ORIGINAL RESEARCH ARTICLE

COACTION PUBLISHING

Gender differences in comorbidity of conduct disorder among adolescents in Northern Finland

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Objectives: Conduct disorder (CD) refers to a pattern of severe antisocial and aggressive behaviour manifested in childhood or adolescence, with heavy costs to society. Though CD is a common psychiatric diagnosis among adolescents of both genders, gender differences in comorbidity of CD have been little studied. In this study we examined gender differences among adolescents with CD in causes for hospitalization, comorbid psychiatric diagnoses and somatic conditions.
Study design: The original study sample consisted of 508 inpatient adolescents in Northern Finland (age 12–17); 155 of them (65 girls, 92 boys) fulfilled the DSM-IV criteria for CD.
Methods: Diagnosis of CD and psychiatric comorbidities were obtained from the K-SADS-PL and somatic conditions from the EuropAsi.
Results: As compared to boys with CD, suicidality (including suicidal ideation and behaviour) was significantly more commonly the cause of hospitalization among girls with CD (43% vs. 24%, $p = 0.013$). Among somatic conditions, there was a significant predominance in self-reported allergies among girls (60% vs. 25%, $p < 0.001$). Girls had more often diagnosed comorbid post-traumatic stress disorder (13% vs. 3%, $p = 0.025$) and marginally significantly more major depressive disorder (36% vs. 23%, $p = 0.086$).
Conclusions: Girls with CD seem to have an increased tendency to develop both comorbid psychiatric and somatic conditions as well as suicidality. New clinical aspects in treatment of CD and comorbid disorders among girls are discussed.

Keywords: *conduct disorder*; *gender*; *adolescence*; *comorbidity*

Received: 28 January 2011; Revised: 14 May 2011; Accepted: 15 August 2011; Published: 20 March 2012

As described in DSM-IV, conduct disorder (CD) involves "a repetitive and persistent pattern of behaviour in which the basic rights of others or major age-appropriate social norms or rules are violated" (1). Estimated lifetime prevalence of CD in the US is 6.8–9.5% (2,3). In Finland comprehensive epidemiological research on the prevalence of CD among adolescents is lacking; however Almqvist and colleagues found that among 8- to 9-year-old Finnish children the combined prevalence of CD and oppositional defiant disorder using DSM-III-criteria was 4.7% (4). In Arctic countries the prevalence of CD has not been researched systematically, and special features of CD in high latitudes are not reported. Especially among indigenous people in the Arctic, the research of adolescents' mental health is limited mainly to substance abuse and suicidality (5). However, it has been reported that in an American Indian reservation population of Alaska the prevalence of CD is higher than generally in US/Canada (6). Also behavioural disorders are reported twice as common in Siberia as in Great Britain (7). The prevalence of CD has been increasing globally, especially among girls (8,9), and it consumes much of the resources of mental health, juvenile justice and the special education system. The number of physical assaults committed by Finnish girls and the percentage of female assaulters have increased since the mid-90s (10). Both clinicians working with adolescents, school psychologists, educators, paediatricians and criminologists meet CD regularly. As a diagnosis easily categorized among one of the most

Citation: Int J Circumpolar Health 2012, **71**: 17393 - DOI: 10.3402/ijch.v71i0.17393

treatment-resistant, the results of leaving these patients untreated can lead to even greater costs to society – not to mention the adolescents themselves (11).

Comorbidity in psychiatric disorders among adolescents is more a rule than an exception. There is evidence that adolescents with comorbid internalizing or externalizing disorders are more likely to have continuing problems than adolescents with only a single disorder (12), and comorbid individuals are more than twice as likely to be among psychiatric services than individuals with only a single diagnosis (13).

Adolescents with CD have also a strong tendency for comorbid psychiatric conditions (14), which can be experienced demanding in treatment. However, comorbid conditions might provide a way to treat patients with CD otherwise hard to treat and perhaps protesting treatment. General guidelines for efficient treatment for CD are lacking, as is solid evidence for drug treatment despite continuous research in that field. Tcheremissine and Lieving (11) suggest in their review that several drug groups can be effective therapeutic options for individuals with CD and comorbid psychiatric conditions. Multisystemic therapy is perhaps the most widely used psychosocial treatment for CD and behavioural problems (15), although its results are also somewhat weak (16). Gender differences in treatment of CD have been poorly examined (9).

