Effectiveness of COVID-19 vaccines against hospital admission with the Delta (B.1.617.2) variant

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We recently reported vaccine effectiveness (VE) estimates against symptomatic disease with the Delta (B.1.617.2) variant.(1) After a full course, VE reached 88% with the Pfizer/BioNTech BNT162b2 vaccine and 67% with the AstraZeneca ChAdOx1 AZD1222 vaccine. This provided important evidence that despite modest reductions in protection, vaccines remain effective against Delta. However, the very recent emergence of the variant and the relatively low case numbers meant that it was not possible to estimate VE against severe disease.

With other variants, vaccines have been found to provide higher levels of protection against severe outcomes compared to mild disease.(2-4) Understanding the effectiveness against more severe end points such as hospital admissions is crucial in evaluating the risk Delta poses on the population and the consequences of easing non-pharmaceutical interventions.

Delta has continued to spread globally, including in the UK, with a proportion of cases resulting in more severe disease and hospitalisation.(5) Here we estimate effectiveness of the BNT162b2 and ChAdOx1 vaccines against Delta as compared to Alpha.

We linked all symptomatic cases between 12th April and 4th June 2021 to the Emergency Care Dataset (ECDS) which records all hospital admission via emergency departments in England. We included any hospitalisations (excluding injuries) within 14 days of a positive test. A cox proportional hazards survival analysis was undertaken to estimate the risk of hospitalisation by vaccination status adjusting for age, clinically extremely vulnerable groups, ethnicity and test week. Odds ratios (OR) for symptomatic disease from a test negative case control analysis (1) were then combined with the hazard ratios (HR) for hospitalisation among symptomatic cases to estimate vaccine effectiveness against hospitalisation as VE = 1 - ($OR_{\text{symptomatic disease}}$ x $HR_{\text{hospitalisation}}$).

There were 14,019 symptomatic cases with Delta included in the analysis, 166 of whom were hospitalised. Overall hazard ratios for hospitalisation among cases with Delta in vaccinated compared to unvaccinated individuals were 0.37 (0.22-0.63) after 1 dose and 0.29 (0.11-0.72) after 2

doses of any vaccine. This compared to 0.44 (0.28-0.70) and 0.64 (0.24-1.72) with Alpha. VE against hospitalisation with Delta was similar to that seen with Alpha: 94% (46-99) after 1 dose and 96% (86-99) after 2 doses of BNT162b2; 71% (51-83) after 1 dose and 92% (75-97) after 2 doses of ChAdOx1 (Table)

These findings indicate very high levels of protection against hospitalisation with the Delta variant with 1 or 2 doses of either vaccine.

Table 1: Estimated vaccine effectiveness against hospitalisation

		Alpha			Delta		
Vaccination status		OR vs symptomatic disease	HR vs hospitalisation	VE vs hospitalisation	OR vs symptomatic disease	HR vs hospitalisation	VE vs hospitalisation
Any vaccine							
	Dose 1	0.51 (0.48-0.55)	0.44 (0.28-0.70)	78% (65-86)	0.69 (0.64-0.75)	0.37 (0.22-0.63)	75% (57-85)
	Dose 2	0.13 (0.1-0.15)	0.64 (0.24-1.72)	92% (78-97)	0.20 (0.18-0.23)	0.29 (0.11-0.72)	94% (85-98)
Pfizer							
	Dose 1	0.53 (0.47-0.58)	0.32 (0.14-0.73)	83% (62-93)	0.64 (0.54-0.77)	0.10 (0.01-0.76)	94% (46-99)
	Dose 2	0.06 (0.05-0.08)	0.88 (0.21-3.77)	95% (78-99)	0.12 (0.1-0.15)	0.34 (0.10-1.18)	96% (86-99)
Astrazeneca							
	Dose 1	0.51 (0.48-0.55)	0.48 (0.30-0.77)	76% (61-85)	0.70 (0.65-0.76)	0.41 (0.24-0.70)	71% (51-83)
	Dose 2	0.26 (0.21-0.32)	0.53 (0.15-1.80)	86% (53-96)	0.33 (0.28-0.39)	0.25 (0.08-0.78)	92% (75-97)

OR =odds ratio. HR = hazards ratio. VE = vaccine effectiveness. OR vs symptomatic disease as described in (1). HR and VE vs hospitalisation adjusted for age, clinically extremely vulnerable groups, ethnicity and test week

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