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Title: The Relationship between Intradialytic Hypotension and Hospitalized Mesenteric Ischemia: a Case-Control Study

Authors:

Eun Young Seong, MD^{1,2}

Yuanchao Zheng, MS¹

Wolfgang C. Winkelmayer, MD, MPH, ScD³

Maria E. Montez-Rath, PhD¹

Tara I. Chang, MD, MS¹

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Supplemental Table 1: ICD-9 codes used to identify comorbid conditions.

Supplemental Table 2: Association (odds ratio and 95% confidence intervals) of intradialytic hypotension (defined as Nadir90 and Nadir 100) with the all variables in the regression model.

Supplemental Table 3: Sensitivity analysis with patients restricted to having Medicare Part D in the 90 days prior to the index date. Characteristics of eligible patients with hospitalized mesenteric ischemia (cases) and without hospitalized mesenteric ischemia (controls).

Supplemental Figure 1: Schema for selection of cases and controls.

Supplemental Figure 2. Sensitivity analysis using cohort of patients with acute mesenteric ischemia. Odds of intradialytic hypotension (IDH) defined in six ways in the 30 days prior to an acute mesenteric ischemia event.

Supplemental Figure 3. Sensitivity analysis using uniform look back window of 180 days to ascertain comorbid conditions. Odds of intradialytic hypotension (IDH) defined in six ways in the 30 days prior to a hospitalized mesenteric ischemia event.

Supplemental Figure 4: Sensitivity analysis using cohort of patients with Medicare Part D and information on antihypertensive medication use. Odds of intradialytic hypotension (IDH) defined in six ways in the 30 days prior to a hospitalized mesenteric ischemia event.

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Supplemental Table 1. ICD-9 codes used to identify comorbid conditions.

Comorbidity	ICD-9 Codes
Cardiovascular	
Coronary artery disease	36.1, 36.1x, 36.2, 414.0, 414.00, 414.01, 414.02, 414.03, 414.04, 414.05, 414.2, 414.3, 414.8, 414.9, v45.81, 00.66, 36.06, 36.07, 36.09, 36.0, 36.00, 36.01, 36.02, 36.05, v45.82
Myocardial infarction	410.x, 412
Angina	411.x, 413.x
Heart failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.13, 404.91, 428.x
Hypertension	401.0, 401.1, 401.9, 402.x, 403.x, 404.x, 405.x
Atrial fibrillation	427.3x
Arrhythmia	426.x, 427.0, 427.20, 427.81, 427.9
Stroke/transient ischemic attack	433.x, 434.x, 436.00, 435.x
Valvular disease	394.x-397.1, 424.x, 746.3-746.6, v42.2, v43.3
Cerebrovascular disease	433, 433.0, 433.00, 433.1, 433.10, 433.2, 433.20, 433.3, 433.30, 433.8, 433.80, 433.9, 433.90, 434, 434.0, 434.00, 434.1, 434.10, 434.9, 434.90, 437.x, 438.x, 438.10, 438.11, 438.12, 438.19, 438.20, 438.21, 438.22, 438.30, 438.31, 438.32, 438.40, 438.41, 438.42, 438.50, 438.51, 438.52, 438.53, 438.81, 438.82, 438.83, 438.84, 438.85, 438.89
Peripheral arterial disease	38.08, 38.18, 38.38, 38.48, 39.25, 040.0, 250.7, 250.7x, 440.2, 440.2x, 440.4, 440.8, 440.9, 443.81, 443.9, 444.22, 444.81, 445.02, 707.1, 707.1x, 785.4
Lower limb amputation	84.1x
Other Medical	
Diabetes mellitus	249.x, 250.x, 357.2, 362.0x
Hyperlipidemia	272.x
Gastrointestinal bleeding	456.00, 456.0, 456.20, 530.21, 530.70, 530.82, 531.0x, 531.2x, 531.4x, 531.6x, 532.2x, 532.4x, 532.6x, 533.0x, 533.2x, 534.0x, 534.2x, 534.4x, 534.6x, 535.x1, 537.83, 537.84, 562.02, 562.03, 562.12, 562.13, 569.3, 569.85, 578.x
Peptic ulcer disease	531.7, 531.0, 531.71, 531.9, 531.90, 531.91, 532.7, 532.70, 532.71, 532.9x, 533.7x, 534.7x, 534.9x
Intracranial hemorrhage	430, 431.00, 432.x
Liver disease	070.x, 456.1, 456.21, 570-573.x, v42.7
Chronic lung disease	490, 491.x-496, 500-505, 506.4, 516.x
Smoking history	305.1x
Alcohol abuse	291.x, 303.x, 305.x
Drug abuse	292.x, 304.x, 305.x
Dementia	290.x, 294.1x, 331.x
Depression	296.2x, 296.3x, 296.5x, 296.82, 300.40, 301.12, 309.0, 309.10, 311
Cancer	140.x-165.x, 170.x-172.x, 174.x, 175.x, 180.x-209.x, 238.6, 273.3
Hypothyroidism	243, 244.0, 244.1, 244.2, 244.9, 244.9
Obesity	278.0x, 649.1x, v85.3x, v85.4

