11 /167,450 7 /167,450 3 /167,450 3 /167,454 3 /167,454 3 /167,454 90 /535,056 648 /534,478 90 /535,056 60 /535,056 20 /535,056 22 /535,106 20 /535,106 14 /535,102 14 /535,112 10 /535,113 6 /535,111 6 /535,112 6 /535,112 6 /535,121	70 /3,995,841 71 /3,995,840 50 /3,995,861 119 /3,995,572 17 /3,995,572 16 /3,995,582 16 /3,995,585 14 /3,995,585 23 /3,995,595 24 /3,995,595 24 /3,995,595 24 /3,995,595 24 /3,995,595 24 /3,995,595 20 /3,623,484 2,838 /3,623,694 40 /3,622,782 20 /3,623,844 20 /3,628,037 10 / /3,628,182 60 /3,628,182 60 /3,628,182 62 /3,628,2182 62 /3,628,2189 42 /3,628,2189 9 /3,622,233 9 /3,628,238 6 /3,628,238	* * **	4.09 3.36 2.01 9.83 2.83 5.97 5.11 2.386 ROR 1.71 1.55 1.33 1.50 1.33 1.50 2.37 2.19 2.11 3.77 2.19 2.11 3.77 4.52 5.66 6.78	(222-7.55) (173-6.52) (2.42-9.41) (105-3.82) (129-6.20) (139-17.84) (142-17.79) (4.82-118.23) 95% Cl (150-1.83) (142-1.69) (1.42-1.69) (1.08-1.66) (1.18-1.94) (2.09-5.66) (1.48-2.51) (2.20-5.66) (1.48-2.56) (1.	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 12.88 9.94 3.73 3.25 2.93 3.25 1.59 1.62 1.62 1.62 1.62 1.62 1.63 1.62 1.63 1.62 1.63 1.63 1.65
Subarachnoid haemorrhage Postmenopausal haemorrhage Biodo blister Eye contusion Haemorrhage urinary tract Subdural haematoma Cerebral haematoma Cerebral haematoma Cerebral haemorrhage Splenic haemorrhage Gastric haemorrhage Injection site bruising Biod urine present Cerebral haemorrhage Haemorrhagic stroke Eye contusion Biodo lister Haemorrhage urinary tract Postmenopausal haemorrhage Ha	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 11 /167,450 7 /167,450 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 70 /535,056 70 /535,056 70 /535,056 70 /535,056 80 /535,066 18 /535,102 22 /535,104 21 /535,102 20 /535,106 18 /535,102 10 /535,117 7 /535,119 6 /535,121 4 /535,122	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,842 17 /3,995,842 16 /3,995,842 16 /3,995,845 2 16 /3,995,845 2 16 /3,995,845 2 (33),995,905 2 (33),995,905 2 (33),952,905 2 (33),952,905 2 (34),952,905 2 (34),955,905 2 (34),955	* * **	4.09 3.36 4.77 2.01 9.83 5.97 5.11 23.86 ROR 1.71 1.55 1.33 1.50 3.32 1.99 2.37 2.19 2.91 2.91 2.91 2.91 2.91 2.19 2.54 4.52 5.65 6.78 6.78	(222-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% CI (1.60-1.83) (1.42-1.69) (1.08-1.66) (1.08-1.66) (1.08-1.65) (1.09-2.51) (2.05-5.66) (1.48-2.51) (1.48-2.51) (1.48-2.51) (1.48-3.62) (1.16-3.42) (1.16-5.47) (1.16-5.47) (1.16-1.45,17) (1.16-1.45,17) (1.16-1.45,17) (1.16-1.45,17) (1.16-2.45,11) (1.17-2.35,19)	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 12.88 9.84 3.73 3.25 2.93 3.25 2.93 3.25 2.93 1.85 1.59 1.62 1.62 1.62 1.62 1.62 1.62 0.64 1.00 0.64 0.65 0.65 0.65 0.65 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.55 0.53 0.55
Subarachnoid haemorrhage Postmenopausal haemorrhage Soldo blister Haemorrhage urinary tract Subdural haematoma Gretbarl haematoma Gretbarl haematoma Gretbarl haematoma Gretbarl haematoma Gretbarl haemorrhage Splenic haemorrhage minue thrombocytopenia Groyinctival haemorrhage Groyinctival haemorrhage Groyinctival haemorrhage Groyinctival haemorrhage Haemorrhage urinary tract Postmenopausal haemorrhage Itemorrhage Internal haemorrhage Taemorrhage Internal haemorrhage Haemorrhage Internal haemorrhage Tomine thrombocytopenia Groyinctival haemorrhage Haemorrhage urinary tract Postmenopausal haemorrhage Itemorrhage Internal haemorrhage Haemorrhage Internal haemorrhage Abdominal wall haematoma	16 /167,441 12 /167,445 10 /167,447 10 /167,447 11 /167,450 7 /167,450 3 /167,453 3 /167,454 3 /167,454 3 /167,454 0 /536,036 648 /534,478 90 /536,036 648 /536,036 60 /536,066 60 /536,066 24 /535,102 22 /535,104 21 /536,106 18 /535,108 14 /535,112 10 /536,116 9 /535,112 1 /535,123	70 /3,995,841 71 /3,995,840 50 /3,995,872 119 /3,995,792 17 /3,995,892 16 /3,995,895 14 /3,995,895 14 /3,995,895 20 /3,795,908 20 /3,995,908 20 /3,995,908 20 /3,823,843 2,833 /3,622,843 440 /3,622,782 317 /3,622,943 440 /3,622,782 317 /3,622,943 44 /3,622,8189 60 /3,628,182 62 /3,628,197 18 /3,628,218 9 /3,628,238 9 /3,628,238 9 /3,628,238 3 /3,628,238	* * **	4.09 3.36 4.77 2.01 9.83 5.97 5.11 2.388 ROR 1.71 1.55 3.32 1.50 3.32 2.19 2.19 2.11 3.77 2.19 2.11 3.77 2.11 3.77 2.19 2.54 5.55 6.78 6.76 6.78 6.509	$\begin{array}{c} (222-7,55)\\ (1.73-6,52)\\ (2.42-9,41)\\ (1.05-3.82)\\ (4.07-23.89)\\ (1.29-6,20)\\ (1.99-17,84)\\ (1.47-17,79)\\ (4.82-118,23)\\ \hline \\ 95\%,C1\\ (1.60-1.83)\\ (1.42-169)\\ (1.42-169)\\ (1.42-169)\\ (1.42-169)\\ (1.42-169)\\ (1.42-2,51)\\ (1.42-3,90)\\$	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 12.88 9.94 12.88 9.94 12.88 9.94 12.88 9.94 12.88 9.94 12.88 1.53 1.59 1.62 1
Subarachnoid haemorrhage Sostmenopausal haemorrhage Sostmenopausal haemorrhage Sige contuision faemorrhage urinary tract budural haematoma Jarebral haematoma Jarebral haematoma Jarebral haematoma Jaemorrhagic stroke truaventricular haemorrhage Splenic haemorrhage Splenic haemorrhage Indiction site bruising Slood urine present Darebral haemorrhage Jonjunctival haemorrhage Jonjunctival haemorrhage Jonjunctival haemorrhage Jaemorrhage urinary tract Sestemenopausal haemorrhage taemorrhage in pregnancy Tab Ibod bilster Haemorrhage in pregnancy Tab Ibod bilster Haemorrhage Haemorrhage Haemorrhage Haemorrhage Haemorrhage Haemorrhage Haemorrhage Haemorrhage Hotoriani wall haematma Haemorrhagic transformation stroke Spontaneous haemorrhage	16 /167,441 12 /167,445 10 /167,447 10 /167,447 10 /167,447 11 /167,450 7 /167,450 3 /167,454 3 /167,454 3 /167,454 3 /167,454 1,110 /534,016 648 /534,478 90 /535,056 70 /535,056 70 /535,056 70 /535,056 70 /535,056 20 /535,102 22 /535,104 21 /535,112 9 /535,112 9 /535,112 9 /535,123 3 /535,123	70 /3,995,841 71 /3,995,840 50 /3,995,841 119 /3,995,852 16 /3,995,852 16 /3,995,852 16 /3,995,852 14 /3,995,852 14 /3,995,852 26 /3,995,908 27 /302 28 /302 /302 28 /302 /302 28 /302 /302 28 /302 /302 20 /3,623,403 20 /3,622,402 20 /3,622,102 20 /3,622,102 20 /3,622,102 20 /3,622,102 21 /3,622,233 21 /3,622,233 21 /3,622,233 21 /3,622,233 21 /3,622,233 21 /3,622,233 21 /3,622,234	* * **	4.09 3.36 4.77 2.01 9.83 5.97 5.11 23.86 ROR 1.71 1.55 3.32 2.37 2.19 2.91 3.77 2.54 5.65 5.27 4.52 5.67 6.78 6.78 6.78 6.78 0.204	(222-7.55) (1.73-6.52) (2.42-9.41) (1.05-3.82) (1.29-6.20) (1.99-17.84) (1.47-17.79) (4.82-118.23) 95% Cl (1.60-1.83) (1.42-1.69) (1.42-1.69) (1.08-1.68) (1.08-1.68) (1.08-1.68) (1.08-2.51) (2.49-4.42) (1.49-2.65) (1.48-2.65) (1.48-2.65) (1.48-2.65) (1.48-2.65) (1.18-5.47) (1.18-5.47) (1.18-5.47) (1.16-2.	1.19 1.16 1.23 0.85 0.98 0.63 0.53 0.36 Height 12.88 9.4 3.73 3.25 2.91 1.59 1.64 1.33 1.00 1.64 1.33 1.00 1.67 0.63 0.65 0.65 0.65 0.65 0.65 0.53 0.55 0.53 0.55 0.56 0.55 0.56 0.55 0.56 0.55 0.56 0.57 0.56 0.57 0.56 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.57 0.55
ubarachnoid haemorrhage ostmenopausal haemorrhage lood blister ye contusion aemorrhage urinary tract ubdural haematoma erebral haematoma aemorrhage stroke traventricular haemorrhage aestric haemorrhage plenic haemorrhage plenic haemorrhage onjunctival haemorrhage aemorrhagic stroke ye ontusion lood blister aemorrhage urinary tract ostmenopausal haemorrhage aemorrhage urinary tract ostmenopausal haemorrhage ternai haemorrhage aemorrhage urinary tract ostmenopausal haemorrhage aemorrhage urinary tract ostmenopausal haemorrhage aemorrhage transit semorthage trogenancy rat blood blister ein rupture aemorrhage transit bdominal wall haematoma aemorrhage transitor	16 /167,441 12 /167,445 10 /167,447 10 /167,447 11 /167,450 7 /167,450 3 /167,453 3 /167,454 3 /167,454 3 /167,454 0 /536,036 648 /534,478 90 /536,036 648 /536,036 60 /536,066 60 /536,066 24 /535,102 22 /535,104 21 /536,106 18 /535,108 14 /535,112 10 /536,116 9 /535,112 1 /535,123	70 /3,995,841 71 /3,995,840 50 /3,995,872 17 /3,995,872 17 /3,995,892 16 /3,995,892 16 /3,995,895 14 /3,995,895 14 /3,995,895 20 /3,784 2,893 /3,622,843 4,399,5,905 20 /3,782,905 14 /3,622,810 4,399,5,905 20 /3,622,810 4,392,62,810 20 /3,622,810 20 /3,622,820 20 /3,622,810 20 /3,622,820 20 /3,62	* * **	4.09 3.36 4.77 2.01 9.83 5.97 5.11 2.388 ROR 1.71 1.55 3.32 1.50 3.32 2.19 2.19 2.11 3.77 2.19 2.11 3.77 2.11 3.77 2.19 2.54 5.55 6.78 6.76 6.78 6.509	$\begin{array}{c} (222-7,55)\\ (1.73-6,52)\\ (2.42-9,41)\\ (1.05-3.82)\\ (4.07-23.89)\\ (1.29-6,20)\\ (1.99-17,84)\\ (1.47-17,79)\\ (4.82-118,23)\\ \hline \\ 95\%,C1\\ (1.60-1.83)\\ (1.42-169)\\ (1.42-169)\\ (1.42-169)\\ (1.42-169)\\ (1.42-169)\\ (1.42-2,51)\\ (1.42-3,90)\\$	1.19 1.16 1.23 0.85 0.98 0.64 0.53 0.36 Height Height 12.88 9.94 3.73 2.93 3.25 2.93 3.25 2.93 1.59 1.64 1.62 1.62 1.64 1.66 1.64 1.62 1.65 1.64 1.62 1.65 1.64 1.62 1.64 1.62 1.64 1.65 1.64 1.65 1.64 1.64 1.65 1.64 1.64 1.65 1.64 1.64 1.65 1.65 1.6