There has been extensive research on comorbid psychiatric diagnoses of CD, but it has mostly been based on data limited in males, not been gender-specific, or the proportion of girls in the analyses has been small (14). Gender differences are, probably due to previous, scarcely studied. Attention deficit hyperactivity disorder (ADHD) is found to influence the development of CD, and comorbidity exists among both genders (17). The prevalence of depression among adolescents with CD varies from 8 to 46% (18,14), while in some studies the connection was not found (19). Also anxiety disorders are common comorbid conditions for CD. The prevalence of anxiety disorders varies between 13 and 69% (14,20). Substance use disorders as comorbid disorders for CD are common (21) – in clinical populations of adolescent substance users the comorbidity of substance use disorders and behavioural disorders is even as high as 95%, and this comorbidity appears to be pronounced among girls (22). It is said about gender differences in comorbid diagnoses of CD that females have more internalizing comorbid conditions, such as depression (14,23) and different anxiety disorders (23). Gender-neutral findings have also observed (20).

Even though it is known that somatic conditions and general health problems are connected with antisocial personality disorder in adulthood (24), there are only few studies on the connection between somatic disorders and CD among adolescents. The focuses of these studies by Hanssen-Bauer et al. (25) and Dunn et al. (26) are mainly on neurological conditions. Also, in earlier literature – while CD has not been studied – depressive and anxiety disorders have been associated with atopic disorders among both adolescents and adults (27,28).

The aim of this study was to investigate comorbidity of CD in a clinical data set of hospitalized adolescents in Northern Finland. It was anticipated that in this data set with the most severe adolescent psychiatric cases comorbidity would be found, and that there would be enough data of girls (and boys) with CD to examine gender differences. We focused out attention on gender differences in (a) psychiatric comorbidity, (b) somatic comorbidity, and (c) causes for admission to psychiatric hospital.

Material and methods

Participants

The STUDY-70 project was initiated to examine the association of various psychosocial risk factors with the outcomes of severe psychiatric and substance disorders among hospital-treated adolescents aged 12–17 years in Northern Finland. The basic study sample consisted of 508 adolescents (208 boys, 300 girls) admitted to Unit 70 at Oulu University Hospital, the Department of Psychiatry, between April 2001 and March 2006. The catchment area of Unit 70 covers the districts of Oulu and Lapland: all adolescents from this area in need of acute psychiatric hospitalization in a closed ward are initially treated in Unit 70. The study protocol was approved by the Ethics Committee of the University Hospital of Oulu (Finland).

Instruments

The subjects were interviewed by a treating physician or a trained medical student under the surveillance of the physician using the Finnish version of Schedule for Affective Disorder and Schizophrenia for School-Age Children Present and Lifetime (K-SADS-PL) to obtain DSM-IV diagnoses and variables of age, smoking status and family structure. The K-SADS-PL is a semi-structured diagnostic interview designed to assess current and past episodes of psychopathology in children and adolescents according to DSM-III-R and DSM-IV criteria and it is known to be a reliable tool for defining DSM-IV-diagnoses (29). Finnish version of K-SADS-PL has been translated into Finnish and then reversely translated back to English to certify the accuracy of translation. K-SADS-PL has been used in numerous studies on adolescents in Finland (30). If data were missing or remained unreliable after interviewing the adolescent, the interview was complemented by interviewing the adolescent's parents. Data were recorded on the basis of both the patients' information and physician's evaluation of the diagnostic interview (31). An objective face-to-face structured interview, the European Addiction Severity

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Index (EuropASI) (32) performed by the staff in the unit, was used to assess dwelling place, living in rural area and repeating grades, as well as to obtain the prevalence of somatic conditions.

