



# Frequency of Burn Injuries in Children with Autism Spectrum Disorders and Attention Deficit/Hyperactivity Disorder

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## Introduction

Critical burn care has improved significantly over the decades, allowing survival of children with large total body surface area (TBSA) burn injuries<sup>1</sup>. Though overall survival has increased, burn injuries are still a leading cause of morbidity and mortality among children<sup>2</sup>. Several studies have found a significantly higher risk of injury in children with disabilities, such as attention-deficit hyperactivity disorder (ADHD), autism spectrum disorders (ASD), anxiety and depression, learning disorders and other developmental delays than among children without disabilities<sup>3</sup>. Children with autism spectrum disorders (ASD) and attention deficit/hyperactivity disorder (ADHD) are at a higher risk of burn injuries, compared to children with neurotypical development, but little is known about the epidemiology of burn injuries in children diagnosed with ASD and ADHD. Research within the pediatric burn population using the Burn Outcomes Questionnaire has been successful in capturing levels of risk on burn-recovery specific domains such as compliance to treatment, pain, and parental concerns.

## Methods

### Data Collection

- Since many of the symptoms of ASD and ADHD overlap, patients were identified with a diagnosis of ASD or ADHD if there were parent-reported symptoms of attention or behavioral problems, developmental delay, intellectual disability or learning problems. Patients were not excluded if they had pre-existing comorbid psychiatric diagnoses of depression.
- Of the 593 patients who completed a BOQ, 186 patients were identified with a diagnosis of ASD or ADHD. 127 patients had multiple parent-reported symptoms which align with diagnoses of ASD and ADHD, including 116 (63.4%) with attention or behavioral problems, 42 (23.3%) with a developmental delay, 7 (3.9%) with an intellectual disability and 90 (49.7%) had learning problems. 66 (37.3%) patients had pre-existing comorbid psychiatric diagnoses of depression.

### Data Analysis

- Scores for BOQ domains are standardized with a mean of 50 and a standard deviation of 10, based upon a large normative sample of children with <20% TSBA burn injuries from the MCBS<sup>4</sup>. BOQ<sub>5-18</sub> scores that were one or more standard deviation below the norm were considered “At-Risk scores” to indicate clinically significant differences.
- Longitudinal BOQ<sub>5-18</sub> scores were collected three (T1), six (T2), and twelve (T3) months after discharge.
- Demographics were compared between the two groups using chi-square analyses and t-tests.

## Results

**Table 1.** Patient Demographics (n=593)

	All Diagnoses (n=593)		ASD or ADHD Diagnosis (n=186)		No ASD or ADHD Diagnosis (n=407)	
	N	M(SD)	N	M(SD)	N	M(SD)
Age at injury (years)	37	593	11.3 (3.8)	186	11.7 (3.7)	407
TBSA at admission (%)	37	585	36.0 (23.3)	183	37.1 (23.2)	402
	N	%	N	%	N	%
<b>Age at injury</b>						
5.0 – 12.99 years	371	63.0	108	58.4	263	65.1
13.0 – 17.99 years	218	37.0	77	41.6	141	34.9
<b>TBSA at admission</b>						
0 – 15.0%	146	25.0	47	25.7	99	24.6
15.01 – 40.0%	207	35.4	58	31.7	149	37.1
40.01 – 100.0%	232	39.7	78	42.6	154	38.3
<b>Time since injury</b>						
0 years	543	91.6	168	90.3	375	92.1
1 year	32	5.4	13	7.0	19	4.7
2 years	13	2.2	3	1.6	10	2.5
3 years	4	0.7	2	1.1	2	0.5
4 years	1	0.2	0	-	1	0.2
<b>Gender</b>						
Male	435	73.4	149	80.1	286	70.3
Female	158	26.6	37	19.9	121	29.7
<b>Race</b>						
White	239	40.3	77	41.4	162	39.8
Black	32	5.4	8	4.3	24	5.9
Hispanic/Latino	280	47.2	90	48.4	190	46.7
Asian	11	1.9	0	-	11	2.7
Other	31	5.2	11	5.9	20	4.9
<b>Residence</b>						
North America	319	54.7	98	53.3	221	55.4
South America	264	45.3	86	46.7	178	44.6
<b>Parent employment</b>						
Both parents	174	31.6	47	27.5	127	66.5
Mother only	48	8.7	18	10.4	30	7.9
Father only	219	39.0	59	34.1	160	41.2