FIGURE 4

ROR values and height of the COVID-19 vaccines of BNT162b2-, Ad26.COV2.S-, and mRNA-1273-associated hemorrhage events. a: cases of target hemorrhage events reported concerning the target COVID-19 vaccines; b: cases of other adverse events reported concerning the target COVID-19 vaccines; c: cases of target hemorrhage events reported concerning all the other vaccines; d: cases of other adverse events reported concerning the target reported concerning all the other vaccines; d: cases of other adverse events reported concerning the target reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccine concerning all the other vaccines.



ROK values and neight of the COVID-19 vaccines of BNT162b2-, Ad26.COV2.5-, and mRNA-12/3-associated thrombocytopenia events. a: cases of target thrombocytopenia events reported concerning the target COVID-19 vaccines; b: cases of other adverse events reported concerning the target COVID-19 vaccines; c: cases of target thrombocytopenia events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines.

15 cases of hemorrhage events concurrent with pulmonary embolism, thrombosis, cerebrovascular accident, deep vein thrombosis, hemorrhagic stroke, acute myocardial infarction, and hemiparesis, respectively, after administration of the BNT162b2 COVID-19 vaccine. A total of seven, six, and six cases of thrombocytopenia events occurring simultaneously with acute myocardial infarction, thrombosis, and pulmonary embolism, respectively, following BNT162b2 vaccination were reported.

In total, 235 cases of hemorrhage events that occurred with thrombosis, including 66, 60, 32, 21, and 18 cases of thrombosis, pulmonary embolism, deep vein thrombosis, abnormal cerebral angiogram, and cerebral venous sinus thrombosis, respectively, were reported following vaccination with Ad26.COV2.S. A total of 27, 15, 13, and 12 cases of thrombocytopenia events that occurred simultaneously with pulmonary embolism, cerebral venous sinus thrombosis, respectively, were reported following vaccination with Ad26.COV2.S.

For mRNA-1273, 262 cases of hemorrhage events occurred with thrombosis, including 74, 44, 28, 26, and 22 cases that occurred during pulmonary embolism, thrombosis, deep vein thrombosis, cerebral venous sinus thrombosis, and hemorrhagic stroke, respectively. A total of 15, seven, six, and four cases of thrombocytopenia events that occurred simultaneously with pulmonary embolism, thrombosis, deep vein thrombosis, and acute myocardial infarction, respectively, were reported. The thrombotic events with hemorrhage and thrombocytopenia after the BNT162b2, Ad26.COV2.S, and mRNA-1273 vaccination are shown in Supplementary Figures S1A–C.

3.4 Cardiac disorders

3.4.1 Cardiac arrhythmia events

Cardiac arrhythmia events showed association with the three COVID-19 vaccines, illustrated in Figures 6A. A total of 8,550 cases of cardiac arrhythmia events were associated with BNT162b2 (ROR 2.75, 95% CI 2.68–2.82, height 34.52). Heart rate increase (ROR 2.74, 95% CI 2.62–2.87, height 18.64, 2,467 cases), palpitations (ROR 3.24 95% CI 3.09–3.40, height 17.88, 2,373 cases), and tachycardia (ROR 2.56, 95% CI 2.41–2.72, height 14.45, 1,457 cases) were ranked in the top three, with more than 1,000 cases reported. These were followed by atrial fibrillation (ROR 3.91, 95% CI 3.47–4.42, height 7.04, 390 cases), abnormal electrocardiogram (ROR 1.76, 95% CI 1.54–2.00, height 6.43, 268 cases), cardiac arrest (ROR 1.79, 95% CI 1.56–2.05, height 6.15, 246 cases), and irregular heart rate (ROR 2.59, 95% CI 2.22–3.01, height 5.57, 218 cases).

A total of 4218 cases of cardiac arrhythmia events were associated with the Ad26.COV2.S vaccine, with an ROR of 1.84 (95% CI 1.78–1.90, height 26.80), ranked by the absolute number of cases including syncope (ROR 1.65, 95% CI 1.56–1.74, height 15.87, 1,446 cases), loss of consciousness (ROR 1.81, 95% CI 1.70–1.92, height 13.43, 1,040 cases), and increased heart rate (ROR 2.27, 95% CI 2.12–2.43, height 12.15, 866 cases).

A total of 6,900 cases of cardiac arrhythmia events were associated with the mRNA-1273 vaccine, with an ROR of 1.88 (95% CI 1.83–1.94, height 31.68), ranked by absolute number of cases of increased heart rate (ROR 1.96, 95% CI 1.87–2.06, height

