Timing disease-modifying therapies with COVID-19 Vaccine in multiple sclerosis patients: A real-world data

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Objective

To provide real-world data of vaccination status and time intervals among vaccine doses in this population to apply for practicing improvement.

Background

Scheduling of COVID-19 vaccine in multiple sclerosis (MS) patients on disease-modifying therapies (DMTs) according to the available guidelines is a challenging issue.

Method

This is a cross-sectional study of 601 MS patients, inclusive of all subtypes, who were assessed during 2021. The data was obtained from the database of the FHMS clinic at Burnaby hospital. The first time interval, defined as TI1, was between the first and second dose, while TI2 was between the second and booster doses (BD).
Patients were categorized into four groups according to the type of DMT, including "Induction DMTs" (Tysabri, Mavenclad, Lemtrada, Rituximab, Ocrevus, and Kesimpta), "Injectable DMTs“ (Interferons, Copaxone/Glatect), "Oral DMTs" (Tecfidera, Aubagio, Fingolimod, Siponimod), and "No DMTs". We compared TIs, the proportion of fully vaccinated patients (FV), and patients who received BD among treatment groups.

Results

For all patients, the means of age, TI1, and TI2 were 49.13 ± 12.67 years, 72.61 ± 29.93 days, and 136.02 ± 50.59 days, respectively. 80.3% of patients were FV and 51% of them received BD. Distribution of patients in treatment groups were: 157 (26.1%) in "Induction DMTs", 130 (21.6%) in "Oral DMTs", 66 (11%) in "injectable DMTs" and 248 (41.3%) in "no DMTs" groups. The TIs were significantly and positively correlated with age (p<0.001). There were no differences in TIs and FV patients among groups that received different types of DMTs. The number of patients who received BD in the "Induction DMTs" group was significantly lower than other DMT groups ("Oral DMTs" (p=0.04) and "Injectable DMTs" (p=0.003)). In “no DMTs” group, a lower number of patients received BD (p<0.001), and TI2 was longer than patients in other treatment groups.

Table 1. An overall view of MS patients' data

Variables		Groups/units	Values
Age (year)		Mean ± SD (min-max)	49.13 ± 12.67 (18-85)
Time interval1 (day)		Mean ± SD (min-max)	72.61 ± 29.93 (22-276)
Time interval2 (day)		Mean ± SD (min-max)	136.02 ± 50.59 (32-492)
Sex, N (%)		Male	152 (25.3)
		Female	449 (74.7)
Vaccination status	Full or not full vaccinated, N (%)	Two or three dose	482 (80.3)
		No or one dose	119 (19.8)
	Booster status N (%)	With	246 (51)
		Without	236 (49)
Vaccine type, (First dose), N		Pfizer	340
		Moderna	119
		ChAdOx1	47
Vaccine type, (Second dose), N		Pfizer	303
		Moderna	157
		ChAdOx1	22
Vaccine type, (Booster dose), N		Pfizer	135
		Moderna	117
Treatment groups, N (%)		Induction DMTs	157 (26.1)
		Daily orals DMTs	130 (21.6)
		Injectable DMTs	66 (11)
		No DMTs	248 (41.3)

N: number, %: percent,

Table 2. The comparison of age in groups with different vaccination statuse treatment

Age@	Not vaccinated	Full vaccinated	p-value*
	47.89 ± 12.74	49.43 ± 12.65	0.24
	Without booster	With booster	p-value*
	48.44 ± 12.79	50.30 ± 12.55	0.11

@ Mean ± SD (year), * T2 independent test

Table 3: The comparison of sex in groups with different vaccination status

Variable		sex		p-value#
		Male	Female	
Vaccination status (N)	Full vaccinated	127	355	0.14
	No vaccination	25	94	
	With booster	65	181	0.53
	Without booster	62	174	

N: number, # Chi-square test

Table 4: The correlations among time intervals and age

Variables		Time interval 1 (day)	Time interval 2 (day)
Age (year)	Correlation Coefficient	0.118	0.275
	p-value@	0.009	0.000

Table 5: The comparison of time intervals between male and female

Variables	Male	Female
Time interval1@	67.76 ± 17.28	69.81 ± 22.06
p-value*	0.93	
Time interval2@	135.00 ± 43.44	136.38 ± 53.00
p-value*	0.76	

@ (Mean ± SD), and (day), * Mann-Whitney U

Table 6: The comparison of full vaccination, getting booster dose and time interval 1, 2 between the group of patients on high-efficacy DMTs and other medication groups

Variables			Injectable DMTs	Oral DMTs
Induction DMTs	Time interval1@	72.72 ± 23.94	66.03 ± 11.95	68.52 ± 20.08
	p-value*		0.09	0.08
	Time interval2@	120.69 ± 43.55	137.33 ± 65.17	120.49 ± 26.44
	p-value*		0.06	0.67
	With/without booster (N)	71/63	40/11	68/34
	p-value#		0.003	0.04
	Fully/not filly vaccination (N)	133/24	53/13	102/28
	p-value#		0.43	0.21

@ (Mean ± SD) and (day),* Mann-Whitney U, # Chi-square test, N: number

Table 7. The comparison of vaccination status and time interval 1, 2 in each medication group with others DMTs in overall

Variables		Induction DMTs	Injectable DMTs	Oral DMTs	No DMTs
Time interval1@	Each group	72.72 ± 23.94	66.03 ± 11.95	68.52 ± 20.08	68.22 ± 22.17
	Other groups	67.84 ± 19.39	69.89 ± 22.15	69.56 ± 21.25	69.67 ± 20.45
P-value*		0.10	0.28	0.18	0.80
Time interval2@	Each group	120.69 ± 43.55	137.33 ± 65.17	120.49 ± 26.44	167.22 ± 52.80
	Other groups	142.39 ± 52.04	135.77 ± 47.53	141.87 ± 56.06	124.25 ± 44.50
p-value*		0.001	0.99	0.002	0.000
Full/not full vaccination (N)	Each group	133/24	53/13	102/28	194/54
	Other groups	349/95	430/106	380/91	288/65
p-value#		0.10	0.53	0.61	0.35
With/without booster (N)	Each group	71/63	40/11	68/34	68/127
	Other groups	175/173	206/225	202/178	179/109
p-value#		0.61	0.000	0.001	0.000

@ (Mean ± SD) and (day), * Mann-Whitney U, # Chi-squ

Discussion

Results highlight that patients of older age were more likely to delay their vaccination doses. The majority of patients had the correct timing with respect to getting DMTs and their vaccines. However, patients on "Induction DMTs" have postponed BD, probably due to time and method of getting DMTs. Patients who received no DMTs have delayed BD likely because of the local policy for 6 months TI2 for the general population. The data provides real-world evidence on the complexity of vaccination schedules for a large number of MS patients on different treatments.