

# Prevalence of Cardiovascular Disease in a Large Population of Individuals with Down Syndrome

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## BACKGROUND

Some research suggests that heart disease (HD) prevalence and other cardiovascular diseases (CVD) in individuals with Down syndrome (DS) is vastly different than individuals without DS. It is well-known that congenital heart defects and related complications are more common among individuals with DS, but little is known about other CVD and common risk factors.

## OBJECTIVES/AIMS

The aim of this study was to describe prevalence of CVD among individuals with DS (cases) relative to individuals without DS (controls).

## DESIGN/METHODS

### Study Design

- Retrospective, descriptive cohort study
- Approximately 28 years of data
- Data collected on the Advocate Health Care patient population, which includes the Adult Down Syndrome Center

### Analysis

- Prevalence is reported as counts (%) with corresponding odds ratio (OR)
- Corresponding Pearson Chi-square tests, or Fisher's Exact tests where prevalence  $\leq 5$ , as indicated by ^ in table
- P-values were calculated to represent statistically significant differences, with  $p < 0.05$  indicated by \* in table
- This study utilized the ICD-9 coding in the disease framework provided in the 2020 *Heart Disease and Stroke Statistics* report from the AHA published in *Circulation*<sup>1</sup>
- Controls were matched on year of birth (+/- one year) and sex at up to a 1:5 ratio

## RESULTS

Table 1. Demographics and Baseline Characteristics of Cases and Controls at Most Recent Visit

	DS Sample (N=6078)	Control Sample (N=30326)
Age (Mean, Median)	27.88 (20.37), 25.00 (9-46)	29.04 (20.96), 25.00 (11-48)
Total Encounters (Mean, Median)	11.23 (15.19), 6.00 (2-14)	194.73 (1656.66), 18.00 (8-42)
Sex	N=6075	N=30324
Male	3171 (52.19%)	15816 (52.15%)
Female	2904 (47.79%)	14508 (47.84%)
Race	N=4495	N=21296
White	3477 (77.35%)	13198 (61.97%)
Black	650 (14.46%)	6667 (31.31%)
Asian	150 (3.34%)	1183 (5.56%)
American Indian	57 (1.27%)	174 (0.82%)
Other	161 (3.58%)	74 (0.35%)
Ethnicity	N=3212	N=21066
Hispanic	851 (26.49%)	3851 (18.28%)
Non-Hispanic	2361 (73.51%)	17215 (81.72%)
Insurance	N=5991	N=29666
Private	2848 (47.54%)	22532 (75.95%)
Medicare	2090 (34.89%)	1464 (4.93%)
Medicaid	644 (10.75%)	4097 (13.82%)
Other	409 (6.82%)	1572 (5.20%)

Table 2. Odds Ratios of CVD Conditions

CVD Conditions	DS Cases (N=6,078)	Controls (N=30,326)	Odds Ratio (CI)	P-value
Total CVD	2121	8345	1.41 (1.33, 1.50)	<0.0001*
Stroke	134	590	1.14 (0.94, 1.37)	0.1866
Congenital Cardiovascular Defects	1697	731	15.68 (14.30, 17.20)	<0.0001*
Kawasaki Disease	4	10	1.99 (0.63, 6.38)	0.2720^
Bradyarrhythmias	100	67	7.55 (5.53, 10.31)	<0.0001*
SVT (Excluding AF and Atrial Flutter)	29	0	-	<0.0001^*
Cardiac Arrest (Including VF and Ventricular Flutter)	45	48	4.71 (3.13, 7.07)	<0.0001*
Tachycardia	55	154	1.79 (1.31, 2.44)	0.0002*
Coronary Heart Disease	183	1290	0.69 (0.59, 0.82)	<0.0001*
Acute Coronary Syndrome	2	10	1.00 (0.22, 4.56)	1.0000^
Stable AP	11	18	3.05 (1.44, 6.467)	0.0022*
Heart Failure	114	407	1.41 (1.13, 1.73)	0.0014*
Valvular Heart Disease	463	360	6.86 (5.96, 7.90)	<0.0001*
Rheumatic Fever/Rheumatic HD	228	198	5.93 (4.89, 7.19)	<0.0001*
Infective Endocarditis	2	0	-	0.0279^
Deep Vein Thrombosis (DVT)	20	257	0.39 (0.25, 0.61)	<0.0001*
Peripheral Artery Disease (PAD)	16	367	0.22 (0.13, 0.36)	<0.0001*
Aortic Diseases	1	143	0.03 (0.01, 0.25)	<0.0001^*
Atherosclerotic Renal Artery Stenosis	0	0	-	-
<b>CVD Risk Factors</b>				
High Blood Pressure (BP)	347	5358	0.28 (0.25, 0.32)	<0.0001*
Diabetes Mellitus	334	1945	0.85 (0.75, 0.96)	0.0070*

## CONCLUSIONS

Relative to their non-DS counterparts, individuals with DS experience **more**:

- Total CVD
- Congenital cardiovascular defects
- Disorders of heart rhythm (Bradyarrhythmias and SVT)
- Cardiac arrest
- Tachycardia
- Angina pectoris
- Heart failure
- Valvular HD
- Rheumatic fever/HD
- Infective endocarditis

Relative to their non-DS counterparts, individuals with DS experience **less**:

- Coronary HD
- DVT
- PAD
- Aortic diseases
- High BP
- Diabetes mellitus

Relative to their non-DS counterparts, individuals with DS experience **similar**:

- Stroke
- Kawasaki disease
- Acute coronary syndrome

Our findings suggest that heart disease and CVD prevalence is markedly different among individuals with DS relative to individuals without DS. Care for CVD in the U.S. aims to avoid complications and acute events by managing risk factors, including blood pressure and blood sugar. Individuals with DS experience less risk factors but more total CVD, suggesting their clinical pathway for developing CVD does not mimic the general population. Furthermore, per the CDC, HD is the leading cause of death in the U.S., with coronary HD being the most common; however, individuals with DS experience less coronary HD than individuals without DS.

## REFERENCES

This study framework can be found here: Virani SS, Alonso A, Benjamin EJ, Bittencourt MS, Callaway CW, Carson AP, et al. Heart disease and stroke statistics-2020 update: A report from the American Heart Association. *Circulation*. 2020;141:e139-e596. doi: <https://doi.org/10.1161/CIR.0000000000000757>

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