Cardiac arrhythmias events	BNT162b2 (a/b)	Comparators (c/d)		ROR	95% CI	Height
	8,550 /437,376	26,237 /3,691,205		2.75	(2.68-2.82)	34.52
Heart rate increased	2,467 /443,459	7,531 /3,709,911	-	2.74	(2.62-2.87)	18.64
Palpitations	2,373 /443,553	6,129 /3,711,313	(e)	3.24	(3.09-3.40)	17.88
Tachycardia	1,457 /444,469	4,754 /3,712,688	iei i	2.56	(2.41-2.72)	14.45
Atrial fibrillation	390 /445,536	831 /3.716.611	⊢ ∎-1	3.91	(3.47-4.42)	7.04
Electrocardiogram abnormal	268 /445,658	1,272 /3,716,170	H#4	1.76	(1.54-2.00)	6.43
Cardiac arrest	246 /445,680	1,149 /3,716,293		1.79	(1.56-2.05)	6.15
Heart rate irregular	218 /445,708	703 /3,716,739	H-1	2.59	(2.22-3.01)	5.57
Heart rate decreased	165 /445,761	919 /3,716,523	H=1	1.50	(1.27-1.77)	5.10
Arrhythmia	133 /445,793	704 /3,716,738		1.58	(1.31-1.90)	4.56
Cardiac flutter	121 /445,805	189 /3,717,253		5.34	(4.25-6.71)	3.69
Sinus tachycardia	105 /445,821	272 /3,717,170	→ → →	3.22	(2.57-4.03)	3.74
Ventricular extrasystoles	86 /445,840	230 /3,717,212	⊢ •−1	3.12	(2.43-3.99)	3.39
Heart rate abnormal	79 /445,847	142 /3,717,300	→ → →	4.64	(3.52-6.11)	3.05
Cardio-respiratory arrest	67 /445,859	324 /3,717,118		1.72	(1.33-2.24)	3.19
Supraventricular tachycardia	65 /445,861	223 /3,717,219		2.43	(1.84-3.20)	3.04
Extrasystoles	52 /445,874	130 /3,717,312		3.33	(2.42-4.60)	2.60
	41 /445,885			6.57	(4.37-9.90)	2.00
Pulseless electrical activity		52 /3,717,390				
Ventricular fibrillation	31 /445,895	75 /3,717,367		3.45	(2.27-5.24)	1.97
Atrial flutter	28 /445,898	76 /3,717,366		3.07	(1.99-4.74)	1.90
Sinus bradycardia	26 /445,900	91 /3,717,351		2.38	(1.54-3.68)	1.89
Ventricular tachycardia	23 /445,903	108 /3,717,334		1.78	(1.13-2.78)	1.83
Bundle branch block right	19 /445,907	69 /3,717,373		2.30	(1.38-3.81)	1.60
Supraventricular extrasystoles	14 /445,912	62 /3,717,380		1.88	(1.05-3.36)	1.39
Electrocardiogram gt prolonged		57 /3,717,385	i	1.90	(1.04-3.47)	1.33
Sinus arrhythmia	12 /445,913	38 /3,717,404		2.63	(1.38-5.04)	1.33
Atrioventricular block complete	9 /445,917	22 /3,717,420		3.41	(1.57-7.41)	0.99
Bundle branch block left	8 /445,918	22 /3,717,420		3.03	(1.35-6.81)	0.94
Atrioventricular block first degre	e 7 /445,919	15 /3,717,427	·	3.89	(1.59-9.54)	0.83
Ventricular arrhythmia	6 /445,920	14 /3,717,428	· · · · · · · · · · · · · · · · · · ·	3.57	(1.37-9.30)	0.77
Cardiac death	5 /445,921	9 /3,717,433	·	4.63	(1.55-13.82)	0.64
Electrocardiogram change	5 /445,921	15 /3,717,427		2.78	(1.01-7.65)	0.71
Cardiac telemetry abnormal	4 /445,922	5/3,717,437		6.67	(1.79-24.84)	0.49
Nodal rhythm	4 /445,922	4 /3,717,438		8.34	(2.08-33.33)	0.45
Nodal arrhythmia	3 /445,923	1 /3,717,441			(2.6-240.44)	0.18
Ad		Comparators (c/d)	1 2 4 8 16 32 64 128	256 ROR		
	4,218 /163,239	55,398 /3,940,513		ROR 1.84	(1.78–1.90)	26.80
Syncope	4,218 /163,239 1,446 /166,011	55,398 /3,940,513 21,000 /3,974,911	H H	ROR 1.84 1.65	(1.78-1.90) (1.56-1.74)	26.80 15.87
Syncope Loss of consciousness	4,218 /163,239 1,446 /166,011 1,040 /166,417	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136	-	ROR 1.84 1.65 1.81	(1.78-1.90) (1.56-1.74) (1.70-1.92)	26.80 15.87 13.43
Syncope Loss of consciousness Heart rate increased	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43)	26.80 15.87 13.43 12.15
Syncope Loss of consciousness Heart rate increased Palpitations	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038	H H	ROR 1.84 1.65 1.81 2.27 1.91	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07)	26.80 15.87 13.43 12.15 10.43
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27 1.91 1.77	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24)	26.80 15.87 13.43 12.15 10.43 3.59
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,755	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72)	26.80 15.87 13.43 12.15 10.43 3.59 3.36
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Artial fibrillation Heart rate irregular	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392 50 /167,407	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,755 871 /3,995,040	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,755	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Artial fibrillation Heart rate irregular	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392 50 /167,407	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,755 871 /3,995,040	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392 50 /167,407 25 /167,432	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,738 1,009 /3,994,902 1,156 /3,994,755 871 /3,995,559	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.13-2.54)	Height 26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392 50 /167,407 25 /167,432 18 /167,439	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,966,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 1,156 /3,994,755 871 /3,995,040 352 /3,995,708	н 1н 1н 1н	ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.13-2.54) (1.31-3.43)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 629/166,628 65/167,392 50/167,437 25/167,432 18/167,439 4/167,453	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,966,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 1,156 /3,994,755 871 /3,995,040 352 /3,995,708		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.13-2.54) (1.31-3.43) (1.24-10.10)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,628 75/167,382 65/167,392 50/167,432 18/167,439 4/167,439 4/167,453	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,755 871 /3,995,040 352 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d)		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.37 1.69 2.12 3.54 256 ROR	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.13-2.54) (1.31-3.43) (1.24-10.10) 95% CI	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68 Height
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete	4,218/163,239 1,446/166,011 1,040/166,611 866/166,591 629/166,628 75/167,382 65/167,392 50/167,407 25/167,432 18/167,439 4/167,453	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.31-3.43) (1.24-10.10) 95% CI (1.83-1.94)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68 Height
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 629/166,528 65/167,382 65/167,382 55/167,432 18/167,439 4/167,453 RNA-1273 (a/b) 6,900/528,226 2,240/532,886	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.13-2.54) (1.31-3.43) (1.24-10.10) 95% CI (1.83-1.94) (1.87-2.06)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68 Height 31.68 18.03
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 629/166,628 65/167,332 65/167,332 18/167,432 18/167,439 4/167,453 NRNA-1273 (a/b) 6,900/528,226 2,240/528,286 2,003/533,123	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,166 /3,994,755 871 /3,995,040 352 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.98 1.96 2.09	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.03-1.82) (1.13-2.54) (1.13-2.54) (1.13-2.54) (1.13-2.54) (1.24-10.10) 95% Cl (1.87-2.06) (1.87-2.06) (1.99-2.20)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68 Height 31.68 18.03 16.93
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,392 50/167,407 25/167,432 18/167,439 4/167,453 8/RNA-1273 (a/b) 6,900/528,226 2,240/523,86 2,003/533,123 1,196/533,930	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,166 /3,994,755 871 /3,995,040 352 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,621,743 5,015 /3,623,227	Image: Second	ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.62	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.32-24) (1.32-24) (1.32-24) (1.32-34) (1.3	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68 Height 31.68 18.03 16.93 13.45
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,392 50/167,407 25/167,432 18/167,439 4/167,453 800/528,226 2,240/532,886 2,003/533,123 1,196/533,930 314/534,812	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,166 /3,994,755 871 /3,995,040 352 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.62 2.35	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.13-2.54) (1.31-3.43) (1.24-10.10) 95% CI (1.83-1.94) (1.87-2.66) (1.99-2.20) (1.52-1.72) (2.07-2.67)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68 Height 31.68 18.03 16.93 13.45
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,392 50/167,407 25/167,432 18/167,439 4/167,453 8/RNA-1273 (a/b) 6,900/528,226 2,240/523,86 2,003/533,123 1,196/533,930	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,166 /3,994,755 871 /3,995,040 352 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,621,743 5,015 /3,623,227		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.62	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.32-24) (1.32-24) (1.32-24) (1.32-34) (1.3	26.800 15.87 13.43 12.15 10.43 3.369 2.94 2.04 1.70 0.688 Height 31.68 31.683 31.693 13.45 6.60
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,392 50/167,407 25/167,432 18/167,439 4/167,453 800/528,226 2,240/532,886 2,003/533,123 1,196/533,930 314/534,812	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,622,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.62 2.35	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.13-2.54) (1.31-3.43) (1.24-10.10) 95% CI (1.83-1.94) (1.87-2.66) (1.99-2.20) (1.52-1.72) (2.07-2.67)	26.800 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.77 0.68 Height 18.03 16.93 13.45 6.60 5.72
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 629/166,628 75/167,382 65/167,382 55/167,432 18/167,439 4/167,453 RRNA-1273 (a/b) 6,900/528,226 2,240/532,886 2,003/533,123 1,196/533,930 314/534,812 206/534,920	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,079 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 1,189 /3,627,353		ROR 1,84 1,65 1,81 2,27 1,91 1,77 1,34 1,37 1,69 2,12 3,54 256 ROR 1,88 1,96 2,09 1,62 2,35 1,17	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-2.43) (1.76-2.07) (1.40-2.24) (1.32-2.43) (1.32-2.43) (1.32-3.43) (1.32-	26.800 15.87 13.43 12.15 10.43 3.59 3.366 2.94 2.04 1.70 0.68 Height 18.03 16.93 18.03 16.93 13.45 6.600 5.72 5.30
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,392 50/167,407 25/167,432 18/167,439 4/167,453 8/RNA-1273 (a/b) 6,900/528,226 2,240/532,886 2,003/533,123 314/533,930 314/534,936	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,508 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335 1,189 /3,627,511 923 /3,627,511		ROR 1,84 1,65 1,81 2,27 1,91 1,77 1,34 1,37 1,69 2,12 3,54 256 ROR 1,96 2,09 1,62 2,09 1,62 2,357 1,176	(1,78-1,90) (1,56-1,74) (1,70-1,92) (2,12-2,43) (1,76-2,07) (1,40-2,24) (1,05-1,72) (1,03-1,82) (1,13-2,54) (1,31-3,43) (1,24-10,10) 95% Cl (1,83-1,94) (1,87-2,66) (1,99-2,20) (1,52-1,72) (2,07-2,67) (1,01-1,36) (1,50-2,07) (1,00-1,40)	26.800 15.87 13.43 12.15 10.43 3.59 3.36 2.94 4.04 4.70 0.68 Height 31.68 18.03 13.46 6.60 5.72 5.30 5.05