Definition of CD

Current DSM-IV-based psychiatric diagnosis for CD (diagnostic code 312.8) according to the K-SADS-PL interview was used in this study. Of the total study population, 155 (31.5%) suffered from CD, and this formed the study sample of the present study. Of these 155 adolescents, 63 (40.6%) were girls and 92 (59.4%) boys.

Definitions of causes for psychiatric hospital admission

Causes for hospitalization were gathered from the semi-structured admission form included in patients' hospital case notes, which was completed together by the treating physician, nurse and the patient and/or patient's parents at the beginning and in the end of treatment episode at unit 70. This information was afterwards categorized into 8 components: depressive mood, suicidality (including both suicidal ideation and behaviour), psychotic symptoms, anxiety symptoms, substance use, behavioural problems, aggressive behaviour and sleeping disorders.

Definitions of somatic conditions

Information on somatic conditions was extracted from the EuropAsi. Self-reported allergy was defined as positive, if the patient or his/her parents reported the patient to have any allergies (yes/no). Regular medication for somatic condition was defined as present (yes/no), when the adolescent had daily and continual doctor-prescribed medication for a somatic condition. Chronic, life-disturbing disease was defined as being present (yes/no) if the adolescent had a chronic, diagnosed somatic condition that subjectively disturbed everyday life.

Comorbid psychiatric diagnoses

Current comorbid psychiatric diagnoses were obtained from the K-SADS-PL interview following DSM-IV criteria (29,1). We examined DSM-IV-diagnosed MDD, panic disorder, simple phobia, social phobia, agoraphobia, generalized anxiety disorder, post-traumatic stress disorder (PTSD), attention deficient hyperactivity disorder (ADHD), alcohol abuse, alcohol dependence, drug abuse and drug dependence as comorbid diagnoses for CD. We also examined separation anxiety disorder, but the number of cases was too small for reasonable statistical analyzes.

Traumas of adolescents with PTSD and CD

The information concerning etiological traumas behind the symptoms of PTSD were gathered from the K-SADS-PL. In order to maintain anonymity of the patients, the distinctive traumas of adolescents were categorized into 8 groups (sexual abuse, physical abuse, parental physical abuse, interparental violence, witness of violence, death of a relative, death of a friend and car-accident).

Statistical methods

Statistical significance of group differences in categorical variables was assessed with Pearson's Chi-square test or Fisher's Exact test, and in continuous variables with Student's t-test or Mann-Whitney U-test. All tests were 2-sided and the limit for statistical significance was set at 0.05. All analyses were carried out using SPSS version 17 for Windows.

Results

Background characteristics

Table I shows the background information for girls and boys with CD separately. None of the background characteristics differed statistically significantly between genders.

Causes for hospitalization

Table II shows the results of the causes for hospitalization of adolescents with CD. The most common cause for girls with CD was suicidality, and within that variable there was also a statistically significant gender difference (girls 43% vs. boys 24%, $p = 0.013$). Among boys with CD the most common reason for hospitalization was aggressive symptoms, but the gender difference remained non-significant. An equal proportion of boys (40, 43.5%) and girls (28, 44.4%) were in involuntary treatment ($p = 0.905$). Two or more causes for admission were observed in 73 (47.1%) adolescents; 32 (50.8%) in females and 41 (44.6%) in males ($p = 0.445$).

Further analyzes revealed that among adolescents with CD, the prevalence of suicidality as a cause for admission was 51% if adolescent had comorbid MDD as compared to 24% among those who weren't depressed (df = 1, chi-square = 10 520, p-value < 0.001). However, it was also noteworthy that only 45% of all suicidal adolescents had diagnosed MDD. The mean number of comorbidities among adolescents who were hospitalized for suicidality was 1.82 (SD = 1.44) and among those adolescents whose cause of hospitalization was other than suicidality 1.51 (SD = 1.38, p-value = 0.206).

Comorbid somatic conditions

Comorbid somatic conditions of adolescents with CD are presented in Table III. A statistically significant female predominance was observed in allergies (60% vs. 25%, $p < 0.001$).