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Supplemental Table 2. Association (odds ratio and 95% confidence intervals) of intradialytic hypotension (defined as Nadir90 and Nadir 100) with the all variables in the regression model.

Variable	Nadir90		Nadir100	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Intradialytic hypotension	1.822	1.471 – 2.257	1.536	1.275 – 1.851
<i>Cause of end stage kidney disease</i>				
Diabetes			Ref.	
Hypertension	1.239	0.969 – 1.585	1.250	0.978 – 1.598
Glomerulonephritis	1.513	0.982 – 2.332	1.556	1.012 – 2.392
Other	1.028	0.710 – 1.488	1.013	0.701 – 1.464
Unknown	1.344	0.781 – 2.315	1.267	0.735 – 2.183
<i>Health care use</i>				
No. of non-nephrology outpatient visits	1.031	1.011 – 1.052	1.030	1.010 – 1.050
Hospital days	1.141	1.088 – 1.196	1.136	1.083 – 1.191
Any nursing home stay	1.048	0.785 – 1.400	1.055	0.791 – 1.407
On kidney transplant waiting list	1.050	0.662 – 1.665	1.030	0.650 – 1.633
<i>Comorbidities</i>				
Myocardial infarction	1.238	0.953 – 1.608	1.247	0.962 – 1.617
Angina	1.102	0.862 – 1.409	1.119	0.876 – 1.428
Heart failure	0.871	0.689 – 1.101	0.857	0.678 – 1.084
Hypertension	0.976	0.543 – 1.755	0.984	0.546 – 1.772
Atrial fibrillation	1.319	1.063 – 1.637	1.348	1.088 – 1.670
Other arrhythmia	1.289	1.034 – 1.607	1.269	1.019 – 1.580
Stroke/transient ischemic attack	0.921	0.713 – 1.191	0.910	0.705 – 1.175
Valvular disease	0.988	0.797 – 1.224	0.984	0.794 – 1.218
Cerebrovascular disease	1.208	0.945 – 1.544	1.218	0.953– 1.556
Hyperlipidemia	0.967	0.780 – 1.198	0.943	0.761 – 1.168
Gastrointestinal bleeding	1.091	0.864 – 1.377	1.070	0.848 – 1.350
Peptic ulcer disease	1.683	1.112 – 2.549	1.686	1.114 – 2.552
Intracranial hemorrhage	1.227	0.629 – 2.391	1.256	0.644 – 2.450
Liver disease	1.184	0.856 – 1.638	1.209	0.874 – 1.671
Chronic lung disease	1.242	1.019 – 1.514	1.259	1.034 – 1.533
Smoking history	1.261	0.888 – 1.790	1.289	0.911 – 1.823