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate inregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate idecreased Cardiac flutter	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,432 18/167,439 4/167,439 4/167,453 8RNA-1273 (a/b) 6,900/528,226 2,240/532,886 2,033/53,123 1,196/533,390 314/534,812 206/534,920 190/534,936 84/535,042	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335 1,189 /3,627,319 226 /3,628,016		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 286 ROR 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.17 1.76 1.88 2.52	(1.78-1.90) (1.56-1.74) (1.70-1.92) (2.12-243) (1.76-2.07) (1.40-2.24) (1.05-1.72) (1.03-1.82) (1.31-3.43) (1.24-10.10) 95% Cl (1.83-1.94) (1.87-2.06) (1.52-1.72) (2.07-2.67) (1.52-1.72) (2.07-2.67) (1.52-1.72) (2.07-2.67) (1.52-1.72)	26.80 15.87 13.43 12.15 10.43 3.58 3.36 2.94 4.004 1.70 0.68 Height 31.66 18.03 16.93 13.45 6.65 5.77 5.30 5.05 3.366
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate inregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate increased Cardiac futter Sinus tachycardia	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 75/167,382 65/167,382 55/167,432 18/167,432 18/167,439 4/167,453 3RNA-1273 (a/b) 6,900/528,226 2,240/532,886 2,003/533,123 1,196/533,930 314/534,920 190/534,920 190/534,936 161/534,965 84/535,042 81/535,045	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,355 1,189 /3,627,053 731 /3,627,319 9226 /3,627,016		ROR 1.84 1.65 1.81 2.27 1.97 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.18 2.23 1.17	(1.78-1.90) (1.56-1.74) (1.76-2.07) (1.76-2.07) (1.76-2.07) (1.40-2.24) (1.32-2.43) (1.32-2.44) (1.32-2.44) (1.32-2.44) (1.32-2.44) (1.32-2.46) (1.32-1.94) (1.32-1.72) (2.07-2.67) (1.01-1.36) (1.50-2.07) (1.01-1.36) (1.50-2.07) (1.01-1.40) (1.52-2.37)	26.80 15.87 13.43 12.15 10.43 3.565 2.94 2.04 1.70 0.668 Height 31.66 31.693 13.44 6.60 5.72 5.303 5.05 3.36 3.42
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular Heart rate decreased Cardiac flutter Sinus tachycardia Cardio-respiratory arrest	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 75/167,382 65/167,392 65/167,392 18/167,432 18/167,439 4/167,453 18/167,453 18/167,453 18/167,453 18/167,453 18/167,453 18/167,453 19/167,453 11/167,455 11/167,45	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,166 /3,994,755 871 /3,995,040 352 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,620,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,319 226 /3,627,019 226 /3,627,946 314 /3,627,928		ROR 1,84 1,65 1,81 2,27 1,91 1,77 1,34 1,37 1,69 2,12 3,54 256 ROR 1,96 2,09 1,62 2,09 1,62 2,357 1,176 1,18 2,52 1,36 1,66 1,68 1,66 1,66 1,66 1,66 1,67 1,97 1,97 1,97 1,99 2,12 3,54 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,97 1,99 2,12 3,54 1,96 1,96 1,96 1,97 1,97 1,99 2,12 3,54 1,96 1,96 1,97 1,97 1,99 2,12 3,54 1,96 1,96 1,97 1,97 1,99 2,12 3,54 1,96 1,96 1,96 1,96 1,96 1,96 1,97 1,97 1,99 2,12 3,54 1,96 1,96 1,96 1,96 1,96 1,96 1,96 1,96 1,96 1,96 1,96 1,96 1,96 1,97 1,67 1,97 1,97 1,99 1,62 2,357 1,176 1,188 2,357 1,176 1,188 2,357 1,176 1,188 2,357 1,188 1,196 1,186 1,1	(1.78-1.90) (1.56-1.74) (1.76-2.07) (1.76-2.07) (1.40-2.24) (1.13-2.54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.32-54) (1.52-57) (1.5	26.80 15.87 13.43 12.15 10.43 3.56 2.94 2.04 1.70 0.68 Height 18.03 13.45 6.66 5.72 5.300 5.05 3.36 3.32 3.32
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete m Heart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular Heart ate irregular Heart ate idecreased Cardiac fultter Sinus tachycardia Cardiac fultter Sinus tachycardia Cardiac fultter Sinus tachycardia	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,392 25/167,432 18/167,439 4/167,453 800/528,226 2,240/532,886 2,003/533,123 1,196/533,930 314/534,925 161/534,926 84/535,042 81/535,049 69/535,057	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 23,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,622,484 6,499 /3,621,743 5,015 /3,622,053 731 /3,627,319 226 /3,622,946 246 /3,627,928 247 /3,627,925		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.68 2.09 1.62 2.35 1.17 1.76 1.88 1.96 2.09 1.65 1.61 2.52 1.86 1.66 1.66 1.69 2.12 3.54 1.91 1.77 1.76 1.78 1.89 1.89	(1,78-1,90) (1,56-1,74) (1,76-1,72) (2,12-2,43) (1,76-2,07) (1,40-2,24) (1,05-1,72) (1,03-1,82) (1,13-2,54) (1,31-3,43) (1,24-10,10) 95% Cl (1,83-1,94) (1,87-2,66) (1,99-2,20) (1,52-1,72) (2,07-2,67) (1,01-1,36) (1,52-2,07) (1,01-1,36) (1,52-4,72) (1,30-2,13) (1,32-2,47) (1,32-2,47) (1,32-2,47)	26.80 15.87 13.43 12.15 10.43 3.56 2.94 2.04 1.70 0.68 Height 18.03 16.93 13.45 6.60 5.72 5.33 6.62 3.36 6.342 3.37 3.35
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate decreased Cardiac flutter Sinus tachycardia Cardio-respiratory arrest Ventricular extrasystoles Supraventricular tachycardia	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392 16 /167,432 18 /167,439 4 /167,453 MRNA-1273 (a/b) 6,900 /528,226 2,240 /532,886 2,003 /533,123 1,196 /533,930 1,196 /533,930 1314 /534,812 206 /534,936 16 /534,935 84 /535,045 77 /535,049 77 /535,045 77 /535,045 76 /535,057 86 /535,055	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 27 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335 1,189 /3,627,053 731 /3,627,319 226 /3,628,016 296 /3,627,948 314 /3,627,985 220 /3,628,022		ROR 1,84 1,65 1,81 2,27 1,91 1,77 1,34 1,37 1,69 2,12 3,54 209 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,12 1,88 1,96 1,97 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,97 1,91 1,97 1,99 1,99 2,12 2,54 2,09 1,62 2,25 1,17 1,77 1,88 1,96 2,09 1,62 2,55 1,177 1,76 1,88 1,96 2,09 1,62 2,55 1,177 1,76 1,88 1,96 2,52 1,86	(1.78-1.90) (1.56-1.74) (1.76-2.07) (1.476-2.07) (1.476-2.07) (1.40-2.24) (1.37-2.43) (1.37-3.43) (1.34-3.43) (1.24-10.10) 95% Cl (1.83-1.94) (1.87-2.06) (1.92-2.07) (1.52-1.72) (2.07-2.67) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-2.73) (1.52-2.	26.80 15.87 13.43 12.15 10.43 3.56 2.94 2.04 1.70 0.66 31.66 31.66 31.66 5.77 5.30 5.30 5.30 5.30 5.30 5.30 5.30 5.30
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete m Heart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular Heart ate irregular Heart ate idecreased Cardiac fultter Sinus tachycardia Cardiac fultter Sinus tachycardia Cardiac fultter Sinus tachycardia	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,392 25/167,432 18/167,439 4/167,453 800/528,226 2,240/532,886 2,003/533,123 1,196/533,930 314/534,925 161/534,926 84/535,042 81/535,049 69/535,057	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 23,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,622,484 6,499 /3,621,743 5,015 /3,622,053 731 /3,627,319 226 /3,622,946 246 /3,627,928 247 /3,627,925		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.68 2.09 1.62 2.35 1.17 1.76 1.88 1.96 2.09 1.65 1.61 2.52 1.86 1.66 1.66 1.69 2.12 3.54 1.91 1.77 1.76 1.78 1.89 1.89	(1,78-1,90) (1,56-1,74) (1,76-1,72) (2,12-2,43) (1,76-2,07) (1,40-2,24) (1,05-1,72) (1,03-1,82) (1,13-2,54) (1,31-3,43) (1,24-10,10) 95% Cl (1,83-1,94) (1,87-2,66) (1,99-2,20) (1,52-1,72) (2,07-2,67) (1,01-1,36) (1,52-2,07) (1,01-1,36) (1,52-4,72) (1,30-2,13) (1,32-2,47) (1,32-2,47) (1,32-2,47)	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 2.04 1.70 0.68 31.68 31.68 31.68 31.68 31.64 5.72 5.30 5.72 5.30 5.33 3.36 3.42 3.37 5.30 5.33 5.30 5.33 5.30 5.33 5.30 5.33 5.33
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate decreased Cardiac flutter Sinus tachycardia Cardio-respiratory arrest Ventricular extrasystoles Supraventricular tachycardia	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392 16 /167,432 18 /167,439 4 /167,453 MRNA-1273 (a/b) 6,900 /528,226 2,240 /532,886 2,003 /533,123 1,196 /533,930 1,196 /533,930 1314 /534,812 206 /534,936 16 /534,935 84 /535,045 77 /535,049 77 /535,045 77 /535,045 76 /535,057 86 /535,055	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,136 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 27 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335 1,189 /3,627,053 731 /3,627,319 226 /3,628,016 296 /3,627,948 314 /3,627,985 220 /3,628,022		ROR 1,84 1,65 1,81 2,27 1,91 1,77 1,34 1,37 1,69 2,12 3,54 209 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,12 1,88 1,96 1,97 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,77 1,91 1,97 1,91 1,97 1,99 1,99 2,12 2,54 2,09 1,62 2,25 1,17 1,77 1,88 1,96 2,09 1,62 2,55 1,177 1,76 1,88 1,96 2,09 1,62 2,55 1,177 1,76 1,88 1,96 2,52 1,86	(1.78-1.90) (1.56-1.74) (1.76-2.07) (1.476-2.07) (1.476-2.07) (1.40-2.24) (1.37-2.43) (1.37-3.43) (1.34-3.43) (1.24-10.10) 95% Cl (1.83-1.94) (1.87-2.06) (1.92-2.07) (1.52-1.72) (2.07-2.67) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-2.73) (1.52-2.	26.80 15.87 13.43 12.15 10.43 3.59 2.94 2.04 1.70 0.68 Height 18.03 13.46 6.60 5.72 5.30 3.66 3.42 3.37 3.16 3.36 3.42 3.37 3.16 3.30 9.2.61
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular Heart rate decreased Cardiac futter Sinus tachycardia Cardiac futter Sinus tachycardia Cardiac futter Sinus tachycardia Cardiac futter Sinus tachycardia Heart rate hormal Pulseless electrical activity	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 75/167,382 65/167,382 65/167,392 18/167,432 18/167,439 4/167,453 3RNA-1273 (a/b) 6,900/528,226 2,240/532,886 2,003/533,123 1,196/533,930 13/14/534,942 190/534,920 190/534,920 190/534,920 190/534,926 161/534,965 161/534,965 161/534,965 161/534,965 161/534,965 171/535,049 66/535,057 84/535,058 48/535,078	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 23,995,559 203 /3,995,508 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335 1,189 /3,627,511 923 /3,627,511 923 /3,627,511 923 /3,627,511 923 /3,627,946 314 /3,627,946 314 /3,627,946 314 /3,627,946 314 /3,627,946		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 ROR 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.18 2.52 1.86 1.86 1.88 1.86 1.88 2.09 1.65 1.17 1.76 1.18 2.52 1.86 1.88 1.86 1.88 3.73	(1,78-1,90) (1,56-1,74) (1,76-1,72) (2,12-243) (1,76-2,07) (1,40-2,24) (1,05-1,72) (1,03-1,82) (1,31-3,43) (1,24-10,10) 95% Cl (1,83-1,94) (1,87-2,06) (1,99-2,20) (1,52-1,72) (2,07-2,67) (1,00-1,40) (1,52-2,77) (1,00-1,40) (1,45-2,47) (1,45-2,4	26.80 15.87 13.43 12.15 10.43 3.59 3.36 2.94 1.70 0.68 18.03 16.93 13.45 6.60 5.72 5.30 5.05 5.33 3.342 3.37 3.315 3.309 2.61 1.94
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate inregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete m Heart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate increased Cardiac flutter Sinus tachycardia Cardiac flutter Sinus tachycardia Cardiac flutter Sinus tachycardia Cardiac systeles Supraventricular tachycardia Heart rate abnormal Pulseless electrical activity Extrasystoles	4,218/163,239 1,446/166,011 1,040/166,171 866/166,591 866/166,591 869/166,828 75/167,382 85/167,382 85/167,432 18/167,439 4/167,453 80,00/528,226 2,240/532,886 2,030/533,123 1,196/533,930 314/534,955 84/535,042 84/535,042 84/535,045 76/535,057 86/535,057 86/535,058 84/55,058 84/55	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 27 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,622,484 6,499 /3,621,743 5,015 /3,622,325 1,189 /3,627,035 1,189 /3,627,035 1,189 /3,627,035 1,189 /3,627,031 226 /3,628,016 296 /3,627,948 314 /3,627,985 220 /3,628,002 173 /3,628,063		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 286 ROR 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.88 1.96 2.09 1.62 2.12 1.91 1.77 1.91 1.77 1.77 1.77 1.34 1.34 1.99 2.12 3.54 1.96 1.96 2.09 1.62 2.25 1.17 1.76 1.88 1.96 2.09 1.62 2.25 1.17 1.76 1.88 1.96 2.09 1.62 2.25 1.17 1.76 1.88 1.96 2.12 2.35 1.17 1.76 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.88 1.88 1.96 2.52 1.88 1.88 1.96 2.52 1.88 1.88 1.88 1.96 2.52 1.88 1.88 1.96 2.52 1.88 1.88 1.88 1.96 2.52 1.88 1.88 1.88 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.88 1.96 1.88 1.88 1.96 1.88 1.88 1.96 1.88 1.50 1.10 1.88 3.73 1.50	(1,78-1,90) (1,56-1,74) (1,76-2,77) (1,40-2,24) (1,05-1,72) (1,03-1,82) (1,31-3,43) (1,24-1,010) 95% Cl (1,83-1,94) (1,87-2,06) (1,99-2,20) (1,19-2,20) (1,19-2,20) (1,19-2,20) (1,19-2,20) (1,19-2,20) (1,19-3,24) (1,19-2,21) (1,19-2,21) (1,19-2,21) (1,19-2,21)	26.80 15.87 13.43 12.15 2.94 2.04 1.70 0.68 Height 18.03 13.45 6.600 5.72 5.30 5.05 3.36 3.42 5.30 5.05 3.37 3.15 3.99 2.61 1.94 2.20