Comorbid psychiatric disorders

Comorbidity of psychiatric disorders was common among both genders (Table IV). 79% of adolescents with CD presented at least 1 other psychiatric (including

Table I. Background information of girls and boys suffering from conduct disorder (CD)

	Total (n = 155)	Girls (n = 63)	Boys (n = 92)	Gender difference
	n (%)	n (%)	n (%)	p-value*
Mean age (SD) at admission, in years	15.5 (1.4)	15.6 (1.3)	15.5 (1.5)	0.585
Living in urban area with population >100,000	34 (21.9)	16 (25.4)	18 (19.6)	0.389
Repeated grades in comprehensive school	31 (20.0)	9 (14.3)	22 (23.9)	0.141
Living in primary family (at least 1 biological parent)	74 (47.7)	32 (50.8)	42 (45.7)	0.529
Daily smoking (at least 1 cig. per day)	133 (85.8)	52 (82.5)	81 (88.0)	0.335

Note: Figures are numbers and percentages if not otherwise specified. Variables are from the K-SADS-PL interview, expect dwelling place from EuropAsi.
*Pearson χ^2-test or Fisher's Exact test, 2-tailed significance.

substance use disorders) condition. The mean number of comorbid diagnoses was 1.5 (SD = 1.4) for boys and 1.8 (1.4) for girls, no gender difference was found (T-test p-value = 0.136). Table IV shows that girls with CD had statistically significantly more PTSD (12.7% vs. 3.3%, p = 0.025), and a trend-like excess of MDD when compared to boys (35.5% vs. 22.8%, p = 0.086). The traumatic etiology of PTSD is displayed in the Table V. In majority of cases, adolescents experienced PTSD-symptoms from multiple traumas.

MDD and allergy among adolescents with CD

Additional analyses were performed to investigate co-morbidity between MDD and allergy among adolescents with CD, since an earlier study has shown an association between these 2 health conditions (28). In our data among girls with CD, MDD was statistically significantly more common among allergic girls compared to those without allergies (45.9% vs. 20.0%, $\chi^2 = 4.39$, p = 0.036), while among boys with CD no association was observed (21.7% vs. 23.5%, $\chi^2 = 0.03$, p = 0.860).

Discussion

In this study, both adolescent girls and boys with CD had a very high, up to 80%, rate of comorbidity of any DSM-IV-diagnosed psychiatric disorder. This observation was made in a sample of under-aged patients (i.e. adolescents aged 12–17 years). We found that girls suffering from CD had more PTSD than boys, and we also observed a trend of girls having more MDD as a psychiatric comorbid diagnosis than boys. Girls with CD had more suicidality as a cause for admission to psychiatric hospital when compared to boys. Another interesting finding was the very high self-reported rate of allergies among girls with CD when compared to boys (60 vs. 25%).

In this study, suicidality as a cause for hospitalization was more common among girls, which is in line with earlier literature (33). As in earlier studies (14), also in this study there was a trend of girls having more MDD, even if the result did not reach statistical significance. From a clinical point of view, as girls with CD seem to be more vulnerable comorbid depression, it is possible that this could be a key for treating these adolescent girls more

Table II. Causes for admission to psychiatric hospital among adolescents suffering from conduct disorder (CD)

	Total (n = 155)	Girls (n = 63)	Boys (n = 92)	Gender difference
	n (%)	n (%)	n (%)	p-value*
Depressive mood	36 (23.2)	17 (27.0)	19 (20.7)	0.359
Suicidality	49 (31.6)	27 (42.9)	22 (23.9)	0.013
Psychotic symptoms	13 (8.4)	4 (6.3)	9 (9.8)	0.449
Anxiety symptoms	20 (12.9)	7 (11.1)	13 (14.1)	0.582
Substance use	22 (14.2)	9 (14.3)	13 (14.1)	0.978
Behavioral problems	34 (21.9)	16 (25.4)	18 (19.6)	0.389
Aggressive symptoms	45 (29.0)	14 (22.2)	31 (33.7)	0.122
Sleep disorders	3 (1.9)	2 (3.2)	1 (1.1)	0.354

Note: Variables are extracted from the semi-structured admission form used in the Department of Psychiatry at Oulu University Hospital.
* Pearson χ^2-test or Fisher's Exact test, 2-tailed significance.