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Variable	Nadir90		Nadir100	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Alcohol abuse	1.243	0.576 – 2.684	1.314	0.613 – 2.819
Drug abuse	1.460	0.886 – 2.407	1.424	0.864 – 2.347
Dementia	0.840	0.611 – 1.156	0.870	0.632 – 1.197
Depression	1.037	0.820 – 1.311	1.009	0.799 – 1.275
Cancer	0.959	0.731 – 1.260	0.982	0.748 – 1.288
Hypothyroidism	1.122	0.897 – 1.403	1.132	0.906 – 1.415
Obesity	1.019	0.770 – 1.349	1.066	0.808 – 1.407
Mean ultrafiltration rate	1.001	0.974 – 1.029	1.000	0.973 – 1.028
Any session with central venous catheter	1.194	0.959 – 1.486	1.187	0.954 – 1.476

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Supplemental Table 3. Sensitivity analysis with patients restricted to having Medicare Part D in the 90 days prior to the index date. Characteristics of eligible patients with hospitalized mesenteric ischemia (cases) and without hospitalized mesenteric ischemia (controls).

	CASES (n=427) With Mesenteric Ischemia	CONTROLS (n=1621) Without Mesenteric Ischemia
<i>Demographics</i>		
Age, years (\pm SD)	71 (10)	71 (10)
Male	169 (40%)	643 (40%)
Race		
White	302 (71%)	1169 (72%)
Black	101 (24%)	375 (23%)
Asian	14 (3%)	58 (4%)
Native American	8 (2%)	18 (1%)
Other/unknown	2 (0.5%)	1 (0.1%)
Dialysis vintage, median (IQR), years	1.6 (0.8, 2.7)	1.6 (0.8, 2.7)
<i>Year of dialysis initiation</i>		
2006	123 (29%)	463 (29%)
2007	93 (22%)	355 (22%)
2008	84 (20%)	320 (20%)
2009	69 (16%)	269 (17%)
2010	46 (11%)	175 (11%)
2011	12 (3%)	39 (2%)
<i>Cause of end stage kidney disease</i>		
Diabetes	211 (49%)	913 (56%)
Hypertension	143 (34%)	484 (30%)
Glomerulonephritis	25 (6%)	55 (3%)
Other	36 (8%)	126 (8%)
Unknown	12 (3%)	43 (3%)
<i>Health care use in 30 days prior to Index Date</i>		
Number of non-nephrology outpatient visits (\pm SD)	5.4 (4.6)	4.9 (4.6)

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	CASES (n=427) With Mesenteric Ischemia	CONTROLS (n=1621) Without Mesenteric Ischemia
Hospital days (\pm SD)	1.0 (2.2)	0.5 (1.6)
Any nursing home stay	73 (17%)	222 (14%)
On kidney transplant waiting list	19 (4%)	91 (6%)
<i>Cardiovascular comorbidities</i>		
Coronary artery disease	315 (74%)	1219 (75%)
Myocardial infarction	89 (21%)	285 (18%)
Angina	118 (28%)	328 (20%)
Heart failure	317 (74%)	1158 (71%)
Hypertension	419 (98%)	1580 (98%)
Atrial fibrillation	170 (40%)	471 (29%)
Other arrhythmia	140 (33%)	400 (25%)
Stroke/transient ischemic attack	115 (27%)	398 (25%)
Valvular disease	152 (36%)	483 (30%)
Cerebrovascular disease	129 (30%)	423 (26%)
Peripheral arterial disease/lower limb amputation	248 (58%)	934 (58%)
<i>Other medical comorbidities</i>		
Diabetes mellitus	332 (78%)	1291 (80%)
Hyperlipidemia	270 (63%)	1063 (66%)
Gastrointestinal bleeding	120 (28%)	370 (23%)
Peptic ulcer disease	37 (9%)	89 (6%)
Intracranial hemorrhage	13 (3%)	32 (2%)
Liver disease	50 (12%)	158 (10%)
Chronic lung disease	228 (53%)	699 (43%)
Smoking history	49 (12%)	126 (8%)
Alcohol abuse	9 (2%)	32 (2%)
Drug abuse	26 (6%)	50 (3%)

