Prospective Decentralized Study Evaluating the Impact of Age on Antibody Responses to COVID-19 Vaccines in Community Dwelling Adults to 48 weeks Post Primary Vaccine Series

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Introduction

The elderly are a risk group for severe illness due to COVID-19. The impact of age and comorbidity on the long term serologic response to COVID vaccines is unclear.

Objective

To prospectively compare the long term antibody response to COVID vaccines and boosters in 861 older (> 70 years) relative to 344 younger (30-50 year) community dwelling adults in Ontario to 48 weeks after initial vaccine series.

Methods

Decentralized cohort study (www.stopCov.ca) with self-report of adverse events and collection of dried blood spots for serology. IgG antibody was determined by ELISA to nucleoprotein, receptor binding domain, and spike protein every 3 months and 3-4 weeks after booster doses. Conversion to the WHO standard BAU/ml enables cross study comparisons.

Results

Figure 1. Violin Plots of Normalized IgG ratio to Receptor Binding Domain over time by vaccine dose and age

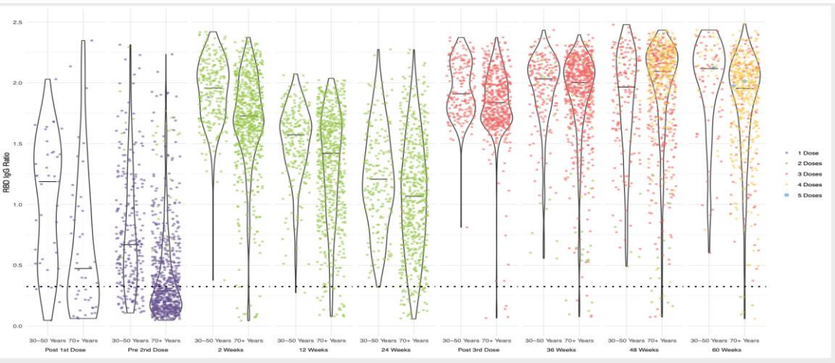
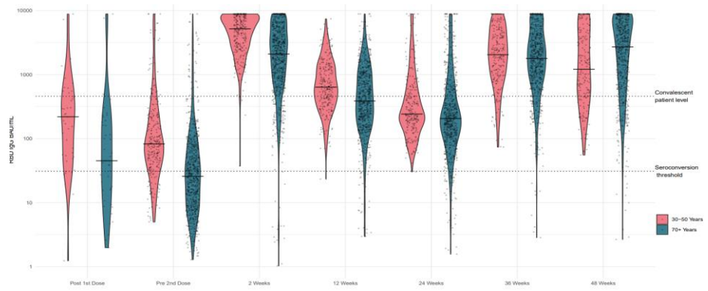
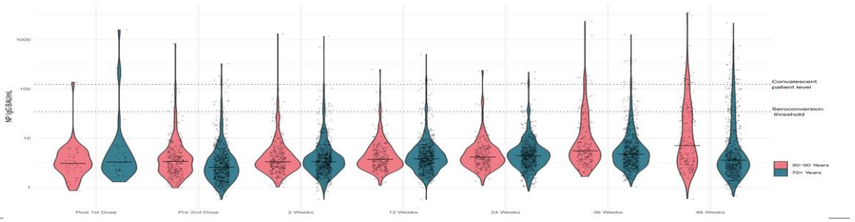


Figure 2. Violin plots of Normalized IgG ratio to Receptor Binding Domain with age over time converted to BAU standard



Median regression models of anti-RBD at 48 weeks: having had a positive COVID test (p<.0001), and receipt of any dose of mRNA 1273 (p< .0001) were associated with higher levels of anti-RBD. At this point older participants with 3 doses had similar antibody levels to younger participants with 3 doses in univariable models but higher levels when adjusted for covariates. This could be confounded by the vaccine booster dose.

Figure 3- Breakthrough COVID infections as determined by antibody to NP (nucleoprotein) by age and time



Conclusions

We report success of a decentralized longitudinal serology study. Antibody responses were higher in the younger than older cohort after the initial vaccine series. Booster doses resulted in increases in antibody titres such that brand, comorbidity and age no longer impacted antibody levels at 48 weeks after the initial series. Breakthrough infection rate of 20% was lower than in the general population

Table 1. Baseline Participant Characteristics and COVID 19 Vaccine Brands by Age Cohort

	30-50	70+
n (%)	344	861
Age[a] (median, IQR)	41 [36, 45]	73 [71, 76]
Female or NonBinary[a]	257 (75.6)	512 (59.6)
Racial Background		
Arab/West Indian	4 (1.2)	7 (0.8)
Black	11 (3.2)	9 (1.0)
Indigenous/Aboriginal/Indian or Native American	3 (0.9)	2 (0.2)
Latin American	7 (2.1)	0 (0.0)
South Asian	8 (2.4)	7 (0.8)
Southeast Asian	20 (5.9)	12 (1.4)
White	256 (75.3)	800 (93.1)
Other	31 (9.1)	22 (2.6)
Smoking Status[a]		
Never	241 (70.9)	434 (50.5)
Previous	68 (20.0)	390 (45.4)
Current	31 (9.1)	35 (4.1)
Comorbidities		
Diabetes	5 (1.5)	123 (14.3)
Cardiovascular Disease	17 (5.0)	414 (48.2)
Cancer	9 (2.6)	171 (19.9)
Transplant or Immunosuppressed	12 (3.5)	36 (4.2)
Chronic Obstructive Lung Disease	0 (0.0)	22 (2.6)
Asthma	48 (14.1)	76 (8.8)
Chronic Kidney Disease	3 (0.9)	17 (2.0)
Hepatitis C	2 (0.6)	3 (0.3)
Chronic Liver Disease	4 (1.2)	9 (1.0)
Chronic Blood Disease	1 (0.3)	12 (1.4)
Chronic Neurologic Disease	4 (1.2)	15 (1.7)
Dialysis	3 (0.9)	4 (0.5)
BMI[a,b] (median, IQR)	25.68 [22.80, 29.59]	26.56 [23.68, 30.04]
BMI Category[a,b]		
Under/Healthy Weight (<25)	157 (46.9)	306 (36.1)
Overweight (2529)	97 (29.0)	328 (38.7)
Obese (≥30)	81 (24.2)	213 (25.1)
Total Number of Vaccine Doses		
1	7 (2.0)	16 (1.9)
2	89 (25.9)	96 (11.1)
3	242 (70.3)	342 (39.7)
4	6 (1.7)	407 (47.3)
Vaccine Types for First Two Doses		
Two Doses of BNT162b2	162 (48.1)	576 (68.2)
Two Doses of mRNA1273	61 (18.1)	71 (8.4)
One Dose BNT162b2, One Dose mRNA1273	63 (18.7)	147 (17.4)
One dose AstraZeneca Vaxzevria®, One dose BNT162b2 or mRNA1273	38 (11.3)	30 (3.6)
Other Combinations or Unknown	13 (3.9)	21 (2.5)

References

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