Citation: Int J Circumpolar Health 2012, **71**: 17393 - DOI: 10.3402/ijch.v71i0.17393

Table III. Comorbid somatic conditions of adolescents suffering from conduct disorder (CD)

	Total (n = 155)	Girls (n = 63)	Boys (n = 92)	Gender difference
	n (%)	n (%)	n (%)	p-value
Allergy	60 (39.2)	37 (59.7)	23 (25.3)	<0.001
Regular medication for somatic condition	11 (7.2)	4 (6.3)	7 (7.8)	0.736
Chronic, life-disturbing disease	20 (13.0)	11 (17.5)	9 (9.9)	0.169
HIV-infection	1 (0.6)	0 (0.0)	1 (1.1)	1.000
Hepatitis B or C	4 (2.6%)	3 (4.8)	1 (1.1)	0.156

Note: All variables are obtained from the EuropAsi questionnaire.
* Pearson χ^2-test or Fisher's Exact test, 2-tailed significance.

efficiently, for example with SSRI medication. Also, clinicians know how difficult it is to treat a adolescent with CD but often without willing to get treated – who is more and more often a girl – treatment of comorbid internalizing psychiatric disorder could lead to more co-operative treatment. The risk for suicidal behaviour must always be taken into consideration when meeting a girl with CD, especially when suspecting comorbid MDD. However, the prevalence of suicidality in our study was even greater than that of comorbid depression. Earlier studies have shown that CD is an independent risk factor for suicidality (34), and that multiple co-morbid psychiatric conditions have an increased risk of suicidal behaviour (35), which could explain the high rate of suicidality among adolescent girls with CD, even in the absence of clinical depression. As stated in the article by Apter and colleagues in 1995 (34): "It seems that there are hypothetically at least two types of suicidal behaviors during adolescence: a wish to die (depression) and a wish not to be here for a time (impulse control)".

PTSD is known to be a diagnosis that commonly co-occurs with other psychiatric diagnoses (36). The finding of girls with CD having more PTSD than boys is somewhat alarming; girls with CD might seek or get into situations where traumatic experiences are more likely to happen. Further, it is even more alarming that the etiology behind the PTSD is extensive and highly malignant as compared to normal adolescent life in general population. On the other hand, we cannot conclude causality from our cross-sectional data, and it is also possible that CD is secondary for PTSD. Further studies of this matter are needed to explain the causality.

The prevalence of allergic diseases (asthma, allergic rhinitis, atopic dermatitis) in general population samples from different countries has been found to be from 14 to

Table IV. Comorbid psychiatric disorders of adolescents with conduct disorder (CD)

	Total (n = 155)	Girls (n = 63)	Boys (n = 92)	Gender difference
	n (%)	n (%)	n (%)	p-value*
Major depressive disorder	43 (27.9)	22 (35.5)	21 (22.8)	0.086
Panic disorder	5 (3.2)	3 (4.8)	2 (2.2)	0.397
Simple phobia	4 (2.6)	2 (3.2)	2 (2.2)	1.000
Social phobia	10 (6.5)	4 (6.3)	6 (6.5)	1.000
Agoraphobia	8 (5.2)	5 (7.9)	3 (3.3)	0.271
Generalized anxiety disorder	3 (1.9)	1 (1.6)	2 (2.2)	1.000
Post-traumatic stress disorder	11 (7.1)	8 (12.7)	3 (3.3)	0.025
Attention deficit hyperactivity disorder	16 (10.3)	6 (9.5)	10 (10.9)	0.787
Alcohol misuse	51 (32.9)	21 (33.3)	30 (32.6)	0.925
Alcohol dependence	40 (25.8)	18 (28.6)	22 (23.9)	0.515
Drug misuse	22 (14.2)	8 (12.7)	14 (15.2)	0.659
Drug dependence	33 (21.3)	13 (20.6)	20 (21.7)	0.869
Any comorbid psychiatric disorder	119 (76.8)	50 (79.4)	69 (75.0)	0.527

Note: All variables are obtained from the K-SADS-PL interview. Table includes only those diagnostic groups in which the number of cases was sufficient for statistical analyses.
* Pearson χ^2-test or Fisher's Exact test, 2-tailed significance.

