

Co-Occurring Medical Conditions in Children with Down Syndrome and Autism

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BACKGROUND

Autism Spectrum Disorder (ASD) co-occurs in 16-18% of individuals with Down syndrome (DS)¹. DS is associated with increased prevalence of a wide range of medical conditions²⁻³, some of which have been tied to increased ASD risk in the general population. To date, there have been no dedicated studies identifying the prevalence of such conditions in children with both DS and ASD.

OBJECTIVE

This study aimed to determine whether certain medical conditions are more prevalent in individuals with DS and ASD compared to those with DS alone.

STUDY DESIGN

This was a retrospective analysis of data collected from patients seen at the Boston Children's Hospital DS program from March 2018 to March 2022 (N =842). Data extracted from RedCap included caregiver-reported medical history and clinician-verified information. Patients were included in the study if they had a clinician-confirmed diagnosis of autism or no autism (n= 692). Analysis was restricted to patients 3 years and older (n= 562) to exclude children who may not yet have displayed clear characteristics of ASD. Medical conditions were counted as "if ever" over the follow up time. Statistical analysis included odds ratios and chi square analysis, and was performed in Microsoft Excel® and MedCalc.org

RESULTS

In total, 12.8% of patients included in the analysis had a diagnosis of ASD. Individuals with DS-ASD were twice as likely to be male (OR 2.23, $p=0.004$ 95%CI: 1.29-3.84). There was no difference in income quartiles or primary language between the groups. Compared to individuals with DS alone, individuals with DS-ASD had higher odds of suffering from constipation (OR 2.19, $p=0.003$ 95%CI: 1.31-3.65) and gastroesophageal reflux (OR 1.91, $p=0.01$ 95%CI: 1.14-3.21). There was a significantly higher frequency of behavioral feeding difficulties in individuals with DS-ASD (OR 2.71, $p=0.04$ 95%CI: 1.02-7.19). Individuals with DS-ASD had half the odds of having a history of congenital heart disease (CHD) than those with DS only (OR 0.56, $p=0.02$ 95%CI: 0.34-0.93) and there was no significant difference in rates of CHD requiring surgery between the two groups. A history of infantile spasms was significantly more likely in individuals with DS-ASD (OR 6.03, $p=0.004$ 95%CI: 1.79-20.34). There was no difference in odds of having a history of prematurity or NICU complications between the two groups. There was no significant difference in rates of depression, anxiety or ADHD between the two groups. Individuals with DS-ASD had significantly higher rates of scoliosis (OR 2.73, $p=0.02$ 95%CI: 1.16-6.40)

DISCUSSION

This study identifies that individuals with DS-ASD have different odds of suffering from a variety of conditions than their peers with DS only, and it builds on previous data that a history of epilepsy and/or infantile spasms places a child with DS at significantly higher odds of being diagnosed with ASD⁴. A strength of the study is that only individuals with clinician-confirmed ASD diagnoses were included. Weaknesses include reliance on the use of caregiver reports. More research is needed to determine potential causal relations between specific medical conditions and a later diagnosis of ASD.

