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Comorbid psychiatric disorders in a clinical sample of adults with ADHD, and associations with education, work and social characteristics: a cross-sectional study

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ABSTRACT

Objectives Adults with attention-deficit hyperactive disorder (ADHD) report high rates of comorbid disorders, educational and occupational failure, and family instability. The aim of this study was to examine the prevalence of comorbid psychiatric disorders in a clinical population of adults with ADHD and to examine associations between educational level, work participation, social characteristics and the rates of psychiatric comorbidity.

Methods Out of 796 patients diagnosed with ADHD in a specialised outpatient clinic in Oslo, Norway, 548 (68%) agreed to participate in this cross-sectional study: 277 women and 271 men. ADHD was diagnosed according to Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition criteria. Comorbid disorders were diagnosed using the Mini-International Neuropsychiatric Interview.

Results In this clinical sample, 53.5% had at least one current comorbid psychiatric disorder. The most prevalent disorders were major depression, substance use disorders and social phobia. Women had more eating disorders than men, whereas men had more alcohol and substance use disorders. Education above high school level (>12 years) and work participation were associated with lower rates of comorbid disorders (adjusted ORs 0.52 and 0.63, respectively). Gender, age, marital status, living with children or living in a city were not associated with comorbidity.

Conclusions Adult ADHD is associated with high rates of comorbid psychiatric disorders, irrespective of gender and age. It appears that higher education and work participation are related to lower probability of comorbidity.

Strengths and limitations of this study

► The study had a naturalistic design, recruiting adult patients with attention-deficit hyperactive disorder from a large area and with no exclusion criteria.
► Rate of consent and the number of participants were high.
► Private clinics may recruit patients with higher social status resulting in a selection bias.

The prevalence of psychiatric disorders other than ADHD is higher in adults with ADHD than in the general population, with rates of comorbid disorders ranging from 47% to 89% in various clinical samples.[6–12] The most commonly reported comorbid disorders are drug abuse, anxiety disorders and mood disorders.[10 11] There is some evidence of gender differences, with women reporting higher rates of mood disorders, panic disorder, eating disorders and somatisation, although these findings are not entirely consistent.[8 13 14] In comparison, men with ADHD have higher prevalence of drug abuse.[8 14]

Social surroundings, such as spouse and children, and socioeconomic circumstances, such as education, work and income, are important aspects of mental health.[15] Low socioeconomic status, lower education, unemployment, marital disruption or family difficulties are associated with higher prevalence of psychiatric disorders in the general population.[16–20] Adults with ADHD have lower education and higher rates of unemployment than the general population,[21 22] and they have more family instability over time.[23] Still, we have found few studies that have examined whether or to what extent social characteristics are associated with comorbid psychiatric disorders in adults with ADHD.

INTRODUCTION

Attention-deficit hyperactive disorder (ADHD) is a neuropsychiatric disorder with core symptoms of inattention, hyperactivity and impulsivity.[1] The population prevalence of adult ADHD is reported to be 3%–5%.[2 3] Adult ADHD causes impairment and suffering.[4 5] Also, various comorbidities in the sense of additional psychiatric disorders are associated with considerable functional impairment and burden to family and society.[2]

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In a German study of adult patients with ADHD, those with a lifetime diagnosis of a comorbid psychiatric disorder were more often unemployed than patient with pure ADHD.[6] However, patients with and without comorbidity did not differ in education or partnership functioning. Due to the limited number of patients assessed (n=70), the authors emphasised the need for studies with larger sample size.

In accordance with findings in the general population, we hypothesised that social surroundings such as family and children, and socioeconomic circumstances such as education and work, are associated with comorbid psychiatric disorders in patients with ADHD. We aimed to estimate the prevalence of comorbid psychiatric disorders in a clinical population of adults diagnosed with ADHD. Then, we wanted to examine whether gender, age and social characteristics, such as marital status, living with children, living in a city, level of education and occupational status were associated with rates of comorbidity.

METHODS
Participants
The study sample consisted of adult patients who fulfilled the criteria for ADHD according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV).[1] They were admitted to a private outpatient clinic in Oslo, Norway, that is specialised in medical examinations and treatment of ADHD. Recruitment was conducted in the years from 2005 to 2015. During these years, a total of 796 patients were found to meet the diagnostic criteria of ADHD and asked to participate in the study. The patients were self-referred (65%) or referred by general physicians, specialists or neuropsychologist (35%).

Out of 796 patients with ADHD, 533 actively consented to participate in the study. Also included, with approval of the Regional Medical Ethics Committee, were 15 patients who had died after the examination. In total, 548 patients were included (68.8%). Assessments and handling of data were carried out in accordance with ethical standards and the principles of the Declaration of Helsinki.

