

STATIN USE AND IN-HOSPITAL MORTALITY IN PATIENTS WITH DIABETES MELLITUS AND COVID-19

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BACKGROUND

Severe coronavirus disease 2019 (COVID-19) is characterized by a proinflammatory state with high mortality. Statins have anti-inflammatory effects and may attenuate the severity of COVID-19.

METHODS

An observational study of all consecutive adult patients with COVID-19 admitted to a single center located in Bronx, New York, was conducted from March 1, 2020, to May 2, 2020. Patients were grouped as those who did and those who did not receive a statin, and in-hospital mortality was compared by competing events regression. In addition, propensity score matching and inverse probability treatment weighting were used in survival models to examine the association between statin use and death during hospitalization.

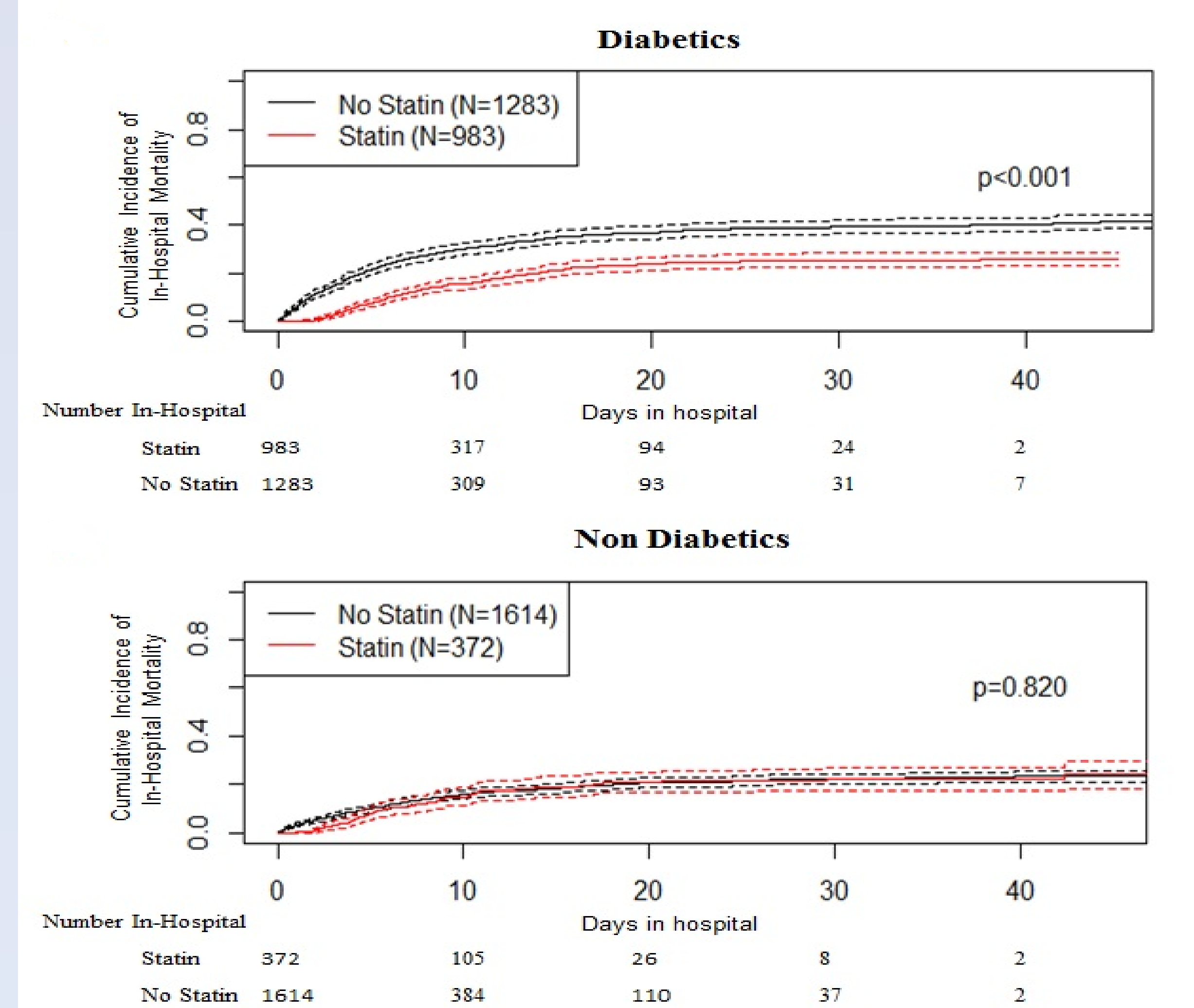
DISCLOSURES

O.S. is supported by grants from the National Institute of Health / National Heart, Lung and Blood Institute (K23HL145140) and the National Center for Advancing Translational Science (NCATS) Clinical and Translational Science Award at Einstein-Montefiore (UL1TR001073).

Baseline Characteristics

	Diabetics (n=2266)			Non-Diabetics (n=1986)		
	Statin (n=983)	No Statin (n=1283)	p-value	Statin (n=372)	No Statin (n=1614)	P value
Age (yrs)	69±11	67±14	<0.003	70±12	59±18	<0.001
Female (n, %)	456 (46%)	621 (49%)	0.34	162 (44)	758 (47)	0.23
Race / Ethnicity (n, %)			0.29			0.54
Non-Hispanic Black	375 (38)	512 (40)		135 (36)	539 (33)	
Non-Hispanic White	69 (7)	95 (7)		45 (12)	142 (9)	
Hispanic	378 (38)	444 (35)		124 (33)	624 (39)	
Other / Unknown	161 (16)	161 (16)		68 (18)	309 (19)	
Body Mass Index (kg/m ²)	28.5 (24.8 - 32.8)	28.7 (24.9 - 33.7)	0.32	27.3 (23.8 - 32.1)	28.9 (24.6 - 33.2)	0.002
Past Medical Diagnosis (n, %)						
Hypertension	898 (91)	1082 (84)	<0.001	277 (74)	903 (50)	<0.001
ASHD	456 (46)	364 (28)	<0.001	127 (34)	162 (10)	<0.001
Lung disease	358 (36)	403 (31)	0.012	100 (27)	342 (21)	0.017
Charlson Comorbidity Index	6 (3-9)	4 (2-8)	<0.001	4 (2-6)	2 (0-4)	<0.001
Days from symptoms to presentation	2 (0-5)	3 (0-6)	0.28	2 (0-6)	3 (0-7)	0.033
Vital Signs at presentation						
