Peer-reviewed version available at *Behav. Sci.* **2018**, *8*, 80; doi:10.3390/bs8090080

Understanding the Demographic Predictors and Association of Comorbidities in Hospitalized Children with Conduct Disorder

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Article Data

Number of Tables	2
Abstract	200 words
Article Main Text	2078 words

Peer-reviewed version available at Behav. Sci. 2018, 8, 80; doi:10.3390/bs8090080

Abstract

Objective: To determine demographic predictors and comorbidities in hospitalized children with conduct disorder.

Methods: A retrospective analysis was performed using Nationwide Inpatient Sample (2012–2014). All patients were ≤18 years and cases with primary diagnosis of conduct disorder (N=32345) and a comparison group with another psychiatric diagnosis (N=410479) were identified using ICD-9-CM diagnosis codes. A logistic regression model was used to generate the Odds Ratio (OR) between both groups.

Results: Children <11 years old have five times greater chances of admission for conduct disorder than adolescent (OR 5.339). African American males are more likely to be admitted for conduct disorder. Children with conduct disorder from low-income families have a 1.5 times higher likelihood for inpatient admission compared to high-income families. These children have about eleven times higher odds of comorbid psychosis (OR 11.810) and seven times for depression (OR 7.093) compared to the comparison group.

Conclusion: Conduct disorders are more debilitating for children and families than many providers realize. African American male under 11 years is at the highest risk for inpatient management for conduct disorder. These patients have a higher risk of comorbid psychosis and depression which may further deteriorate the severity of illness and require acute inpatient care.

Keywords: conduct disorder; comorbidities; schizophrenia; demographics; child; behaviour; child psychiatry

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1. Introduction

Conduct disorder is defined as a repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated [1]. Children or adolescents with conduct disorder exhibits aggressive behavior, such as bullying, threatening, initiating physical fights, cruelty towards animals, destruction of property, stealing and serious violations of rules in a variety of settings [1]. Conduct disorder symptoms are the most common primary presenting problems for psychiatric referral among children and adolescents in the United States [2], and youth diagnosed with conduct disorder have higher degree of distress and impairment in virtually all domains of living than youth with other mental disorders [2, 3]. The estimated lifetime prevalence of conduct disorder in the United States is 9.5% (12% in males and 7.1% in females) with median age of onset 11.6 years [2]. An epidemiological meta-analysis estimated that the worldwide prevalence of conduct disorder among children and adolescents aged 6–18 years is 3.2% and the prevalence estimate does not vary significantly across countries [4].

Conduct disorder can have its onset before ten years' age or in adolescence, and children with early-onset conduct disorder are at greater risk for persistent difficulties. Current data indicates that the prevalence of conduct disorder is 2–5% in children between 5–12 years and 5–9% in adolescents between 13-18 years [5]. Most studies show that boys are more likely to present with symptoms of conduct disorder than girls. However, this gender difference may vary somewhat across development. In young children under five years age, gender differences are small [6]. This changes in adolescence, where both gender show increase in rates of conduct disorder and boys are two to three times more likely to be diagnosed than in girls [7]. Conduct disorder prevalence may or may not vary in different race and ethnicities depending on socioeconomic status, neighbourhood and parenting practices. According to current data, lifetime prevalence of conduct disorder in Hispanics 6.9%, Black 4.9% and White 5.0% [8].

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Moreover, many studies in past have shown that conduct problems are associated with increased risk of other mental disorders [9]. Many children with a conduct disorder may have coexisting conditions such as ADHD (3-41%), depression (0-46%) and anxiety disorder (0-41%) [10]. A birth cohort study in New Zealand showed boys who had conduct disorder prior to adolescence were three times more likely to have an anxiety disorder and major depressive disorder, eight times more likely to be homeless, three times more likely to be dependent on alcohol, and 25 times more likely to have attempted suicide by age 32 years compared to boys without conduct disorder [11].