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate increased Cardiac futter Sinus tachycardia Cardio-respiratory arrest Ventricular etachycardia Heart rate abnormal Pulseless electrical activity Extrasystoles Ventricular tachycardia	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,521 629 /166,528 75 /167,382 65 /167,382 65 /167,432 18 /167,439 4 /167,453 30 /532,886 2,003 /533,123 1,196 /533,930 11,196 /533,930 11,196 /533,930 161 /534,982 161 /534,982 161 /534,982 163,5045 77 /535,049 84 /535,045 84 /535,045 85 /535,058 48 /535,058 58 /58 /58 58 /58 /58 /58 58 /58 /58 /58 58 /58 /58 /58 /58 /58 /58 /58 /58 /58 /	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,038 1,009 /3,994,902 1,156 /3,994,902 21,156 /3,995,559 203 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,223 1,189 /3,627,053 731 /3,627,315 907 /3,627,315 914 /3,627,928 247 /3,627,946 314 /3,628,142		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.18 2.23 1.17 1.76 1.18 2.23 1.17 1.76 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.18 2.23 1.17 1.76 1.88 1.96 1.88 1.96 1.88 1.96 1.96 1.96 1.97 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.91 1.77 1.99 2.12 2.35 1.17 1.76 1.88 1.96 1.88 1.96 1.62 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.96 1.88 1.76 1.88 1.86 1.88 1.86 1.88 1.86 1.88 1.88 1.86 1.88 1.88 1.86 1.88 1.50 1.5	(1.78-1.90) (1.56-1.74) (1.76-2.07) (1.47-2.07) (1.40-2.24) (1.17-2.07) (1.40-2.24) (1.31-3.43) (1.24-10.10) 95% CI (1.33-3.43) (1.24-10.10) 95% CI (1.32-1.72) (2.07-2.67) (1.52-1.72) (2.07-2.67) (1.52-1.72) (2.07-2.67) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-1.72) (1.52-2.73) (1.52-2.73) (1.52-2.73) (1.52-2.75) (1	26.80 15.87 13.43 3.59 2.94 2.04 1.70 0.68 Height 31.66 5.72 5.30 5.05 5.05 5.32 5.33 5.05 5.34 2.33 7.15 3.309 2.61 1.94 2.20 2.10
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular Heart rate decreased Cardiac flutter Sinus tachycardia Cardiac flutter Supraventricular tachycardia Pulseless electrical activity Extrasystoles Ventricular tachycardia Atrial flutter	4,218/163,239 1,446/166,011 1,040/166,417 866/166,528 75/167,382 65/167,382 65/167,332 18/167,439 4/167,453 18/167,439 4/167,453 18/167,439 4/167,453 18/167,439 4/167,453 1,196/533,930 314/534,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920 190/544,920	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 352 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,355 1,189 /3,627,053 731 /3,627,053 731 /3,627,319 226 /3,622,016 236 /3,627,946 314 /3,627,928 247 /3,627,995 220 /3,628,016 217 /3,628,069 60 /3,628,182 149 /3,628,069 88 /3,628,144 76 /3,628,166		ROR 1,84 1,65 1,81 2,27 1,91 1,77 1,34 1,37 1,69 2,12 3,54 235 ROR 1,88 1,96 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,09 1,62 2,16 1,17 1,77 1,77 1,89 2,12 3,54 2,56 1,87 1,95 1,17 1,76 1,88 1,96 1,96 1,17 1,76 1,89 2,12 1,86 1,66 1,89 2,106 1,17 1,76 1,89 2,106 1,17 1,76 1,89 2,106 1,95 1,17 1,76 1,88 3,73 1,150 2,25 1,17 1,76 1,88 3,73 1,150 2,255 2,150 1,17 1,76 1,89 2,150 2,150 2,150 1,17 1,76 1,89 2,150 2,150 2,150 2,150 1,17 1,76 1,89 2,150 2,150 2,150 2,150 2,150 2,150 2,150 2,150 2,150 1,17 1,76 1,89 2,150 2,250 2,500 2	(1.78-1.90) (1.56-1.74) (1.76-2.07) (1.76-2.07) (1.40-2.24) (1.37-2.24) (1.37-2.24) (1.37-2.24) (1.37-2.44) (1.37-2.44) (1.37-2.46) (1.39-2.20) (1.50-2.07) (1.07-1.65) (1.50-2.07) (1.07-2.67) (1.07-	26.80 15.87 13.43 12.15 2.94 2.04 1.70 0.68 Height 18.03 16.93 13.45 6.60 5.02 5.33 5.05 5.72 5.33 3.422 3.37 3.155 3.369 2.61 1.94 2.200 2.101 1.90
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete m Heart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular Heart rate irregular Heart ate irregular Heart rate irregular Gardiac futter Sinus tachycardia Cardiac futter Sinus tachycardia Heart rate abnormal Heart rate abnormal Atriae turter Supraventricular tachycardia Heart rate abnormal Ventricular tachycardia Atria futter Supraventricular tachycardia Keart futter Supraventricular tachycardia	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,432 18/167,439 4/167,453 8RNA-1273 (a/b) 6,900/528,226 2,240/532,886 2,003/533,123 314/534,945 11,96/533,930 314/534,945 84/535,042 81/535,045 84/535,043 83/535,057 68/535,058 48/5	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 23,995,559 203 /3,995,578 27 /3,995,884 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335 1,189 /3,627,733 731 /3,627,319 226 /3,627,946 234 /3,627,946 247 /3,628,024 247 /3,627,945 220 /3,628,024 247 /3,628,029 247 /3,628,029 247 /3,628,029 247 /3,628,029 247 /3,628,029 247 /3,628,039 249 /3,628,144 76 /3,628,162		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.68 1.96 2.09 1.62 2.35 1.17 1.76 1.88 1.96 2.09 1.65 1.66 1.88 1.96 2.09 1.65 1.65 1.66 1.88 1.96 2.09 1.65 1.77 1.76 1.88 1.96 2.09 1.65 1.65 1.65 1.88 1.96 2.09 1.65 1.66 1.66 1.88 1.96 2.09 1.65 1.77 1.76 1.88 1.96 2.09 1.65 1.66 1.66 1.88 1.96 2.09 1.65 1.77 1.76 1.88 1.96 2.09 1.65 1.76 1.88 1.96 2.09 1.66 1.66 1.88 1.96 2.09 1.66 1.66 1.66 1.66 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.65 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.68 1.66 1.69 2.10 1.69 2.10 1.76 1.69 2.10 1.76 1.69 2.10 1.76 1.69 2.10 1.69 1.69 2.10 1.76 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 2.10 1.69 1.69 1.69 1.69 1.69 1.50 1.50 2.28 2.50 1.81	(1,78-1,90) (1,56-1,74) (1,76-1,72) (2,12-2,43) (1,76-2,07) (1,40-2,24) (1,05-1,72) (1,03-1,82) (1,31-3,43) (1,24-1,010) 95% Cl (1,33-2,43) (1,24-1,010) 95% Cl (1,32-1,22) (2,07-2,67) (1,01-1,36) (1,52-1,72) (2,07-2,67) (1,01-1,36) (1,52-4,72) (1,01-1,36) (1,32-2,13) (1,45-2,47) (1,32-2,13) (1,45-2,47) (1,32-2,13) (1,45-2,47) (1,02-2,15) (1,43-3,38) (1,62-3,15) (1,04-3,14)	26.80 15.87 13.43 3.56 2.94 2.04 1.70 0.68 2.94 2.04 1.70 0.68 31.66 31.66 3.16 3.16 3.16 3.16 3.16 3.
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate inregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete Meart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate increased Cardiac flutter Sinus tachycardia Cardio-respiratory arrest Ventricular extrasystoles Supraventricular tachycardia Heart rate abnormal Pulseless electrical activity Extrasystoles Ventricular achycardia Atrial fibrillation Cardiac artest Heart rate abnormal Pulseless electrical activity Extrasystoles Supraventricular tachycardia Atrial fibrillation Supraventricular extrasystoles Bundle branch block left	4,218 /163,239 1,446 /166,011 1,040 /166,417 866 /166,591 629 /166,828 75 /167,382 65 /167,392 50 /167,432 18 /167,439 4 /167,453 6,900 /528,226 2,240 /532,886 2,030 /533,123 1,196 /533,903 314 /534,812 206 /534,812 206 /534,812 206 /534,820 190 /534,936 84 /535,042 81 /535,045 84 /535,058 84 /535,058 84 /535,058 84 /535,058 84 /535,058 84 /535,058 84 /535,058 84 /535,058 84 /535,058 83 /535,093 33 /535,093 33 /535,093 33 /535,101 10 /535,116	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 27 /3,995,559 203 /3,995,559 203 /3,995,708 27 /3,995,884 Comparators (c/d) 24,979 /3,603,263 7,758 /3,620,484 6,499 /3,621,743 5,015 /3,622,325 1,189 /3,627,035 1,189 /3,627,035 1,189 /3,627,035 1,189 /3,627,035 1,189 /3,627,035 21 /3,627,948 214 /3,628,069 98 /3,628,144 76 /3,628,162 20		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.34 1.37 1.69 2.12 3.54 286 ROR 1.88 1.96 2.09 1.62 2.35 1.17 1.76 1.88 2.52 1.86 1.66 1.88 2.52 1.86 1.66 1.88 3.54 2.52 1.86 1.66 1.88 3.54 2.52 1.86 1.66 1.88 3.54 2.52 1.86 1.66 1.88 3.54 2.52 1.86 1.66 1.88 1.96 1.50 2.52 1.86 1.66 1.88 1.96 1.50 2.52 1.86 1.66 1.88 1.96 1.50 2.52 1.86 1.66 1.88 1.56 1.88 1.56 1.88 1.96 1.56 1.86 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.50 2.52 1.88 1.50 2.52 1.88 1.50 2.52 1.88 1.50 2.52 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.56 1.88 1.50	(1,78-1,90) (1,56-1,74) (1,76-2,07) (1,40-2,24) (1,76-2,07) (1,40-2,24) (1,31-3,43) (1,24-1,10) 95% Cl (1,33-3,43) (1,24-1,0,10) 95% Cl (1,33-1,94) (1,37-2,06) (1,52-1,72) (2,07-2,67) (1,52-1,72) (2,07-2,67) (1,52-1,72) (1,52-1,72) (1,52-1,72) (1,52-1,72) (1,52-1,72) (1,52-2,73) (1	26.80 15.87 13.43 3.59 2.94 2.04 1.70 0.68 31.68 18.03 13.45 6.60 5.72 5.30 0.5.05 3.366 3.342 3.37 3.37 5.30 9.2.61 1.94 2.20 2.10 1.90 2.10 1.94 1.94 1.94 1.94 1.94 1.94 1.94 1.94
Syncope Loss of consciousness Heart rate increased Palpitations Heart rate decreased Atrial fibrillation Heart rate irregular Sinus tachycardia Heart rate abnormal Atrioventricular block complete m Heart rate increased Palpitations Tachycardia Atrial fibrillation Cardiac arrest Heart rate irregular Heart rate irregular Heart ate irregular Heart rate irregular Gardiac futter Sinus tachycardia Cardiac futter Sinus tachycardia Heart rate abnormal Heart rate abnormal Atriae turter Supraventricular tachycardia Heart rate abnormal Ventricular tachycardia Atria futter Supraventricular tachycardia Keart futter Supraventricular tachycardia	4,218/163,239 1,446/166,011 1,040/166,417 866/166,591 629/166,828 75/167,382 65/167,432 18/167,439 4/167,453 8RNA-1273 (a/b) 6,900/528,226 2,240/532,886 2,003/533,123 314/534,945 11,96/533,930 314/534,945 84/535,042 81/535,045 84/535,045 84/535,045 84/535,045 83/535,053 33/535,093 33/535,093 33/535,093 26/535,084 16/535,084	55,398 /3,940,513 21,000 /3,974,911 13,775 /3,982,138 9,132 /3,986,779 7,873 /3,988,038 1,009 /3,994,902 1,156 /3,994,902 23,995,559 203 /3,995,578 27 /3,995,884 6,499 /3,621,743 5,015 /3,623,227 907 /3,627,335 1,189 /3,627,733 731 /3,627,319 226 /3,627,946 234 /3,627,946 247 /3,628,024 247 /3,627,945 220 /3,628,024 247 /3,628,029 247 /3,628,029 247 /3,628,029 247 /3,628,029 247 /3,628,029 247 /3,628,039 249 /3,628,144 76 /3,628,162		ROR 1.84 1.65 1.81 2.27 1.91 1.77 1.37 1.69 2.12 3.54 256 ROR 1.88 1.96 2.09 1.68 1.96 2.09 1.62 2.35 1.17 1.76 1.88 1.96 2.09 1.65 1.66 1.88 1.96 2.09 1.65 1.65 1.66 1.88 1.96 2.09 1.65 1.77 1.76 1.88 1.96 2.09 1.65 1.65 1.65 1.88 1.96 2.09 1.65 1.66 1.66 1.66 1.66 1.66 1.66 1.66 1.66 1.66 1.65 1.66 1.66 1.66 1.66 1.65 1.55	(1,78-1,90) (1,56-1,74) (1,76-1,72) (2,12-2,43) (1,76-2,07) (1,40-2,24) (1,05-1,72) (1,03-1,82) (1,31-3,43) (1,24-1,010) 95% Cl (1,33-2,43) (1,24-1,010) 95% Cl (1,32-1,22) (2,07-2,67) (1,01-1,36) (1,52-1,72) (2,07-2,67) (1,01-1,36) (1,52-4,72) (1,01-1,36) (1,32-2,13) (1,45-2,47) (1,32-2,13) (1,45-2,47) (1,32-2,13) (1,45-2,47) (1,02-2,15) (1,43-3,38) (1,62-3,15) (1,04-3,14)	26.80 15.87 13.43 3.56 2.94 2.04 1.70 0.68 2.94 2.04 1.70 0.68 31.66 31.66 3.16 3.16 3.16 3.16 3.16 3.