Table V. Traumas behind post-traumatic stress disorder among adolescents with conduct disorder

	Gender	Trauma
case 1	Female	Sexual abuse, interparental violence
case 2	Female	Sexual abuse, physical abuse, witness of a violence, interparental violence, death of a relative
case 3	Female	Interparental violence, death of a friend
case 4	Female	Parental physical abuse, death of a relative
case 5	Female	Sexual abuse, parental physical abuse, interparental violence
case 6	Female	Death of a friend
case 7	Female	Car-accident, witness of violence, physical abuse
case 8	Female	unknown
case 9	Male	Physical abuse, death of a friend
case 10	Male	Parental physical abuse
case 11	Male	Parental physical abuse, physical abuse

32% (37,38), being higher and increasing in Western countries (39). A recent study on Finnish adolescents aged 15–16 years reported a 25% prevalence of allergic diseases (40). Gender differences in prevalence of allergies are contradictory and reported to be minor. In Finnish adolescent data boys are reported to have more asthma than girls, while no significant gender difference was found in the prevalence of allergic rhinitis (41). Our finding of girls with CD having more self-reported allergies than boys (60 vs. 25%) is novel and extremely interesting. This finding can be partly – but not entirely – explained by predominance of comorbid MDD among girls, since it has been documented that there is a connection between allergies and depression, especially among females (28). Even in our study among girls with CD, allergies were more common among girls with CD and depression than among those with only CD. However, the fact that in this study half of the girls with CD but no MDD had self-reported allergy is a more than good reason for further research on the connection between CD and atopic disorders especially among females. Whether the gender difference actually exists, or whether boys neglect to report their allergic disorders needs further research of this matter by using validated and objective measures of atopic disorders.

The main limitation of the present study is that the sample consisted of the most severe, hospitalized manifestations of the psychiatric disorders studied, presumably with increased rates of co-morbidity when compared to general population. This limits the generalization of our findings to all adolescents with less severe problems. In this data set the prevalence of allergies was based on self-reports, which might differ from true prevalence, and are possibly underestimates.

The strengths of this study were that all the patients were interviewed by a treating physician or a trained medical student under the surveillance of the physician, and that the data were gathered using established semi-structured interviews (29,32). The study sample consisted of all hospitalized psychiatric adolescent patients in a geographically large area in northern Finland, and thus it represents the most serious cases in the general adolescent population. Further, the strengths included a reasonable sample size of adolescents with CD, especially females, to examine gender differences, which is why this study also brings an important addition to earlier literature.

In sum, CD is known to be a difficult and complicated disorder to treat. Our study shows, that according to present diagnostic criteria, adolescents with CD have a tendency to develop comorbid psychiatric conditions that are somewhat gender specific. While treatment of CD per-se has been found challenging, the treatment of these comorbid conditions might have a big and important role in treating adolescents with CD.

Acknowledgements

This study received support from the Ethel F. Donaghue Women's Health Investigator Program at Yale, the Alcoholic Beverage Medical Research Foundation (ABMRF), the Alma & K.A. Snellman foundation, the Eli Lilly and Company Foundation, the Jalmari and Rauha Ahokas Foundation, the Research Foundation of Orion Corporation, the Yrjö Jahnsson Foundation, the Finnish Cultural Foundation, the Finnish Medical Foundation and the Päivikki and Sakari Sohlberg Foundation. We thank the staff of Adolescent Unit 70 of Oulu University Hospital for data collection, and all the adolescents who participated in this study.

Conflict of interest and funding

The authors have not received any funding or benefits from industry or elsewhere to conduct this study.

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Citation: Int J Circumpolar Health 2012, **71**: 17393 - DOI: 10.3402/ijch.v71i0.17393

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Citation: Int J Circumpolar Health 2012, **71**: 17393 - DOI: 10.3402/ijch.v71i0.17393