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	CASES (n=427) With Mesenteric Ischemia	CONTROLS (n=1621) Without Mesenteric Ischemia
Dementia	55 (13%)	204 (13%)
Depression	118 (28%)	361 (22%)
Cancer	59 (14%)	204 (13%)
Hypothyroidism	102 (24%)	343 (21%)
Obesity	76 (18%)	240 (15%)
<i>Dialysis information from the 30 days prior to index date</i>		
Total number of dialysis sessions	12.3 (1.1)	12.7 (1.1)
Treatment time (minutes)	210 (27)	208 (25)
Ultrafiltration volume (L)	-2.4 (1.3)	-2.4 (1.2)
Ultrafiltration rate (mL/hr/kg)	8.7 (3.7)	8.8 (3.3)
Systolic blood pressure		
Pre-dialysis SBP (mmHg)	142 (22)	147 (20)
Post-dialysis SBP (mmHg)	135 (20)	139 (19)
Nadir SBP (mmHg)	106 (18)	111 (17)
Change in SBP (pre-dialysis–nadir SBP, mmHg)	36 (16)	36 (16)
Diastolic blood pressure		
Pre-dialysis DBP (mmHg)	69 (11)	72 (11)
Post-dialysis DBP (mmHg)	66 (10)	68 (10)
Nadir DBP (mmHg)	56 (10)	59 (10)
Change in DBP (pre-dialysis–nadir DBP, mmHg)	13 (8)	12 (8)
Any session with CVC	140 (33%)	467 (29%)
<i>Antihypertensive use in 90 days prior to index date</i>		
Number of antihypertensive classes		
0	77 (18%)	256 (16%)
1 to 3	190 (45%)	746 (46%)
4+	160 (38%)	619 (38%)

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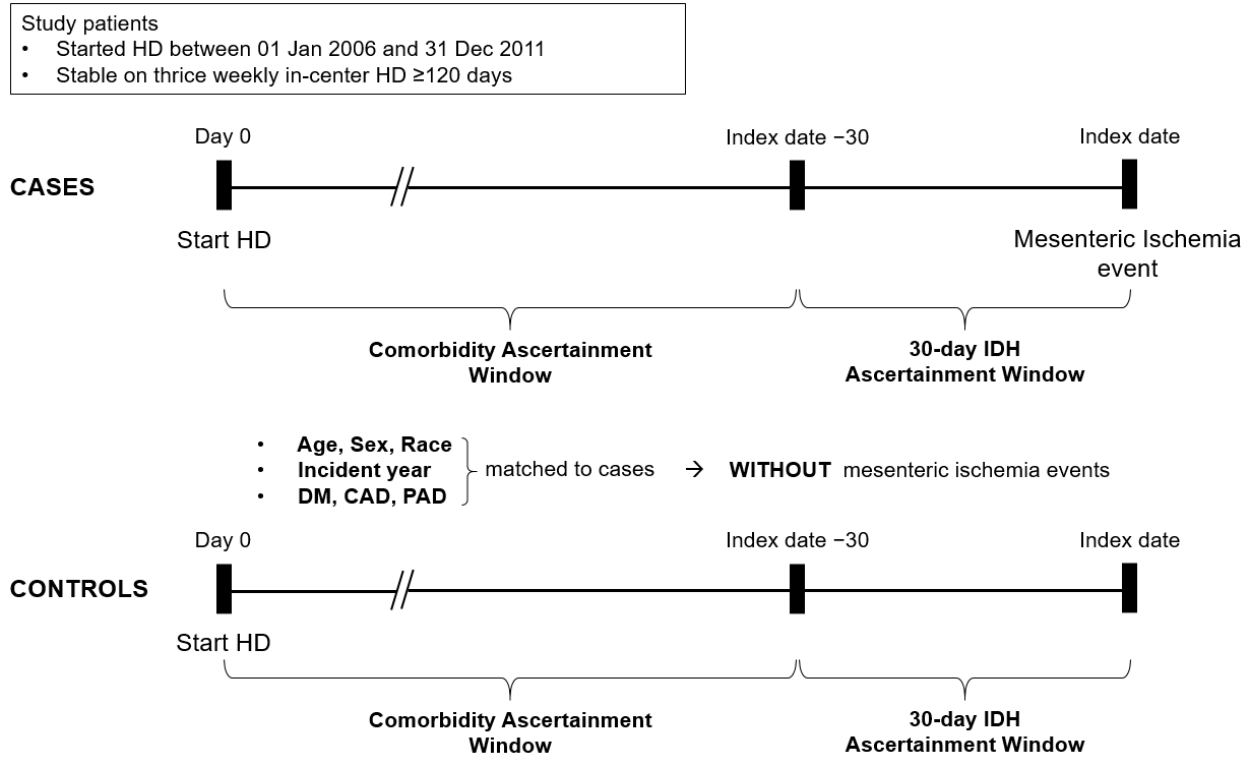
	CASES (n=427) With Mesenteric Ischemia	CONTROLS (n=1621) Without Mesenteric Ischemia
Medication		
ACEI/ARB	178 (42%)	679 (42%)
Calcium channel blocker	169 (40%)	722 (45%)
Beta blocker	241 (56%)	949 (59%)
Diuretic	101 (24%)	395 (24%)
Alpha blocker	31 (7%)	123 (8%)
Central alpha agonist	65 (15%)	229 (14%)
Nitrate	65 (15%)	258 (16%)
Vasodilator	101 (24%)	300 (19%)