Despite the significant impact of conduct disorder on society, economy, and healthcare; no prior studies have been done to determine demographic differences in inpatient population of conduct disorder against other psychiatric disorders in children and adolescent population in the United States. There are questions regarding the widely documented comorbidities of conduct disorder with other mental disorders [9]. Although it is clear that conduct disorder is associated with other disorders, little is known about the prevalence of these comorbid disorders, specifically, very less data is available regarding the likeliness of having schizophrenia and psychotic disorder, depression, substance/alcohol use disorder as a comorbidity to conduct disorder. Thus, the purpose of this study is to determine the demographic predictors and association of comorbidities in children hospitalized for primary psychiatric diagnosis of conduct disorder.

2. Methods

2.1. Data source

A retrospective analysis was performed using the Healthcare Cost and Utilization Project's (HCUP) Nationwide Inpatient Sample (NIS) data from the years 2012 to 2014 [12]. The Agency for Healthcare Research and Quality (AHRQ) sponsors the HCUP databases that

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are specifically designed to determine and identify patterns in hospital utilization and cost across the United States. The HCUP-NIS database is the largest inpatient database available in the United States, which represents a sample of non-federal United States community hospitals [12].

2.2. Variables of interest

Based on the ICD-9-CM diagnosis codes, we identified the patients with a primary diagnosis of conduct disorder at the time of admission as the target group, and the comparison group with a primary psychiatric diagnosis other than conduct disorder at the time of admission. In HCUP databases, more than 14,000 ICD-9-CM diagnosis codes and 3,900 procedure codes had been mentioned [12].

Patients in comparison group were identified using diagnosis codes for anxiety disorder (293.84, 300.00-300.02, 300.09, 300.10, 300.20-300.23, 300.29, 300.3, 300.5, 300.89, 300.9, 308.0-308.4, 308.9, 309.81, 313.0, 313.1, 313.21, 313.22, 313.3, 313.82, 313.83), mood disorder (293.83, 296.00–296.06, 296.10–296.16, 296.40–296.46, 296.60–296.66, 296.7, 296.50–296.56, 296.82, 296.80, 296.89, 296.7, 296.20–296.26, 296.30–296.36, 296.82, 300.4, 311, 293.83, 296.90 or 296.99) and, schizophrenia and other psychotic disorders (293.81, 293.82, 295.00–295.05, 295.10–295.15, 295.20–295.25, 295.30–295.35, 295.40–295.45, 295.50–295.55, 295.60–295.65, 295.70–295.75, 295.80–295.85, 295.90–295.95, 297.0–297.3, 297.8–298.4, 298.8 or 298.9). Patients with conduct disorder were identified using diagnosis codes 312.00–312.03, 312.10–312.13, 312.20–312.23, 312.4, 312.8, 312.81, 312.82, 312.89 and 312.9. The age limit was set ≤18 years to compare the hospitalization outcomes and comorbidities between conduct disorder and other psychiatric disorders in children and adolescents.

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Demographic variables examined in this study included age group (<11 years, 12–18 years), gender (male or female), race (Caucasian, African American, Hispanic and other) and median household income (below/above 50th percentile). Comorbidities are considered coexisting conditions to conduct disorder, which is the primary disorder under this study [13]. Using ICD-9-CM codes, this variable identified four comorbidities in the records of patient during hospitalization- alcohol abuse (291.0-291.3, 291.5, 291.8, 291.81, 281.82, 291.89, 291.9, 303.00-303.93, 305.00-305.03), drug abuse (292.0, 292.82-292.89, 292.9, 304.00-304.93, 305.20-305.93, 648.30-648.34), psychosis (295.00-298.9, 299.10, 299.11), and depression (300.4, 301.12, 309.00, 309.1, 311).

2.3. Approaches

A retrospective analysis was performed over the HCUP-NIS database, focusing on the determination of the hospital outcomes for conduct disorder patients and controls. Descriptive statistics were used to summarize the results. The mean and standard deviations were used to explain the continuous variables. Pearson's chi-square test and independent sample T-test were used for categorical data and continuous data, respectively. We used a multinomial logistic regression model to measure the risk of associations (Odds Ratio (OR)) between both groups in terms of demographic predictors and comorbidities. We applied discharge weights in all regression models to obtain nationally representative inpatient data. A P value < .01 was used as a reference to determine the statistical significance test result. All statistical analysis was done by SPSS 23 in this study [14].