Measures
A psychiatric examination was undertaken for all patients included in the study. All patients had prior to assessment either been to a neuropsychological examination, or examined by a special educational teacher with experience and expertise in the use of Wechsler Adult Intelligence Scale-III (WAIS-III)[24] and ADHD. These have concluded with concentration and attention deficiency, and evidence of ADHD. Finally, the diagnosis of ADHD required six out of nine symptoms of inattention or six out of nine symptoms of hyperactivity or impulsivity present for at least 6 months prior to assessment, causing impairment, according to the diagnostic manuals of DSM-IV.[1] The symptoms must cause significant impairment in social, academic or occupational functioning.

Furthermore, some hyperactive, impulsive or inattentive symptoms must have been present before age of 7 years. Parents, teachers or other relevant persons were interviewed about the patients' childhood, when possible, to confirm whether they met the criteria for ADHD in childhood. We recorded if the patient fulfilled the criteria for predominantly inattentive type—attention-deficit disorder (ADD), predominantly hyperactive-impulsive type—hyperactive disorder (HD) or combined type—ADHD.[1]

Age, sex, educational background, occupational and marital status and whether they were living with children and lived in or outside Oslo city were recorded. Comorbid disorders were diagnosed using the Mini-International Neuropsychiatric Interview (M.I.N.I.), which is a brief and valid structured clinical interview.[25] This interview enables researchers to make diagnoses of psychiatric disorders according to DSM-IV criteria.[1] We used the Norwegian version of the M.I.N.I., V.5.0.0., that has been validated in clinical settings and has shown good psychometric properties.[26 27]

IQ was measured in a subsample of participants (n=341), using the WAIS-III test.[24]

Statistical analysis
We performed X^2 tests or Student's t-test to compare sociodemographic characteristics of participants and non-participants, and to compare rates of comorbidity in men and women, and in diagnostic subgroups of ADHD. We used logistic regression analyses to examine associations between levels of education, work participation and social characteristics, and rates of comorbidity. Confounding effects of IQ were tested in a subsample. All tests were two tailed and differences were considered significant if P<0.05. All statistical analyses were done using the software package SPSS V.22.

RESULTS
Table 1 shows levels of education, work participation and social characteristics of participants. Participants had higher age and higher education than non-participants, and more participants were living with children and in urban areas (data not shown).

Table 2 shows current comorbid psychiatric disorders among the participants. Half of both women and men had at least one comorbid disorder, and a quarter had at least two comorbid disorders. The most prevalent comorbid disorders were major depression, substance abuse or dependence and social phobia. There were some gender differences. More women had bulimia or anorexia, and more men had alcohol and substance use disorders. Substance dependence was the most prevalent comorbid disorder in men, whereas major depression was the most prevalent one in women.

When divided into subtypes, 74 (13.5%) of the patients had the predominantly inattentive type (ADD), none had the predominantly hyperactive-impulsive type (HD) and

Table 1 Demographic description of adult patients diagnosed with attention-deficit hyperactive disorder (ADHD) in a psychiatric clinic specialised in examination and treatment of ADHD

	Women, n=271 (50.5)	Men, n=277 (49.5)	All (N=548)
Age			
Mean years (SD)	36.2 (11.3)	37.4 (10.7)	36.6 (11.0)
Range years	18–69	18–67	18–69
Married/cohabitant, n (%)			
Yes	112 (41.3)	126 (45.5)	238 (43.4)
No	159 (58.7)	151 (55.5)	310 (56.6)
Living with children, n (%)			
Yes	98 (36.2)***	149 (53.8)	247 (45.1)
No	173 (63.8)	128 (46.2)	301 (54.9)
Years of education, n (%)			
>15	23 (8.5)	25 (9.0)	48 (8.8)
13–15	95 (35.1)	110 (39.7)	205 (37.4)
≤12	153 (56.5)	142 (51.3)	295 (53.8)
Working, n (%)			
Yes	176 (64.9)*	155 (56.0)	331 (60.4)
No	95 (35.1)	122 (44.0)	217 (39.6)
Residence, n (%)			
City	176 (64.1)	168 (60.6)	380 (69.3)
Rural	95 (35.1)	109 (39.4)	168 (30.7)

*p<0.05 and ***P<0.001 (women compared with men).

473 (86.3%) had the combined type. Participants with the combined type had higher prevalence of comorbid disorders (55.7%) than those with the predominantly inattentive type (39.2%, P=0.008).

Table 3 shows the association between levels of education, work and social characteristics, and the occurrence of any current comorbid psychiatric disorder. Higher education and work participation were associated with lower probability of comorbidity. Gender, age and whether the patients were married or cohabitant, or whether they were living with children, or living in Oslo versus more rural areas outside Oslo, were not significantly associated with comorbidity.