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Category	All (n/N, %)	DS-ASD (n/N, %)	DS only (n/N, %)	Odds Ratio	P value with 95% CI
Male Gender	316/562 (56.2%)	52/72 (72.2%)	264/490 (53.9%)	2.23	0.004 (1.29-3.84)
English as Primary Language	514/559 (91.9%)	69/72 (95.8%)	445/487 (91.4%)	2.17	0.21 (0.65-7.20)
Preterm (<37 wk GA) delivery	136/536 (25.4%)	19/71 (26.8%)	117/465 (25.2%)	1.09	0.77 (0.62-1.91)
NICU stay >4 days	293/514 (57.0%)	39/66 (59.1%)	254/448 (56.7%)	1.10	0.71 (0.65-1.87)
NICU complications	195/516 (37.8%)	27/65 (41.5%)	168/451 (37.3%)	1.20	0.51 (0.71-2.03)
CHD with or without surgery vs no CHD	320/531 (60.3%)	33/69 (47.8%)	287/462 (62.1%)	0.56	0.02 (0.34-0.93)
CHD with surgery vs CHD without surgery	99/320 (30.9%)	9/33 (27.3%)	90/287 (31.4%)	0.82	0.63 (0.37-1.84)
CHD with surgery vs no CHD	99/310 (31.9%)	9/45 (20.0%)	90/287(31.4%)	0.49	0.07 (0.22-1.05)
CHD without surgery vs no CHD	221/432 (51.2%)	24/60 (40.0%)	197/372 (53.0%)	0.59	0.06 (0.34-1.03)
Atrioventricular Canal Defect	96/554 (17.3%)	12/71 (16.9%)	84/483 (17.4%)	0.97	0.92 (0.50-1.88)
Atrial Septal Defect	113/554 (24.0%)	8/71 (11.3%)	125/483 (25.9%)	0.36	0.009 (0.17-0.78)
Ventricular Septal Defect	114/553 (20.6%)	13/71 (18.3%)	101/482 (21.0%)	0.85	0.61 (0.45-1.60)
Tetralogy of Fallot	21/554 (3.8%)	5/71 (7.0%)	16/483 (3.3%)	2.21	0.13 (0.78-6.24)
Respiratory Problems	250/544 (46.0%)	33/72 (45.8%)	217/472 (46.0%)	0.99	0.98 (0.60-1.64)
Thyroid Disease	165/535 (30.8%)	17/70 (24.3%)	148/465 (31.8%)	0.69	0.20 (0.38-1.23)
Congenital hypothyroidism	92/536 (17.2%)	10/70 (14.3%)	82/466 (17.6%)	0.78	0.49 (0.38-1.23)
Acquired Hypothyroidism	82/535 (15.3%)	8/70 (11.4%)	74/465 (15.9%)	0.68	0.33 (0.31-1.48)
Hyperthyroidism	17/535 (3.2%)	3/69 (4.3%)	14/466 (3.0%)	1.47	0.55 (0.41-5.24)
Constipation	337/544 (45.8%)	45/72 (62.5%)	204/472 (43.2%)	2.18	0.003 (1.31-3.65)
Gastroesophageal Reflux	145/541 (26.8%)	28/72 (38.9%)	117/469 (38.9%)	1.91	0.01 (1.14-3.21)
Celiac	31/544 (5.7%)	5/72 (6.9%)	26/472 (5.5%)	1.28	0.63 (0.48-3.45)
GI surgery	51/414 (12.3%)	10/50 (20.0%)	41/364 (11.3%)	1.97	0.08 (0.92-4.23)
Duodenal Atresia/Stenosis	27/543 (5.0%)	4/72 (5.6%)	23/471 (4.9%)	1.15	0.81 (0.38-3.41)
Hirschsprung's Disease	12/542 (2.2%)	1/72 (1.4%)	11/470 (2.3%)	0.38	0.61 (0.07-4.62)
Feeding Problem	169/542 (31.2%)	26/69 (37.7%)	143/473 (30.2%)	1.40	0.21 (0.83-2.36)
Gastrostomy Tube	64/541 (11.8%)	10/68 (14.7%)	54/473 (11.4%)	1.34	0.43 (0.65-2.77)
Dysphagia without aspiration	29/541 (5.4%)	4/69 (5.8%)	25/472 (5.3%)	1.10	0.86 (0.37-3.26)
Dysphagia with aspiration	54/542 (10.0%)	8/69 (11.6%)	46/473 (9.7%)	1.22	0.63 (0.55-2.70)
Special Dietary Needs	84/542 (15.5%)	14/69 (20.3%)	70/473 (14.8%)	1.47	0.16 (0.77-2.78)
Behavioral Feeding Problem	22/541 (4.1%)	6/69 (8.7%)	16/472 (3.4%)	2.71	0.04 (1.02-7.19)
C-Spine Problem/Atlantoaxial Instability	22/540 (4.1%)	4/68 (5.9%)	18/472 (3.8%)	1.58	0.42 (0.52-4.81)
Scoliosis	30/540 (5.6%)	8/68 (11.8%)	22/472 (4.7%)	2.73	0.02 (1.16-6.40)
Ear Nose and Throat problem	397/548 (72.4%)	51/70 (72.9%)	346/478 (72.4%)	1.02	0.93 (0.58-1.80)
Hearing Loss	216/547 (39.5%)	31/70 (44.3%)	185/477 (38.8%)	1.25	0.38 (0.76-2.08)
Hearing Aids	87/547 (15.9%)	9/70 (12.9%)	78/477 (16.4%)	0.75	0.45 (0.36-1.58)
Eustachian Tube Dysfunction	153/547 (28.0%)	18/70 (25.7%)	135/477 (28.3%)	0.88	0.65 (0.50-1.55)
Tympanostomy Tubes	248/547 (45.3%)	29/70 (41.4%)	219/477 (45.9%)	0.83	0.48 (0.50-1.39)
History of Tonsillectomy	210/544 (38.6%)	28/68 (41.2%)	182/476 (38.2%)	1.13	0.64 (0.67-1.90)
History of Adenoidectomy	224/546 (41.0%)	30/70 (42.9%)	194/476 (40.8%)	1.09	0.74 (0.66-1.81)
Vision Problems	414/544 (76.1%)	49/68 (72.1%)	365/476 (76.7%)	0.78	0.40 (0.44-1.39)
Transient Myeloproliferative Disorder	8/529 (1.5%)	1/66 (1.5%)	7/463 (1.5%)	1.0	1.00 (0.12-8.28)
Anemia	35/532 (6.6%)	6/66 (9.1%)	29/466 (6.2%)	1.51	0.38 (0.60-3.78)
Leukemia	12/532 (2.3%)	1/66 (1.5%)	11/466 (2.4%)	0.64	0.67 (0.08-5.01)
Epilepsy	22/531 (4.1%)	6/68 (8.8%)	16/463 (3.5%)	2.70	0.046 (1.02-7.17)
Infantile Spasms	11/530 (2.1%)	5/68 (7.4%)	6/462 (1.3%)	6.03	0.004 (1.79-20.34)
Generalized Seizures	13/530 (2.5%)	4/68 (5.9%)	9/462 (1.9%)	3.15	0.06 (0.94-10.51)
Obstructive Sleep Apnea (past or present)	186/539 (34.5%)	22/68 (32.4%)	164/471 (34.8%)	0.90	0.69 (0.52-1.54)
ADHD	54/561 (9.6%)	9/72 (12.5%)	45/489 (9.2%)	1.41	0.38 (0.67-3.02)
Depression	9/562 (4.2%)	3/72 (4.2%)	6/490 (1.2%)	3.51	0.08 (0.86-14.35)
Anxiety	38/561 (6.8%)	5/72 (6.9%)	33/489 (6.7%)	1.03	0.95 (0.43-2.73)
Regression/Catatonia	17/562 (3.0%)	2/70 (2.8%)	15/490 (3.1%)	0.90	0.90 (0.20-4.04)