FIGURE 6

(A) ROR values and height of the COVID-19 vaccines of BNT162b2-, Ad26.COV2.S-, and mRNA-1273-associated cardiac arrhythmia events. a: cases of target cardiac arrhythmia events reported concerning the target COVID-19 vaccines; b: cases of other adverse events reported concerning the target COVID-19 vaccines; c: cases of target cardiac arrhythmia events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines.

Reporting Odds Ratio

Cardiac failure events	BNT162b2 (a/b)	Comparators (c/d)								ROR	95% CI	He
	561 /445,365	1,799 /3,715,643	-	•						2.60	(2.37-2.86)	8
Cardiac failure congestive	92 /445,834	264 /3,717,178	-							2.91	(2.29-3.68)	3
Pulmonary oedema	85 /445,841	401 /3,717,041								1.77	(1.40-2.23)	З
Brain natriuretic peptide increased	72 /445,854	142 /3,717,300			•					4.23	(3.18-5.61)	2
Pulmonary congestion	71 /445,855	348 /3,717,094								1.70	(1.32-2.20)	3
Ejection fraction decreased	45 /445,881	123 /3,717,319	–		-					3.05	(2.17-4.29)	2
Cardiomegaly	45 /445,881	202 /3,717,240	• • • • • • • • • • • • • • • • •	4						1.86	(1.34-2.57)	2
Cardiac failure acute	24 /445,902	47 /3,717,395			•	-				4.26	(2.60-6.96)	1
Cardiogenic shock	24 /445,902	56 /3,717,386	-							3.57	(2.21-5.76)	1
N-terminal prohormone brain natriuretic peptide increased	20 /445,906	37 /3,717,405			•					4.51	(2.62-7.76)	1
Left ventricular dysfunction	17 /445,909	45 /3,717,397		· ·						3.15	(1.80-5.50)	1
Orthopnoea	12 /445,914	32 /3,717,410	—	•						3.13	(1.61-6.07)	1
Left ventricular failure	8 /445,918	17 /3,717,425								3.92	(1.69-9.09)	0
Acute left ventricular failure	7 /445,919	14 /3,717,428			•					4.17	(1.68-10.33)	(
Acute pulmonary oedema	7 /445,919	17 /3,717,425								3.43	(1.42-8.28)	(
Chronic left ventricular failure	7 /445,919	7 /3,717,435						-		8.34	(2.92-23.77)	(
Diastolic dysfunction	7 /445,919	21 /3,717,421		•		•				2.78	(1.18-6.54)	(
Cardiac failure chronic	6 /445,920	5 /3,717,437				· ·				10.00	(3.05-32.78)	(
Cor pulmonale acute	5 /445,921	8 /3,717,434	·		· ·					5.21	(1.70-15.93)	(
Systolic dysfunction	4 /445,922	9 /3,717,433		•						3.71	(1.14-12.03)	(
Cardiac dysfunction	3 /445,923	4 /3,717,438								6.25	(1.40-27.94)	
			1 2	4		8	16	32	64			
Ad2	26.COV2.S (a/b)	Comparators (c/d)								ROR	95% CI	He
	15/167,442	117 /3,995,794								3.06	(1.79-5.24)	1
Left ventricular dysfunction	6 /167,451	56 /3,995,855		•						2.56	(1.10-5.93)	
N-terminal prohormone brain natriuretic peptide increased	6 /167,451	51 /3,995,860				4				2.81	(1.20-6.54)	
Cor pulmonale acute	3 /167,454	10 /3,995,901								7.16	(1.97-26.01)	(
			1 2	4		8	16	32	64			
mi	RNA-1273 (a/b)	Comparators (c/d)								ROR	95% CI	Н
	·····	15,132/3,613,110								1.84	(1.78–1.90)	
Peripheral swelling		14,161 /3,614,081								1.81	(1.75-1.88)	
Cardiac failure congestive	89 /535,037	267 /3,627,975								2.26	(1.78-2.87)	
Pulmonary congestion	76 /535,050	343 /3,627,899								1.50	(1.17-1.93)	
Brain natriuretic peptide increased	63 /535,063	151 /3,628,091	· · · ·							2.83	(2.11-3.80)	
Cardiac failure acute	18 /535,108	53 /3,628,189								2.30	(2.11-3.80)	
Cardiogenic shock	17 /535,109	63 /3,628,179								1.83	(1.07-3.13)	
V-terminal prohormone brain natriuretic peptide increased	13 /535,113	44 /3,628,198								2.00	(1.07-3.13)	
Acute left ventricular failure	9 /535,117	12 /3,628,230		1						2.00	(2.14-12.07)	
_ower respiratory tract congestion	9/535,117	22 /3,628,220	· · · · ·							2.77	(1.28-6.02)	
Chronic left ventricular failure	7 /535,119	7 /3,628,235								6.78	(2.38-19.33)	
Dyspnoea paroxysmal nocturnal	5 /535,119	4 /3,628,233				-				8.48	(2.28-31.56)	
Jyaphoda paroxyshiai hociumai										0.40 6.78	(2.26-31.56) (1.96-23.42)	
	5 /535 101											
Right ventricular dilatation	5 /535,121	5 /3,628,237	1 2	4		8	16	32	64	0.70	(

FIGURE 6 (Continued)

(B) ROR values and height of the COVID-19 vaccines of BNT162b2-, Ad26.COV2.S-, and mRNA-1273-associated cardiac failure events. a: cases of target cardiac failure events reported concerning the target COVID-19 vaccines; b: cases of other adverse events reported concerning the target COVID-19 vaccines; c: cases of target cardiac failure events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines.

18.03, 2,240 cases), palpitations (ROR 2.09 95% CI 1.99–2.20, height 16.93, 2,003 cases), and tachycardia (ROR 1.62, 95% CI 1.52–1.72, height 13.45, 1,196 cases).

3.4.2 Cardiac failure events

Cardiac failure events mainly showed association with BNT162b2 and mRNA-1273, as shown in Figure 6B. A total of 561 cases of cardiac failure events were associated with BNT162b2 (ROR 2.60, 95% CI 2.37–2.86, height 8.95), ranked by the absolute number of cases including congestive cardiac failure (ROR 2.91, 95% CI 2.29–3.68, height 3.55, 92 cases), pulmonary edema (ROR 1.77, 95% CI 1.40–2.23, height 3.60, 85 cases), and increased brain natriuretic peptide (ROR 4.23, 95% CI 3.18–5.61, height 2.96, 72 cases). A total of

4088 cases of cardiac failure events (ROR 1.84, 95% CI 1.78–1.90, height 24.50) showed association with mRNA-1273, of which peripheral swelling (ROR 1.81, 95% CI 1.75–1.88, height 23.59) was reported with the highest frequency. There were only 15 cases of cardiac failure events associated with Ad26.COV2.S (ROR 3.06, 95% CI 1.79–5.24, height 1.51).

3.4.3 Hypertension events

The hypertension events that showed association with the three COVID-19 vaccines are illustrated in Figure 6C. A total of 2,890 cases of hypertension events were associated with BNT162b2, with an ROR of 3.28 (95% CI 3.14–3.42, height 19.70), ranked by the absolute number of cases

Hypertension events	BNT162b2 (a/b)	Comparators (c/d)		ROR	95% CI	Height
	2,890 /443,036	7,384 /3,710,058	-	3.28	(3.14-3.42)	19.70
Blood pressure increased	1,577 /444,349	3,416 /3,714,026	iei	3.86	(3.63-4.10)	14.21
Hypertension	1,245 /444,681	3,861 /3,713,581	(m)	2.69	(2.53-2.87)	13.28
Blood pressure systolic increased	20 /445,906	50 /3,717,392	→ → →	3.33	(1.99-5.60)	1.57
Hypertensive urgency	16 /445,910	13 /3,717,429	↓·	10.26	(4.94–21.33)	1.06
Hypertensive emergency	10 /445,916	11 /3,717,431	⊢	7.58	(3.22-17.85)	0.88
Essential hypertension	9 /445,917	23 /3,717,419		3.26	(1.51-7.05)	1.00
White coat hypertension	6 /445,920	2 /3,717,440	• • • • • • • • • • • • • • • • • • •	25.01	(5.05-123.92)	0.36
Malignant hypertension	4 /445,922	7 /3,717,435		4.76	(1.39-16.27)	0.54
Blood pressure orthostatic increased	3 /445,923	1 /3,717,441	• • • • • • • • • • • • • • • • • • • •	25.01	(2.60-240.44)	0.18
			1 2 4 8 16 32 64 128 256			
А	d26.COV2.S (a/b)	Comparators (c/d)		ROR	95% CI	Heigh
	605 /166,852	9,537 /3,986,374	iai	1.52	(1.40-1.65)	10.31
Hypertension	329 /167,128	4,777 /3,991,134	H=4	1.64	(1.47-1.84)	7.58
Blood pressure increased	269 /167,188	4,724 /3,991,187	Heri	1.36	(1.20-1.54)	6.89
Hypertensive emergency	4 /167,453	17 /3,995,894	↓ ·•	5.61	(1.89–16.69)	0.64
Blood pressure diastolic increased	3 /167,454	19 /3,995,892	·	3.77	(1.11–12.73)	0.55
			1 2 4 8 16 32 64 128 256			
	mRNA-1273 (a/b)	Comparators (c/d)		ROR	95% CI	Height
	2,230 /532,896	8,058 /3,620,184	N	1.88	(1.79–1.97)	18.08
Blood pressure increased	1,189 /533,937	3,804 /3,624,438	iei	2.12	(1.99-2.26)	13.02
Hypertension	995 /534,131	4,111 /3,624,131	lei	1.64	(1.53-1.76)	12.25
Hypertensive crisis	18 /535,108	65 /3,628,177		1.88	(1.11-3.16)	1.56
Blood pressure systolic increased	15 /535,111	55 /3,628,187	⊢−− ■−−1	1.85	(1.04-3.27)	1.41
Hypertensive urgency	9 /535,117	20 /3,628,222		3.05	(1.39–6.70)	0.98
Accelerated hypertension	4 /535,122	3 /3,628,239	· · · · · · · · · · · · · · · · · · ·	9.04	(2.02-40.39)	0.40
			1 2 4 8 16 32 64 128 256			

(C) ROR values and height of the COVID-19 vaccines of BNT162b2-, Ad26.COV2.S-, and mRNA-1273-associated hypertension events. a: cases of target hypertension events reported concerning the target COVID-19 vaccines; b: cases of other adverse events reported concerning the target covID-19 vaccines; c: cases of target hypertension events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines.

including increased blood pressure (ROR 3.86, 95% CI 3.63–4.10, height 14.21, 1,577 cases) and hypertension (ROR 2.69, 95% CI 2.53–2.87, height 13.28, 1,245 cases). A total of 2230 cases of hypertension events were associated with mRNA-1273, with an ROR of 1.88 (95% CI 1.79–1.97, height 18.08), and increased blood pressure (ROR 2.12, 95% CI 1.99–2.26, height 13.02, 1,189 cases) was the most reported. Only 605 cases of hypertension events were associated with Ad26.COV2.S, with an ROR of 1.52 (95% CI 1.40–1.65, height 10.31).