Analyses in a subsample of participants that had data on IQ (n=341) revealed no significant association between IQ and comorbidity (OR 1.01, 95% CI 0.97 to 1.06, P=0.62). IQ had no confounding effects in models of multiple logistic regression (data not shown). Also, IQ was not significantly associated with levels of education or work participation. There were no significant differences between the IQ subsample and the non-IQ subsample in gender, age or any of the social characteristics.

Regarding individual diagnoses, higher education was associated with lower risk of social phobia (OR: 0.67 95% CI 0.50 to 0.97, P=0.033). Work participation was associated with lower risk of major depression (OR 0.58,

95% CI 0.37 to 0.91, P=0.017), substance abuse (OR 0.29, 95% CI 0.10 to 0.84, P=0.022), substance dependence (OR 0.44, 95% CI 0.28 to 0.69, P<0.001) and post-traumatic stress disorder (OR 0.52, 95% CI 0.31 to 0.87, P=0.013).

DISCUSSION
In this clinical sample of adults with ADHD, about half of the participants had at least one comorbid psychiatric disorder, irrespective of gender and age. The most prevalent disorders were major depression, substance use disorders and social phobia. Women had more eating disorders than men, whereas men had more alcohol and substance use disorders. Higher education and work participation were associated with lower probability of comorbidity.

Prevalence of comorbid disorders
The 50% prevalence of a comorbid mental disorder was similar or in the lower range of what was found in other studies of adults with ADHD.[6–12] The disorders in question are the same as those common in the general population, but appeared to exist to a greater extent.[28] In fact, the point prevalence of a comorbid psychiatric disorder was about twice as high in this study, as an average 12 months prevalence of common mental disorders in the general population of various Western countries.[17 29–32]

Education and work
The high comorbidity of mental disorders in people with ADHD may have several reasons, such as coinciding genetic dispositions for mental disease, increased psychological vulnerability due to ADHD symptomology or lower resilience due to adverse social or socioeconomic consequences of ADHD. Our results are most relevant to the possible effects of social and socioeconomic factors. The finding that unemployment was associated with higher probability of psychiatric comorbidity is in accordance with a German study that showed that patients with ADHD with a lifetime diagnosis of a comorbid psychiatric disorder were more often unemployed than patient with pure ADHD.[6] Unlike that study, we found that education was also related to psychiatric comorbidity. Both findings make sense when compared with evidence from general population studies. Psychiatric morbidity is more common among unemployed and people with less education,[28 32 33] and rates of almost all psychiatric disorders decline with increased income and education.[34]

Some authors have suggested that educational attainment may represent a proxy for IQ because individuals with higher IQs stay longer within education.[35] In our study, however, the relationship between education and comorbid mental illness was independent of IQ, and IQ was poorly related to comorbidity. Although the assessment of IQ was limited to a smaller sample, our findings indicate that there may be other factors that are more important for educational attainment in people with

Table 2 Prevalence of current comorbid disorders in a clinical population of 548 adult patients diagnosed with attention-deficit hyperactive disorder

	Women, n=277	Men, n=271	Total, N=548
Major depression	48 (17.3)	47 (17.3)	95 (17.3)
Suicidality	15 (5.4)	12 (4.4)	27 (4.9)
Social phobia	41 (14.8)	37 (13.7)	78 (14.2)
Agoraphobia	20 (7.2)	5 (1.9)	25 (4.6)
Panic disorder	14 (5.1)	11 (4.1)	25 (4.6)
General anxiety disorder	17 (6.1)	11 (4.1)	28 (5.1)
Post-traumatic stress disorder	40 (14.4)	25 (9.2)	65 (11.9)
Alcohol abuse	1 (0.4)	4 (1.5)	5 (0.9)
Alcohol dependence	11 (4.0)*	27 (10.0)	38 (6.9)
Substance abuse	2 (0.7)*	14 (5.2)	16 (2.9)
Substance dependence	26 (9.4)***	64 (23.6)	90 (13.5)
Bulimia/anorexia	36 (13.0)***	3 (1.1)	39 (7.1)
Obsessive-compulsive disorder	18 (6.5)	14 (5.2)	32 (5.8)
Bipolar disorder	32 (11.6)	23 (8.5)	55 (10.0)
Psychotic disorder	4 (1.4)	9 (3.3)	13 (2.4)
At least one comorbid disorder	151 (54.5)	142 (52.4)	293 (53.5)
At least two comorbid disorders	70 (25.3)	56 (21.0)	126 (23.0)

Figures are given as numbers (percentages). All diagnoses are done according to Mini-International Neuropsychiatric Interview.
*p<0.01; ***P<0.001 (women compared with men).

ADHD than intelligence, and that intelligence does not protect against comorbid mental illness.

Work and educational success may increase income and social status and serve as important arenas for investment in social capital, all important for prevention of mental illness. It is also possible that individuals with a current comorbid mental disorder have a previous history of mental illness that made it harder to get education and work. Socioeconomic factors and mental health may have interfered with each other in a dynamic process that has affected education, work performance and the probability of mental illness.