2.4. Ethical approval

Our database did not contain patients' personally identifiable information. To protect the privacy of individual patients, physicians, and hospitals, the state and hospital identifiers are

de-identified. Thus, we were not required to take Institution Review Board permission for this study.

3. Results

3.1. Sample Characteristics

The study analyzed a total of 442,824 children admitted in the hospital for primary psychiatric diagnosis from 2012 to 2014. The comparison group (N= 410,479) included the children admitted for primary diagnosis of anxiety disorder (5.1%), mood disorder (3.3%) and schizophrenia or other psychotic disorders (91.6%). On the other side the target group included 32,345 children admitted in the hospital for conduct disorder.

3.2. Demographic differences

About 55% children admitted in the hospital for conduct disorder were adolescents (12-18 years) and 70% were males. The mean age of the comparison group was 14.4 years (± 2.827) and was higher than patients with conduct disorder (11.6 years ± 3.606). Only 13% children in comparison group were under 11 years, compared to 44% with conduct disorder. So, the children in <11 years age group have five times greater chances of admission for conduct disorder than adolescent (OR 5.339). Males are three times more likely to be admitted for conduct disorder than females (OR 3.339). Among racial sub group analysis, majority of the patients admitted for conduct disorder were African Americans (29.4% vs. 16.7%) and Hispanics (15.2% vs. 13.2%) when paralleled with the comparison group. African Americans were two-folds more likely to be admitted for conduct disorder compared to other races.

Majority of the patients with conduct disorder were covered by Medicaid (65%) followed by private insurance (29.4%). Children with conduct disorder coming from low-income families with median household income below 50th percentile have 1.5 times higher likelihood for

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inpatient admission than those from high-income families. The demographic distribution of the study population is shown in Table 1.

3.3. Association of comorbidities

The most prevalent comorbidities in conduct disorder patients were psychosis (29%) followed by depression (14.9%) and least was drug abuse (6%). Children with conduct disorder had lower likelihood of comorbid alcohol abuse and drug abuse compared to other children admitted for other psychiatric diagnosis. These children with conduct disorder have about eleven times higher odds of comorbid psychosis (OR= 11.810) and seven times higher odds of depression (OR= 7.093) compared to the comparison group.

4. Discussion

This study included 442,824 children ≤ 18 years' old who were admitted in the hospital for psychiatric disorder and 32,345 had the admitting diagnosis of conduct disorder. As per a retrospective study conducted on in the National Comorbidity Survey Replication (NCS-R), the estimated prevalence of conduct disorder in the United States is 9.5% with median age of onset 11.6 years [2]. A meta-analysis that included studies from 1987 to 2008 concluded that the worldwide prevalence of conduct disorder among children aged 6–18 years is 3.2% and only methodological and not geographic factors were related with variability of the prevalence [4]. None of the studies estimated nationwide inpatient prevalence of conduct disorder, and as per our results about 7.3% children with mean age of 11.6 years from total inpatient psychiatric admissions had primary diagnosis of conduct disorder. Children under 11 years have five times greater chances of inpatient admission for conduct disorder than adolescents.

About 70% of the children with conduct disorder in current study and they were three times more likely to be admitted for conduct disorder than females. Our results were supported by a longitudinal study conducted by Moffitt et al [7] that concluded, boys are two to three

times more likely to be diagnosed with conduct disorder than girls. A study on the National Comorbidity Survey Replication stated that conduct disorder prevalence may or may not vary in different race/ethnicities and socioeconomic status [8]. But in our study we were able to discern the racial pattern as majority of the patients admitted for conduct disorder were Caucasians, but in our regression model we found that African Americans had two-folds higher risk of admitted for conduct disorder.

A birth cohort study in New Zealand showed boys who had conduct disorder were three times more likely to have an anxiety disorder and major depressive disorder, and be dependent on alcohol compared to boys without conduct disorder [11]. The conduct disorder cohort in our study had seven times higher odds of depression, but were less likely to have a co-diagnosis of drug abuse and alcohol abuse. Many studies in the past had shown the association of schizophrenia and conduct disorder [15-19], and also we found about eleven-fold higher likelihood of comorbid schizophrenia and other psychotic disorder in children admitted for conduct disorder.