3.5 Hepatotoxicity events

A total of 137 cases of hepatotoxicity events were associated with BNT162b2 (ROR 2.32, 95% CI 1.92–2.80, height 4.46), with 50 cases associated with Ad26.COV2.S (ROR 2.86, 95% CI 2.13–3.84, height 2.85) and 90 cases associated with mRNA-1273 (ROR 1.54, 95% CI 1.23–1.94, height 3.68), as shown in Figure 7.

3.6 Acute renal impairment events

Acute renal impairment events were only associated with BNT162b2 and mRNA-1273. A total of 591 cases of acute renal impairment events were associated with BNT162b2 (ROR 2.55, 95% CI 2.33–2.80, height 9.20), ranked by the absolute number of cases including acute kidney injury (AKI) (ROR 5.41, 95% CI 4.54–6.43, height 4.87, 210 cases), increased blood creatinine (ROR 1.77, 95% CI 1.51–2.09, height 5.18, 175 cases), and increased blood urea (ROR 1.77, 95% CI 1.45–2.17, height 4.19, 115 cases). The acute renal impairment events associated with mRNA-1273 with an ROR of 2.47 (95% CI 2.10–2.91, height 5.24, 201 cases) are illustrated in Figure 7.

3.7 Seizure events

Seizure events only showed association with BNT162b2 and Ad26.COV2.S, as illustrated in Figure 7. A total of 693 cases of

Hepatotoxicity events	BNT162b2 (a/b)	Comparators (c/	/d)						ROR	95% CI	Heigh
	137/445,789	493/3,716,949		1					2.32	(1.92-2.80)	4.46
International normalised ratio increased	53/445,873	261/3,717,181							1.69	(1.26-2.27)	2.84
Liver function test increased	43/445,883	128/3,717,314							2.80	(1.98-3.96)	2.41
Hepatic pain	10/445,916	31/3,717,411			-				2.69	(1.32-5.49)	1.10
International normalised ratio decreased	10/445,916	34/3,717,408							2.45	(1.21-4.96)	1.11
Ischaemic hepatitis	6/445,920	5/3,717,437		·					10.00	(3.05-32.78)	0.57
Hepatic lesion	5/445,921	15/3,717,427		•					2.78	(1.01-7.65)	0.71
Bilirubin urine present	4/445,922	8/3,717,434	-						4.17	(1.26-13.84)	0.56
Portal hypertension	3/445,923	6/3,717,436							4.17	(1.04-16.67)	0.45
Blood bilirubin abnormal	3/445,923	5/3,717,437	·						5.00	(1.20-20.93)	0.43
			1 2	4	8	16	32	64			
Ad2	:6.COV2.S (a/b)	Comparators (c/	/d)						ROR	95% CI	Heigh
	50/167,407	417/3,995,494		•					2.86	(2.13-3.84)	2.85
International normalised ratio increased	29/167,428	285/3,995,626							2.43	(1.66-3.56)	2.17
Blood fibrinogen decreased	7/167,450	47/3,995,864							3.55	(1.61-7.86)	0.97
International normalised ratio decreased	6/167,451	38/3,995,873	—						3.77	(1.59-8.91)	0.87
Hepatic pain	5/167,452	36/3,995,875	·	-					3.31	(1.30-8.45)	0.79
Antithrombin III decreased	3/167,454	11/3,995,900					-		6.51	(1.82-23.33)	0.51
			1 2	4	8	16	32	64			
m	RNA-1273 (a/b)	Comparators (c/	/d)						ROR	95% CI	Heigh
	90/535,036	395/3,627,847							1.54	(1.23-1.94)	3.68
International normalised ratio increased	53/535,073	261/3,627,981							1.38	(1.02-1.85)	2.84
Liver function test increased	37/535,089	134/3,628,108	.						1.87	(1.30-2.69)	
		,,,	1 2	4	8	16	32	64		(
				-		10					
Acute renal impairment events	3NT162b2 (a/b)	Comparators (c/	'd) 						ROR	95% CI	Height
	591/445,335	1,932/3,715,510		I					2.55	(2.33-2.80)	9.20
Acute kidney injury	210/445,716	324/3,717,118		Ē	■1				5.41	(4.54–6.43)	4.87
Blood creatinine increased	175/445,751	823/3,716,619	⊢ ∎1						1.77	(1.51-2.09)	5.18
Blood urea increased	115/445,811	541/3,716,901	⊢ ∎⊸1						1.77	(1.45–2.17)	4.19
Glomerular filtration rate decreased	60/445,866	130/3,717,312							3.85	(2.83-5.23)	
Dialysis	19/445,907	89/3,717,353		-					1.78	(1.08–2.92)	1.65
Blood urea nitrogen/creatinine ratio increased	9/445,917	19/3,717,423		•					3.95	(1.79–8.73)	0.97
Blood creatinine abnormal	3/445,923	6/3,717,436	ŀ	-					4.17	(1.04–16.67)	0.45
			1 2	4	8	16	32	64			
m	RNA-1273 (a/b)	Comparators (c/	/d)						ROR	95% CI	Heigh
	201/534,925	551/3,627,691		4					2.47	(2.10-2.91)	5.24
Acute kidney injury	143/534,983	391/3,627,851		-					2.48	(2.05-3.00)	
Glomerular filtration rate decreased	50/535,076	140/3,628,102							2.42	(1.75-3.34)	2.59
Blood urea nitrogen/creatinine ratio increased	8/535,118	20/3,628,222							2.71	(1.19-6.16)	
-			1 2	4	8	16	32	64			
			1 2	4	0	10	52	04			
Seizures events	BNT162b2 (a/b)	Comparators (c/	/d)						ROR	95% CI	Heigh
	693/445,233	5,165/3,712,277	H H H						1.12	(1.03–1.21)	10.70
Seizure	688/445,238	5,154/3,712,288	HeH						1.11	(1.03-1.21)	10.66
ColEdio	5/445,921	11/3,717,431				I			3.79	(1.32-10.91)	0.67
Focal dyscognitive seizures	5/445,921	, ,									
	5/445,921	, ,	1 2	4	8	16	32	64			
Focal dyscognitive seizures	,			4	8	16	32	64	RUP	95% CI	Height
Focal dyscognitive seizures Ad2	26.COV2.S (a/b)	Comparators (c/		4	8	16	32	64	ROR	95% CI	Height
Focal dyscognitive seizures	26.COV2.S (a/b)			4	8 8	16 16	32 32	64 64	ROR 1.61	95% CI (1.44-1.78)	

FIGURE 7

The ROR values and height of the COVID-19 vaccines of BNT162b2-, Ad26.COV2.S-, and mRNA-1273-associated hepatotoxicity, acute renal impairment, and seizure events. a: cases of target hepatotoxicity, acute renal impairment, and seizure events reported concerning the target COVID-19 vaccines; b: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines; d: cases of other adverse events reported concerning all the other vaccines.

Severe AEFI	BNT162b2	Ad26.COV2.S	mRNA-1273
Covid events	Yes	Yes	Yes
Thrombotic events	Yes	Yes	Yes
Hemorrhage events	Yes	Yes	Yes
Thrombocytopenia events	Yes	Yes	Yes
Cardiac arrhythmia events	Yes	Yes	Yes
Cardiac failure events	Yes	Yes ^a	Yes
Hypertension events	Yes	Yes	Yes
Hepatotoxicity events	Yes	Yes	Yes
Acute renal impairment events	Yes	_	Yes
Seizure events	Yes	Yes	_
Pancreatitis events	_	_	_

TABLE 1 Severe AEFI associated with the BNT162b2, Ad26.COV2.S, and mRNA-1273 vaccines.

^aOnly 15 cases of cardiac failure events were associated with the Ad26.COV2.S vaccines.

seizure events were associated with BNT162b2, with an ROR of 1.12 (95% CI 1.03–1.21, height 10.70), including seizures (ROR 1.11, 95% CI 1.03–1.21, height 10.66, 688 cases). A total of 368 cases of seizure (ROR 1.61, 95% CI 1.44–1.78, height 8.03) were associated with Ad26.COV2.S.

3.8 Acute pancreatitis events

A total of 57, 59, and 10 cases of acute pancreatitis events were associated with BNT162b2, mRNA-1273, and Ad26.COV2.S, respectively, but the lower limit of the 95% CI was less than 1. The results are shown in Supplementary Figure S2.

All serious AEFI associated with the BNT162b2, Ad26.COV2.S, and mRNA-1273 vaccines are summarized in Table 1.

4 Discussion

In the present study, a disproportionality analysis of VAERS data was performed, and the results demonstrated that the COVID-19 vaccines BNT162b2, mRNA-1273. and Ad26.COV2.S were associated with a broad scope of adverse events. There were statistically significant differences between Ad26.COV2.S and the other two vaccines for the frequency of deaths after vaccination. The reported frequency of birth defects and emergency room visits was statistically different between Ad26.COV2.S and BNT162b2. There were people who died after taking the three vaccines, with the most common combination of AEFI being dyspnea, cardiac arrest, and lack of response to stimuli. Patients went to the emergency rooms and visited hospitals for dizziness, dyspnea, headache, and nausea. Dyspnea, pulmonary embolism, and headache were also reported as life-threatening AEFI associated with the three vaccines. There were a few people who still developed COVID-19, showed a positive SARS-CoV-2 test, and had asymptomatic COVID-19 after vaccination. The results were in line with those of previous studies.

4.1 Coagulation disorders, cardiac disorders, hepatotoxicity, acute renal impairment, and seizure events associated with the three COVID-19 vaccines

The disproportionality analysis showed that BNT162b2 was associated with thrombosis, hemorrhage, thrombocytopenia, cardio arrhythmia, cardiac failure, hypertension, hepatotoxicity, acute renal impairment, and seizure events. Ad26.COV2.S showed association with thrombosis, hemorrhage, thrombocytopenia, cardiac arrhythmia, hypertension, hepatotoxicity, and seizure events. The mRNA-1273 vaccine was associated with thrombotic events, hemorrhage, thrombocytopenia, cardiac arrhythmias, cardiac failure, hypertension, hepatotoxicity, and acute renal impairment. Acute pancreatitis events showed no associations with the three vaccines because the lower limits of the 95% CIs were less than 1.