SBP, systolic blood pressure, DBP, diastolic blood pressure, CVC, central venous catheter, ACEI, angiotensin converting enzyme inhibitor, ARB, angiotensin receptor blocker

Values are presented as mean (\pm SD), n (%) or median (interquartile range), unless otherwise indicated.

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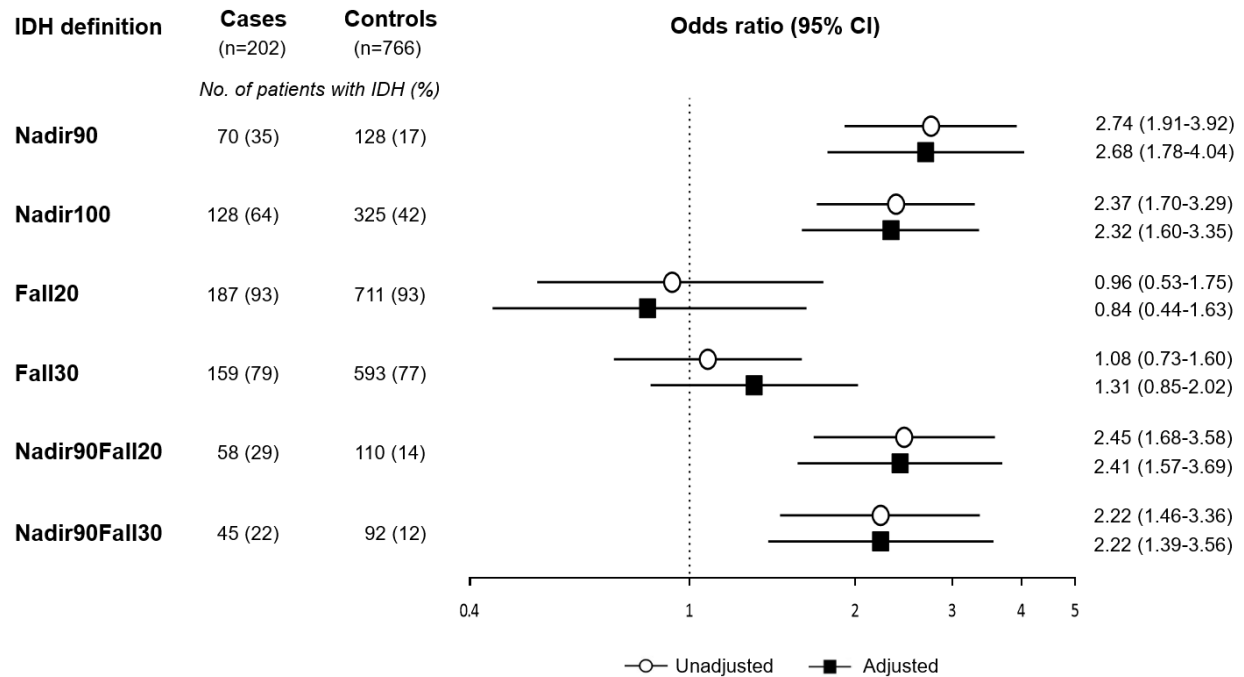
Supplemental Figure 1. Schema for selection of cases and controls.