Individual disorders

Some diagnoses such as major depression, bipolar disorder, substance use disorders and eating disorders appeared to be far more common than what has been found in the general Norwegian population.[32] The reason may vary for various disorders. While inadequacy in coping with life stressors has repeatedly been proposed as a theory of depression,[36 37] a need for self-medication to alleviate ADHD symptoms has been suggested to explain the relationship between ADHD and substance use.[38 39] Our findings suggest that getting a job can be preventive to both depression and substance use disorders, or the

Table 3 Risk of at least one current comorbid psychiatric disorders in a clinical sample of 548 adult patients with attention-deficit hyperactive disorder (logistic regression)

	Crude/unadjusted		Adjusted	
	OR (95% CI)	P value	OR (95% CI)	P value
Sex (female vs male)	1.09 (0.78 to 1.52)	0.62	1.04 (0.73 to 1.48)	0.85
Age (increase in 10 years)	1.05 (0.90 to 1.23)	0.52	1.11 (0.94 to 1.32)	0.22
Marriage/cohabitant (yes vs no)	0.78 (0.56 to 1.10)	0.15	0.75 (0.50 to 1.13)	0.16
Living with children (yes vs no)	1.03 (0.73 to 1.44)	0.87	1.35 (0.88 to 2.09)	0.17
Living in Oslo (yes vs no)	1.08 (0.77 to 1.52)	0.67	1.13 (0.78 to 1.64)	0.51
Education				
≤12 (Reference)	–	–	–	–
13 – 15	0.57 (0.40 to 0.82)	0.003	0.56 (0.39 to 0.81)	0.002
>15	0.32 (0.17 to 0.61)	0.001	0.33 (0.17 to 0.63)	0.001
Working (yes vs no)	0.65 (0.46 to 0.92)	0.015	0.63 (0.43 to 0.92)	0.018

disorders may coincide with previously reduced health which has affected the ability to work.

The gender differences in our study, with more eating disorders among women and more alcohol and substance use disorders among men, are in line with evidence from other ADHD comorbidity studies.[8 14] The gender differences are like those in the general population.[28 32 34] Conceptually, it is impossible to know to what extent they are unique to ADHD or simply reflect general population patterns of gender-specific aetiology.[40]

Methodological considerations

Benefits of the study include a naturalistic design with inclusion of patients admitted to examination or treatment of ADHD; they were recruited from a large area and over a long period of time. There have been no exclusion criteria; each individual who met the ADHD criteria was asked to participate in the study. The rate of consent and the number of participants were high.

Some limitations of this study should be noted. First, the cross-sectional design does not allow conclusions about causality. Future longitudinal studies are needed to explore the nature of the association between education, work participation and mental health in people with ADHD. Second, the inclusion of patients attended to a private ADHD clinic questions the representativeness of the study sample for the adult population with ADHD in general. Some adults with ADHD never come to medical examination at all; others are referred to the public health service. Private clinics may recruit patients with higher social status and better finances. Compared with patients with ADHD in the Norwegian public health service,[10] our participants had greater participation rate in work and less comorbid disorders. However, we believe that bias in the sample selection may primarily affect the frequency estimates of socioeconomic factors or comorbid disorders and to a lesser extent their relationship.[41 42] Third, we restricted our examination to 16 axis I DSM-IV disorders that are common in the general population[25] and do not know if other comorbid psychiatric disorders may exist in adult people with ADHD. For example, we have no information about personality disorders. Finally, we did not collect data on income and wealth. Such data might indicate whether it was the work in itself, or what it caused by financial benefits that was related to mental health.

Implications

Clinicians should be aware of high rates of comorbid mental disorders in adults with ADHD. Symptoms of comorbid mental disorders may complicate the examination of ADHD or the evaluation of treatment. In other cases, it may be complicated to detect and treat comorbid disorders because symptoms are obscured by ADHD symptomatology. It has been suggested that people with ADHD should be screened for depression, anxiety and substance use.[43] Another suggestion is that clinicians should consider ADHD evaluation and treatment as part of the management of substance use disorders.[39]

Likewise, the presence of treatment-resistant depression should arise attention to a possible presence of ADHD.[44]

There is convincing evidence that social capital is protective against developing common mental disorders,[45] which may be equally valid for people with ADHD. People with ADHD report inferior educational and occupational attainment.[21 22 46] In the present sample of patients with ADHD, 60% had work compared with 70%–80% of adults in the Norwegian general population.[47] In other Norwegian populations of adult patients with ADHD, work participation has been even lower, ranging from 24%[46] to 44%.[10]

Thus, there is reasonable evidence to implement and evaluate interventions to facilitate education and work participation in people with ADHD. The effectiveness of such intervention in preventing mental disorders should be evaluated in longitudinal studies.

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