There were cases of AEFI showing association with the three vaccines, but only with a relatively large ROR value with a wide 95% CI, indicating a promising signal; however, only few cases, such as thrombotic events of arterial stent insertion, basilar artery occlusion, carotid endarterectomy, intra-aortic balloon placement, renal artery thrombosis, and vertebral artery occlusion, were associated with BNT162b2. Those signals require more reported cases to further validate them. To improve the credibility of ROR by removing false positives caused by a lack of absolute counts, we presented a unique method to verify the validity of ROR values. Those adverse events

with smaller numbers of cases and wider 95% CIs usually showed a lower height.

4.2 Coagulation disorders following vaccination with BNT162b2, Ad26.COV2.S, and mRNA-1273 and the unknown mechanisms

The vast majority of reported cases of thrombosis are related to vaccination with ChAdOx1nCoV-19 (Bayas et al., 2021; Schultz et al., 2021) or Ad26.COV2.S (Iavorska et al., 2021; See et al., 2021). There was also a case report of cerebral venous sinus thrombosis after the Pfizer-BioNTech vaccination (Cheng, 2021). A study based on European data showed that ChAdOx1nCoV-19 and Ad26.COV2.S recipients had higher frequencies of not only serious AEFI caused by venous blood clots and hemorrhage but also thromboembolic disease and arterial events, including myocardial infarction and stroke, than those of BNT162b2 recipients (Cari et al., 2021). However, in the present study, the total thrombosis frequency of mRNA-1273 recipients was less than that of BNT162b2 and Ad26.COV2.S recipients.

To date, several studies on the mechanism of VITT caused by the COVID-19 vaccines have been reported. Published studies have suggested that the two most likely mechanisms include the effect of anti-platelet factor 4 (PF4) antibodies and the direct interaction between the adenovirus vector and platelets (Rzymski et al., 2021). Among these two mechanisms, some authors believed that the effect of PF4 antibodies was responsible for formation of the immunogenicity complex due to the negative charge on the surface of the adenovirus and the positive charge PF4 released by platelets, which further bonded with the IgG antibody, thus activating platelets and causing the additional release of PF4. PF4 interacted with the Fcgamma receptor IIA (FcyRIIa) of platelets and then activated the platelets to enter a hypercoagulable state, leading to increased PF4 release and promoting arterial and venous thrombosis, which ultimately triggers VITT (Arepally, 2017). Another speculation was that free adenovirus DNA or some components of adenovirus could trigger VITT, but the evidence was not sufficient, and further research is needed [37]. The direct interaction between the adenovirus vector and platelets mechanism suggests that the adenoviruses in the adenovirus vectortype COVID-19 vaccine, such as human adenovirus type 5 and human adenovirus type 3, could bind to the platelets in the blood circulation through CAR and CD46 and activate platelets (Stone et al., 2007; Jin et al., 2014). Eventually, this leads to platelet aggregation, and activated platelets release a large amount of PF4, which in turn triggers VITT (Arepally et al., 2007). In addition, Rzymski et al. proposed a novel explanation referring to anti-SARS-CoV-2 spike protein antibody and PF4 cross-reaction. The author suggested that the cross-reaction of the anti-adenovirus antibody and PF4 could lead to interaction between the spike protein and platelets, causing platelets to express spike protein and activate a corresponding immune response (Rzymski et al., 2021). The proposed mechanisms of vaccine-induced immune thrombotic thrombocytopenia are shown in Supplementary Figure S3.

Notably, most of the venous thrombotic serious AEFI associated with BNT162b2 and Ad26.COV2.S vaccines were not complicated with thrombocytopenia, according to our results, suggesting that VITT is not the only type of thrombosis following the adenovirus vector. The interaction between the SARS-CoV2 virus and the angiotensin-converting enzyme 2 (ACE2) receptor as a potential cause of platelet aggregation is supported by strong evidence (Divani et al., 2020). However, the exact mechanism by which the COVID-19 vaccine might exert a prothrombotic effect without causing thrombocytopenia is still largely unknown. The binding of the spike (S) glycoprotein ACE2 might result to in ACE2 downregulation, which in turn results in higher production of angiotensin II (AngII) by ACE and less conversion of ACE2 to Ang-(1-7), which is consistent with the mechanism by which viral vector vaccines induce immunization. Stroke and thrombosis might be caused by an overactive ACE/AngII/AT1R pathway because of its prothrombotic, pro-inflammatory, and vasoconstrictor effects, especially in venous circulation (Divani et al., 2020).

4.3 Potential AEFI related to BNT162b2, Ad26.COV2.S, and mRNA-1273 vaccines and the unknown mechanisms

After receiving the first dosage of the Pfizer-BioNTech vaccine, Bril et al. reported the first case of liver injury (Bril et al., 2021). Since then, a series of AEFI have been reported (Shroff et al., 2022). A worldwide case series study has shown that SARS-CoV-2 vaccinations (Pfizer-BioNTech, Moderna, and Oxford-AstraZeneca) have the potential to be hepatotoxic (Efe et al., 2022). Liver injury was predominantly hepatocellular and showed features of immune-mediated hepatitis (Efe et al., 2022). Administering vaccines to individuals with cancer during immunotherapy and with a history of hepatitis C virus (HCV) resulted in a higher risk of autoimmune hepatitis after the administration of the COVID-19 vaccine (Hasegawa et al., 2022; Lasagna et al., 2022). Although the exact mechanism of SARS-CoV-2 vaccine-induced

liver injury is still unknown, published reports of SARS-CoV-2 vaccine-induced liver injury predominantly refer to hepatocellular issues frequently characterized by autoimmune hepatitis-like symptoms (Bril et al., 2021; Efe et al., 2022; Hasegawa et al., 2022; Lasagna et al., 2022).

Interestingly, at least six cases of gross hematuria have been reported in patients with a history of biopsy-proven IgA nephropathy (IgAN), involving both mRNA vaccines (Negrea and Rovin, 2021; Perrin et al., 2021; Rahim et al., 2021). All of the previous patients were treated with supportive therapy, and there was rapid resolution of hematuria and no AKI. There were also patients who had prior biopsy-proven IgAN, who developed gross hematuria after their second dose of the BNT162b2 vaccine, without a preceding COVID-19 infection, and patients who had minimal change in disease and AKI following BNT162b2 vaccination (D'agati et al., 2021; Plasse et al., 2021). After receiving the first dose of the BNT162b2 COVID-19 vaccine, a 20-year-old male college student developed AKI that required hemodialysis (Kahn et al., 2021). According to Luo et al.'s statement in an epidemiological study, mRNA vaccinations (such as BioNTech and mRNA-1273) were more frequently linked to AKI than adenovirus vaccines (such as Ad26.COV2.S), which was consistent with our results (Luo et al., 2022). Although mRNA vaccine technology has been developed and improved for nearly 20 years, it has not been widely used in clinical practice until recently (Pardi et al., 2020). There is no convincing hypothesis for the mechanism of SARS-CoV-2 vaccine-induced AKI yet, but it should be noted that there are potential cross-reactivity risks between autoimmune target proteins and SARS-CoV-2, which could lead to immune activation and trigger autoimmune diseases (Segal and Shoenfeld, 2018; Vojdani and Kharrazian, 2020). No AKI events were reported to be associated with the Ad26.COV2.S COVID-19 vaccine; perhaps this vaccine is a better choice for patients with a history of kidney disease.

There is little literature on vaccine association with heart failure and arrhythmias. For example, there was a case of a patient who developed hyperthyroidism complicated with atrial fibrillation and heart failure on the sixth day after the first dose of BNT162b2 (Yamamoto et al., 2021). Tachycardia and hypertension were common adverse events observed with vaccines in a study based on the WHO database, with an incidence rate of 16.41% and 5.82%, respectively (Jeet Kaur et al., 2021). Furthermore, a healthy vaccine recipient was diagnosed with postural orthostatic tachycardia (Reddy et al., 2021) on the sixth day after he received the first dose of BNT162B2. The mechanism for the AEFI of the cardiovascular system associated with COVID-19 vaccination remains unknown and is possibly caused by an immunological response to adrenergic receptors that impair vasoconstriction, which therefore leads to postural tachycardia (Li et al., 2014; Reddy et al., 2021). Fewer heart failure events were reported to be associated with Ad26.COV2.S; perhaps this vaccine is more appropriate for patients with a history of heart failure. Seizure events only showed association with BNT162b2 and Ad26.COV2.S. For patients with a history of epilepsy, the mRNA-1273 vaccine is a better option.

4.4 Limitations of the study

It is important to recognize that there are limitations to the data mining procedure using the VAERS database. First, because of the feature of the spontaneous reporting system that the total number of patients vaccinated was unknown, the prevalence of AEFI associated with COVID-19 vaccines could not be calculated. For example, since it is not possible to determine the proportion of pregnant women who received the three vaccines in the real world, the incidence of birth defects is merely the statistical tendency using the VAERS data. If the proportion of pregnant women was higher in some vaccines, the incidence of birth defects may increase correspondingly. Second, the causal relationships between AEFI and the suspected vaccines in the AEFI reports submitted to the VAERS could be questionable since the identification or diagnosis of AEFI was based on the experience of health workers and comorbidities of the patients. Third, the analysis of COVIDrelated adverse events should be carefully interpreted since the VAERS is specialized to accept adverse event cases associated with vaccination, and there was hardly any information about indications for the vaccine recipients or whether the vaccine recipients had ever been infected with COVID-19 before the vaccination. Fourth, cases possibly resulting in death were the percentage of cases that ended with fatal outcomes among all the cases where individuals were vaccinated with the same vaccines. It was unknown at the time if they were related, and there was no further investigation. Fifth, we did not analyze the symptom text provided by VAERSDATA. The text provided us with the adverse event in detail based on "symptom," which is an abstract of symptom text; however, the spontaneous reporting system still demonstrated enlightening clues regarding how COVID-19 vaccines are associated with a higher risk of AEFI from the data mining and signal detection point of view.

5 Conclusion

In conclusion, a disproportionality analysis was performed using the ROR method based on the VAERS

data. Ad26.COV2.S vaccination was associated with a lower death frequency than BNT162b2 and mRNA-1273. Ad26.COV2.S vaccination was associated with a lower birth defect and emergency room visit frequency than BNT162b2. A minor proportion of vaccine recipients suffered from COVID-19-related symptoms after vaccination with the three vaccines but not as a causal relationship. Thrombotic, hemorrhage, thrombocytopenia, cardiac arrhythmia, hypertension, and hepatotoxicity events were associated with the COVID-19 vaccines BNT162b2, Ad26.COV2.S, and mRNA-1273. Cardiac failure events and acute renal impairment events showed associations with BNT162b2 and mRNA-1273. Seizure events were all associated with BNT162b2 and Ad26.COV2.S. Patients with underlying medical conditions may be advised to use the aforementioned information for vaccination selection. These results are consistent with those of previous studies. The risk/benefit profile of these vaccines remains unchanged, although it is important to maintain vigilance.

Data availability statement

Publicly available datasets were analyzed in this study. These data can be found here: https://vaers.hhs.gov/.

Author contributions

All authors discussed and commented on the results of the study. X-YQ and M-KZ designed the study; M-MY, HZ, and Z-RL conducted the study; Y-PQ and HZ analyzed and interpreted the data; QZ and Z-RL contributed to the formation of figures and the analytical method; M-MY, J-WC, and S-SW drafted the manuscript; J-WC, X-YQ, and M-MY revised the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fphar. 2022.921760/full#supplementary-material

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