Abbreviations: HD, hemodialysis, IDH, intradialytic hypotension, DM, diabetes mellitus, CAD, coronary artery disease, PAD, peripheral artery disease

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Supplemental Figure 2. Sensitivity analysis using cohort of patients with acute mesenteric ischemia. Odds of intradialytic hypotension (IDH) defined in six ways in the 30 days prior to an acute mesenteric ischemia event.

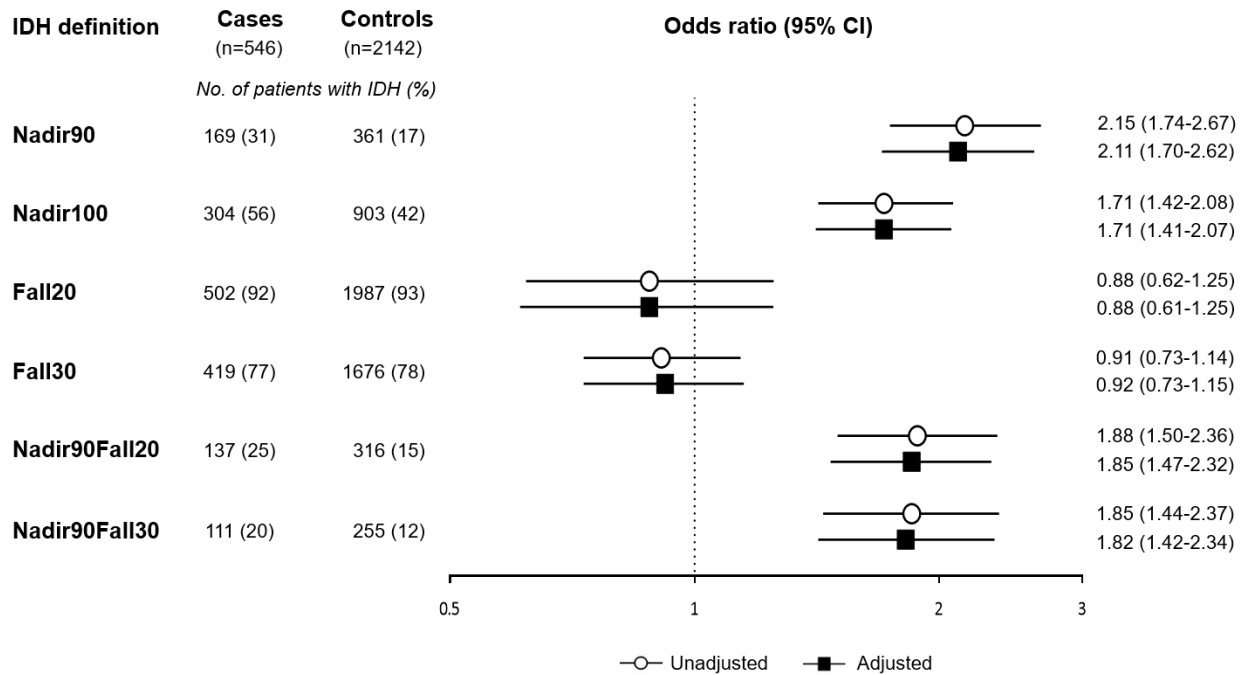


Adjusted: adjusted for cause of end stage kidney disease, number of non-nephrology outpatient visits, hospital days, any nursing home stay, on kidney transplant waiting list, all comorbidities, mean ultrafiltration rate and central venous catheter use.