**Table 2.** Comorbid Diagnoses (n=593)

Comorbid Conditions	Has this child ever had it?		Does this child get treatment?		Are this child's activities limited?	
	N	%	N	%	N	%
<b>All diagnoses (n=593)</b>						
Attention or behavioral problems	116	20.2	65	25.5	22	9.0
Developmental delay	42	7.2	31	14.8	10	4.9
Intellectual disability	7	1.2	5	2.6	6	3.2
Learning problem	90	15.6	49	22.1	18	8.6
Depression	66	11.5	35	16.7	13	6.6
<b>ASD or ADHD diagnosis (n=186)</b>						
Attention or behavioral problems	116	63.4	64	47.4	17	13.7
Developmental delay	42	23.3	29	31.2	8	9.2
Intellectual disability	7	3.9	4	5.3	3	4.2
Learning problem	90	49.7	47	45.6	14	15.2
Depression	66	37.3	33	35.1	9	11.0
<b>No ASD or ADHD diagnosis (n=407)</b>						
Attention or behavioral problems	0	-	1	0.8	5	4.1
Developmental delay	0	-	2	1.7	2	1.7
Intellectual disability	0	-	1	0.9	3	2.6
Learning problem	0	-	2	1.7	4	3.4
Depression	0	-	2	1.7	4	3.4

**Table 3.** Burn Outcome Questionnaire Scores (n=593)

BOQ Domains	All Diagnoses (n=593)			ASD or ADHD Diagnosis (n=186)			No ASD or ADHD Diagnosis (n=407)		
	N	M(SD)	N Risk (%)	N	M(SD)	N Risk (%)	N	M(SD)	N Risk (%)
<b>T1</b>									
Pain	587	42.8 (12.2)	35.3	184	42.3 (12.7)	31.5	403	43.0 (12.0)	37.0
Itch	590	44.0 (9.7)	31.5	186	43.2 (9.9)	31.2	404	44.4 (9.6)	31.7
Satisfaction	585	44.0 (11.4)	31.5	186	42.2 (11.7)	36.6	399	44.8 (11.2)	29.1
Compliance	583	50.3 (10.0)	11.1	184	49.0 (10.2)	13.0	399	50.9 (9.9)	10.3
Concerns	583	45.1 (8.5)	36.0	184	44.4 (7.9)	38.6	399	45.3 (8.8)	34.8
<b>T2</b>									
Pain	476	50.0 (9.4)	13.4	146	49.6 (9.7)	15.1	330	50.0 (9.4)	12.7
Itch	477	47.9 (9.8)	20.5	146	47.4 (9.8)	21.2	331	48.2 (9.7)	20.2
Satisfaction	480	48.8 (9.8)	15.0	147	46.9 (10.3)	19.7	333	49.6 (9.4)	12.9
Compliance	475	50.3 (9.5)	12.0	147	48.4 (11.7)	13.6	328	51.2 (8.2)	11.3
Concerns	482	49.0 (9.3)	23.0	149	48.0 (8.9)	26.2	333	49.5 (9.4)	21.6
<b>T3</b>									
Pain	391	51.7 (8.7)	8.2	124	50.7 (9.7)	12.1	267	52.2 (8.1)	6.4
Itch	390	50.8 (9.0)	13.6	124	49.8 (9.8)	19.4	266	51.2 (8.7)	10.9
Satisfaction	388	50.9 (9.0)	10.8	123	49.4 (10.7)	16.3	265	51.6 (8.0)	8.3
Compliance	380	49.0 (11.2)	15.8	121	48.6 (10.7)	17.4	259	49.2 (11.5)	15.1
Concerns	388	50.5 (9.9)	20.9	122	50.3 (9.7)	19.7	266	50.5 (10.0)	21.4

## Results

Of the 593 patients enrolled to the MCBS, 186 patients were identified with a diagnosis of ASD or ADHD. The mean age of this cohort (n=186) was 11.7 ±3.7 years with a mean percent TBSA of 37.1 ±23.2. Majority of patients were admitted within the year of injury date (90.3%), several patients were seen for follow-up procedures after one year (7.0%), two years (1.6%) and three years (1.1%) after injury date. In this cohort, 80.1% were male, 48.4% were Hispanic and 53.3% were from North America. Most families were supported by an employed father (34.1%), followed by both parents being employed (27.5%).

127 patients had multiple comorbid diagnoses related to ASD and ADHD, including 116 (63.4%) had attention or behavioral problems, 42 (23.3%) had developmental delay, 7 (3.9%) had an intellectual disability and 90 (49.7%) had learning problems. 66 (37.3%) patients had pre-existing comorbid psychiatric diagnoses of depression. Less than half of the patients receive treatment for each comorbid diagnosis: 47.4% with attention or behavioral problems, 31.2% with developmental delay, 5.3% with intellectual disability, 45.6 with learning problems and 35.1% with depression. However, only 10.7% of these patients have limited activity levels due to their comorbid diagnoses.

## Discussion

Children with ASD or ADHD are more likely to have frequent behavioral problems during burn care and recovery, and have more problems in complying with treatment recommendations, including medications, wound care, and required physical therapy course. Critical burn care targeted for children with developmental disabilities is imperative, and insight into co-occurring conditions allows an understanding of current treatment compliance approaches that may be open to intervention and prevention. While it is important to educate all children in burn prevention efforts, special attention may be necessary to assure training with children at greater risk for burn injury through specific parent training.

## References

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