Pediatric Obesity and Adverse Outcomes Following Deformity Correction Surgery for Adolescent Idiopathic Scoliosis

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INTRODUCTION: A positive correlation between obesity and severity of adolescent idiopathic scoliosis (AIS) along with likelihood to fail conservative treatment has been established in the literature. While metrics such as operation times, use of intraoperative crystalloids, and rates of postoperative infections have been explored, there has not yet been a large scale database study to examine the in hospital complications following deformity correction surgery for AIS. We used the National Inpatient Sample (NIS) to compare outcomes between obese and non-obese patients following posterior fusion surgery for scoliosis deformity correction. Incidence with respect to demographics, comorbidities, socioeconomic status, and insurance provider were also examined. Establishing a correlation between comorbid obesity diagnoses and a wide variety of adverse outcomes can assist in the preoperative planning of corrective surgery for AIS in a growing population of obese pediatric patients.

METHODS:

The NIS database from 2015-2020 was queried for patients under the age of 18 hospitalized for AIS that underwent posterior spinal fusion. The hospital course of patients with and without obesity were analyzed. The incidence and risk factors for adverse hospital outcomes were analyzed using multivariate logistic regression. Factors of interest included demographic characteristics, insurance provider, length of stay (LOS), and comorbidities among others.

RESULTS:

A total of 1,140 obese and 27,7250 non-obese pediatric patients undergoing posterior instrumented fusion for AIS were identified. Median LOS was 5 (range= 3,5) days in the obese group compared to 4 (range= 3,4) days in the non-obese group (p<0.001). The obese group was more likely to have a high SSI (0.9% vs 0.1%, p<0.001). Rate of UTI was also more associated with obesity when compared to normal BMI (1.8% vs. 0.1%, p<0.001). Blood transfusion was significantly more common in obese patients than non-obese patients (16.2% vs 13.3%, p=0.005). Obese patients were more likely to have a non-routine discharge when compared to non-obese (5.7% vs. 3.4%, p<0.001). After multivariate regression analysis, it was determined that Hispanic patients were more likely to be obese (OR=1.917, CI=1.467-2.506, p<0.001). Obesity was positively associated with SSI (OR=4.335, CI=2.019-9.307, p<0.001), UTI (OR=2.112, CI=1.263-3.533, p=0.004), non-routine discharge (OR=1.552, CI=1.180-2.041, p=0.002), and an extended LOS (OR=1.797, CI=1.575-2.051, p<0.001) after posterior fusion surgery for AIS.

DISCUSSION AND CONCLUSION:

In this retrospective database study, obesity was associated with postoperative blood transfusion, superficial surgical infection, urinary tract infection, increased LOS, and non-routine discharge after pediatric AIS deformity surgery. In addition to the increased morbidity seen in obese patients, we also identified the significantly increased cost of care for this group when compared to non-obese patients. Differences in ethnicity were also appreciated, with a higher likelihood of obesity seen in the Hispanic population.

Table 1. Patient demographics

Variable	Not Obese (27,750)	Obese (1,140)	p-value
Median Age	14 (12,16)	14 (12,16)	
Female	20,245 (73.0%)	750 (65.8%)	<0.001
Race/Ethnicity			
White	15,800 (61.5%)	620 (58.2%)	0.031
Black	4,020 (15.7%)	155 (14.6%)	0.343
Hispanic	3,450 (13.4%)	210 (19.7%)	<0.001
SES			
(1) 0-25th	6,065 (22.4%)	270 (24.0%)	0.176
(2) 25th-50th	6,835 (25.1%)	300 (26.7%)	0.247
(3) 50th-75th	6955 (25.6%)	360 (32.0%)	<0.001
(4) 75th-99th	7,355 (27.0%)	195 (17.3%)	<0.001
Complications			
DVT	10 (0.01%)	0	
PE	5 (0.001%)	0	
SSI	30 (0.1%)	10 (0.9%)	<0.001
UTI	180 (0.6%)	20 (1.8%)	<0.001
AKI	55 (0.2%)	5 (0.4%)	0.088
SIRS	60 (0.2%)	5 (0.4%)	0.133
Ileus	140 (0.5%)	0	
CSF leak	10 (0.0%	0	
Pneumonia	35 (0.1%)	0	
MI	0	0	
Epidural Hematoma/Hemorrhage	15 (0.1%)	0	
DIC	15 (0.1%)	0	
SCI	115 (0.4%)	0	
Peripheral neuropathy	0	0	
Brachial plexus	5 (0.00%)	0	
Blood Transfusion	3,685 (13.3%)	185 (16.2%)	0.005
Non routine discharge	939 (3.4%)	65 (5.7%)	<0.001
Complication > 1	105 (0.4%)	10 (0.9%)	0.025
Levels			
Two or more	295 (1.1%)	5 (0.4%)	0.036
Two to seven	6,280 (22.6%)	150 (13.2%)	<0.001
Eight or more	17,285 (62.3%)	855 (75%)	<0.001
Total charges	169,604 (120,912-240,339)	184,446 (131,341-265,522)	<0.001
Median LOS	4 (3,4)	5 (3,5)*	<0.001

ODDS OF OBESITY

Table 2. Multivariate for obesity.

Covariate	Odds ratio (95% C.I)	p-value
Age	1.00 (0.973-1.028)	0.975
Female	0.664 (0.579-0.760)	**<0.001**
Race/Ethnicity		
White	1.194 (0.939-1.519)	0.148
Black	1.170 (0.884-1.548)	0.272
Hispanic	1.917 (1.467-2.506)	**<0.001**
Low SES (bottom two percentiles)	0.921 (0.812-1.045)	0.204
Complications		
DVT	*	*
PE	*	*
SSI	4.335 (2.019-9.307)	**<0.001**
UTI	2.112 (1.263-3.533)	**0.004**
AKI	1.737 (0.671-4.495)	0.255
SIRS	1.307 (0.502-3.402)	0.583
Blood Transfusion	1.011 (0.849-1.204)	0.901
Non routine discharge	1.552 (1.180-2.041)	**0.002**
Levels		
Two or more	0.300 (0.118-0.766)	**0.012**
Two to seven	0.705 (0.557-0.891)	**0.003**
Eight or more	1.666 (1.388-2.000)	**<0.001**
Extended LOS (>4 days)	1.797 (1.575-2.051)	**<0.001**