Abbreviations: Nadir90, nadir intradialytic systolic blood pressure (SBP) <90 mmHg; Nadir100, nadir intradialytic SBP <100 mmHg; Fall20, (pre-dialysis SBP – nadir intradialytic SBP) ≥20 mmHg; Fall30, (pre-dialysis SBP – nadir intradialytic SBP) ≥30 mmHg; Nadir90Fall20, nadir intradialytic SBP <90 mmHg and (pre-dialysis SBP – nadir intradialytic SBP) ≥20 mmHg; Nadir90Fall30, nadir intradialytic SBP <90 mmHg and (pre-dialysis SBP – nadir intradialytic SBP) ≥30 mmHg

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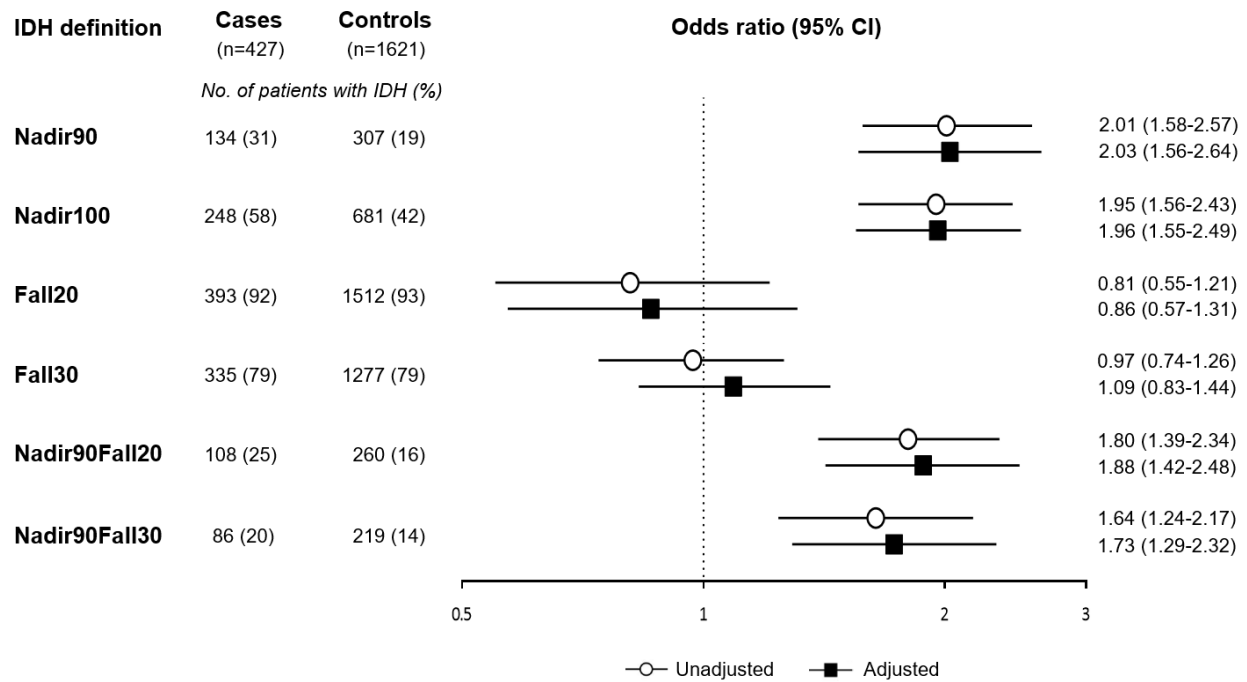


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Adjusted: adjusted for cause of end stage kidney disease, number of non-nephrology outpatient visits, hospital days, any nursing home stay, on kidney transplant waiting list, all comorbidities, mean ultrafiltration rate and central venous catheter use.

Abbreviations: Nadir90, nadir intradialytic systolic blood pressure (SBP) <90 mmHg; Nadir100, nadir intradialytic SBP <100 mmHg; Fall20, (pre-dialysis SBP – nadir intradialytic SBP) ≥20 mmHg; Fall30, (pre-dialysis SBP – nadir intradialytic SBP) ≥30 mmHg; Nadir90Fall20, nadir intradialytic SBP <90 mmHg and (pre-dialysis SBP – nadir intradialytic SBP) ≥20 mmHg; Nadir90Fall30, nadir intradialytic SBP <90 mmHg and (pre-dialysis SBP – nadir intradialytic SBP) ≥30 mmHg