The key strength of this study is the national representation provided by the NIS dataset, with a uniform collection of data using ICD-9-CM codes, and its large sample size of 442,824 children under 18 years' age. This study includes children with psychiatric diagnosis with conduct disorder versus without conduct disorder. Identification of patients using ICD-9-CM diagnosis code may be affected by some external factors such as insurance and billing. The clinical and non-clinical information in this dataset are coded independently of the individual practitioner and so it is subjected to minimal reporting bias. Nevertheless, our study does have few limitations being an administrative dataset. Re-hospitalizations, which add to the total inpatient burden, are not accounted in our study. However, despite these limitations, NIS is still an excellent population–based representation of disease associations with comorbidities.

5. Conclusion

Conduct disorders are more debilitating for children and families than many providers realize. African American male under 11 years are at the highest risk for inpatient management for conduct disorder. These patients have a higher risk of comorbid psychosis and depression which may further deteriorates the severity of illness and require acute inpatient care. Further studies should be done to highlight the growing issue of conduct disorder and the necessity to develop biopsychosocial care model for prompt diagnosis and treatment.

Acknowledgement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Disclosure / Conflict of Interest

The authors report no conflict of interest.

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Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 21 August 2018 doi:10.20944/preprints201808.0373.v1

Peer-reviewed version available at Behav. Sci. 2018, 8, 80; doi:10.3390/bs8090080

Tables

Table 1. Demographic predictors of hospitalized patients with conduct disorder

Characteristic	CD (–)		CD (+)		Logistic Regression Model		
	N	%	N	%	OR	95% CI	P value
Age							
< 11 years	53695	13.1	14410	44.6	5.339	5.214 – 5.467	< .001
12 – 18 years	356784	86.9	17935	55.4	Referent		
Gender							
Male	166054	40.5	22570	69.8	3.339	3.316 – 3.483	< .001
Female	244414	59.5	9775	30.2	Referent		
Race							
Caucasian	227555	62.9	13255	48.4	.794	.756 – .834	< .001
African American	60475	16.7	8055	29.4	1.816	1.724 – 1.912	< .001
Hispanic	47805	13.2	4180	15.2	1.192	1.127 – 1.261	< .001
Other	26175	7.2	1920	7..0	Referent		
Primary payer							
Medicaid	193574	47.3	21050	65.5	2.294	2.145 – 2.453	< .001
Private Insurance	185870	45.4	9440	29.4	1.459	1.321 – 1.613	.049
Self-pay	10480	2.6	725	2.3	1.071	1.000 – 1.148	< .001
Other	19725	4.8	935	2.9	Referent		
Median household income							
0 – 50th Percentile	214624	53.4	19515	64.0	1.553	1.516 – 1.591	< .001
51st – 100th Percentile	187325	46.6	10970	36.0	Referent		

Differences between groups conducted by Cross tabulation. Components may not add up to the rounded sum due to weighting and rounding or missing data.
Odds Ratio generated by binary logistic regression model and the reference category for this model are mentioned within the table.

CD: Conduct disorder; OR: Odds Ratio; CI: Confidence Interval

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Table 2. Association of comorbidities in patients with conduct disorder

Comorbidity	CD (–)		CD (+)		Logistic Regression Model		
	N	%	N	%	OR	95% CI	P value
Alcohol Abuse	75705	18.4	4195	13.0	.700	.672 – .729	< .001
Drug Abuse	24470	6.0	1250	3.9	.758	.706 – .814	< .001
Depression	11245	2.7	4825	14.9	7.093	6.781 – 7.420	< .001
Psychosis	12950	3.2	9365	29.0	11.810	11.399 – 12.235	< .001

Differences between groups conducted by Cross tabulation. Components may not add up to the rounded sum due to weighting and rounding or missing data.
Odds Ratio generated by binary logistic regression model and were adjusted for age, gender, and race and median-household income. Reference category for this model was patients without conduct disorder.

CD: Conduct disorder; OR: Odds Ratio; CI: Confidence Interval