Systolic blood pressure (mmHg)	135 (118 - 153)	132 (113 - 149)	<0.001	130 (113 - 148)	128 (114 - 144)	0.10
Diastolic blood pressure (mmHg)	74 (64 - 83)	75 (63 - 85)	0.26	75 (66 - 84)	75 (66 - 85)	0.60
Heart Rate (beats per minute)	95 (82 - 108)	101 (87 - 115)	<0.001	95 (82 - 107)	99 (86.8 - 113.3)	<0.001
Oxygen Saturation (%)	95 (92 - 98)	94 (89 - 97)	<0.001	96 (92 - 98)	95 (91 - 98)	0.71
Respiratory rate (breaths per min)	20 (18 - 22)	20 (18 - 24)	<0.001	20 (18 - 22)	20 (18 - 22)	0.037
Temperature (F)	98.8 (98.2 - 100)	98.9 (98.2 - 100.1)	0.16	98.8 (98.2 - 100)	99.0 (98.3 - 100.1)	0.065
Laboratory Markers						
Alanine transaminase (U/l)	23 (16-36)	27 (17-44)	<0.001	28 (18 - 43.5)	31 (19 - 49)	0.031
Neutrophil count (k/uL)	5.5 (3.9 - 7.9)	6.1 (4.2 - 8.8)	<0.001	5.2 (3.4 - 7.4)	5.6 (3.7 - 8.6)	0.001
Lymphocyte count (k/uL)	0.9 (0.7 - 1.3)	1.0 (0.7 - 1.4)	0.32	1.0 (0.7 - 1.4)	1.1 (0.7 - 1.5)	0.079
Ferritin (ng/ml)	683 (340 - 1486)	786 (368 - 1702)	0.048	785 (455.5 - 1425)	854.5 (408 - 1709)	0.34
Lactate dehydrogenase (U/l)	367 (282 - 487)	434 (323 - 616)	<0.001	381 (295 - 546)	393 (285 - 543.5)	0.89
C-Reactive Protein (mg/l)	10.2 (4.5 - 18.4)	12.9 (5.9 - 21.4)	<0.001	8.4 (3 - 16.8)	9.7 (3.7 - 18.2)	0.14
D-Dimer (ug/ml)	1.8 (0.9 - 3.7)	2.2 (1.1 - 5)	<0.001	1.9 (0.9 - 3.6)	1.6 (0.9 - 4)	0.56
Procalcitonin (ng/ml)	0.2 (0.1 - 0.8)	0.4 (0.1 - 1.5)	<0.001	0.2 (0.1 - 0.6)	0.2 (0.1 - 0.8)	0.32
Lactic acid (mmol/l)	2.1 (1.6 - 2.8)	2.3 (1.7 - 3.4)	<0.001	1.9 (1.4 - 2.6)	2 (1.5 - 2.9)	0.028
Pro BNP (pg/ml)	617 (174 - 3467)	572 (137 - 2519)	0.14	598 (128 - 1848)	257 (66 - 1240.5)	<0.001
Creatinine (mg/dl)	1.4 (1 - 2.8)	1.3 (0.9 - 2.3)	<0.001	1.1 (0.9 - 1.6)	1 (0.8 - 1.4)	<0.001
Glucose (mg/dl)	176 (128 - 260)	183 (129 - 283)	0.16	123 (109 - 143)	123 (108 - 145)	0.76
Troponin T (mg/ml)	0.01 (0.01 - 0.06)	0.01 (0.01 - 0.05)	0.10	0.01 (0.01 - 0.03)	0.01 (0.01 - 0.02)	0.009
Inpatient Medications (n, %)						
ACE inhibitors	127 (12.9)	69 (5.4)	<0.001	36 (9.7)	50 (3.1)	<0.001
ARB	102 (10.4)	63 (4.9)	<0.001	22 (5.9)	54 (3.3)	0.020
Hydrochloroquine	734 (74)	918 (72)	0.10	273 (73)	1106 (69)	0.67
Antibiotics	739 (75)	1019 (79)	0.016	287 (77)	1207 (75)	0.34
Intravenous Steroids	245 (25)	312 (24)	0.74	70 (19)	320 (20)	0.66

Cumulative incidence of in-hospital mortality during COVID-19 in statin users and nonusers stratified by presence or absence of diabetes mellitus



RESULTS

A total of 4252 patients were admitted with COVID-19. Diabetes mellitus modified the association between statin use and in-hospital mortality. Patients with diabetes mellitus on a statin (n=983) were older (69±11 versus 67±14 years; $P<0.01$), had lower inflammatory markers (C-reactive protein, 10.2; interquartile range, 4.5-18.4 versus 12.9; interquartile range, 5.9-21.4 mg/dL; $P<0.01$) and reduced cumulative in-hospital mortality (24% versus 39%; $P<0.01$) than those not on a statin (n=1283). No difference in hospital mortality was noted in patients without diabetes mellitus on or off statin (20% versus 21%; $P=0.82$). Propensity score matching (hazard ratio, 0.88; 95% CI, 0.83-0.94; $P<0.01$) and inverse probability treatment weighting (HR, 0.88; 95% CI, 0.84-0.92; $P<0.01$) showed a 12% lower risk of death during hospitalization for statin users than for nonusers.

Conclusions

Statin use was associated with reduced in-hospital mortality from COVID-19 in patients with diabetes mellitus. These findings, if validated, may further reemphasize administration of statins to patients with diabetes mellitus during the COVID-19 era.