Attention-Deficit/Hyperactivity Disorder (ADHD) in Grown-Ups: Administrative Data on Co-Existing Conditions

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Abstract

ADHD in children and adolescents is associated with substantial comorbidity. Longitudinal studies have shown ADHD to frequently persist into adulthood.

Objectives: To use administrative data from Nordbaden / Germany to assess the extent of co-existing medical conditions in grown-ups with a diagnosis of ADHD (Hyperkinetic Disorder: ICD-10 F90.0, F90.1).

Methods: Using the comprehensive claims database of the official physicians' organization of Nordbaden (KVNB, with an insured population of 2.234m in 2003), n=630 ADHD patients age 20 and beyond were identified. The ADHD group was matched with a non-ADHD cohort (n=630) on a 1:1 ratio based on age and gender, and the rate of co-existent conditions was compared between both groups. Chi-square statistics was used to explore levels of significance.

Results: The most prevalent psychiatric conditions associated with ADHD in adults included depressive episodes (F32: prevalence 30.3%; relative risk [RR] 7.1*** [p<0.001]), recurrent depressive disorder (F33: 14.3%, RR 12.9***), persistent mood disorders (F34: 7.0%, RR 11.0***), anxiety disorders (F41: 15.7%, RR 5.8***), adjustment disorders (F43: 18.9%; RR 6.6***), other neurotic disorders (F48: 8.6%, RR 6.8***), specific personality disorders (F60: 14.1%; RR 22.3***), other behavioral/emotional disorders with onset in childhood/adolescence (F98: 9.0%; RR 57.0***), mental/behavioral disorders due to substance use (F19: 4.9%; RR 7.8***) or due to use of alcohol (F10: 4.6%; RR 5.8***), and eating disorders (F50: 4.3%, RR 13.5***). Non-psychiatric conditions associated with ADHD included obesity, metabolic, infectious and allergic disorders, including asthma bronchiale, and diseases of the ear and hearing loss but not disorders of the eye and visual disturbances.

Conclusions: These data point to significant comorbidity associated with ADHD in grown-ups, thus underscoring the clinical relevance of the condition. They provide a basis for further epidemiological research and for analyses of the cost associated with ADHD in adult patients.

Patient Population

- **ADHD Group**
  - All SHI insured patients in the region of Nordbaden with at least one diagnosis F90.0 and/or F90.1 in 2003
- **Control Group (Matched Pairs Technique)**
  - For each F90.0/F90.1 patient, a control patient with similar demographic characteristics (age, gender, type of statutory health insurance) was randomly identified
- For both patient groups, the complete claims dataset was available from the KV database

Age group	Overall n	Male n	Female n
20-29 Years	223	148	75
30-39 Years	161	79	82
40-49 Years	136	82	54
>50 Years	110	47	63
Total	630	356	274

Patients with Co-Existing Conduct Disorder			
Age Group	Total	Male	Female
20-29 Years	15%	20%	7%
30-39 Years	10%	11%	9%
40-49 Years	15%	10%	22%
>50 Years	25%	19%	30%
Total	16%	15%	16%

Key Findings & Observations

Key Findings: Co-Existing Psychiatric Conditions[1]

- **Mood / affective disorders (61.8% vs. 14.3% in control group)**
- **Conduct & personality disorders (33.2% vs. 0.6%)**
- **Adjustment disorders (18.9% vs. 3.0%)**
- **Sleep disorders (11.3% vs. 2.3%)**
- **Disorders due to substance abuse (7.8% vs. 1.9%)**
- **Disorders due to brain damage (5.1% vs. 0.6%)**
- Eating disorders (4.3% vs. 0.3%)
- Specific developmental disorders (3.8% vs. 0.6%)
- Mental retardation (2.4% vs. 0.2%)
- Developmental disorders of scholastic skills (2.2% vs. 0.3%)
- Habit and impulsive disorders (1.4% vs. 0.0%)

Conspicuous Observations: Co-Existing Somatic Conditions[1]

- **Diseases of the musculoskeletal system (48.4% vs. 21.6%)**
- **Gastrointestinal disorders (41.1% vs. 21.6%)**
- **Metabolic disorders (36.5% vs. 19.0%)**
- **Diseases of the upper respiratory tract (33.7% vs. 15.2%)**
- Disorders of the genitourinary system (24.8% vs. 13.5%)
- Cardiovascular diseases (23.3% vs. 13.5%)
- Infectious diseases (22.9% vs. 10.3%)
- Diseases of the skin (22.4% vs. 12.8%)
- Disorders involving immune mechanisms (22.2% vs. 11.8%)
- Injuries, overall (21.4% vs. 14.3%)
- Neurological disorders (21.3% vs. 8.9%)
- Diseases of the ear (16.0% vs. 8.2%)
- Pulmonary diseases (14.1% vs. 5.0%)
- Diseases of the blood and blood-forming organs (7.9% vs. 3.6%)

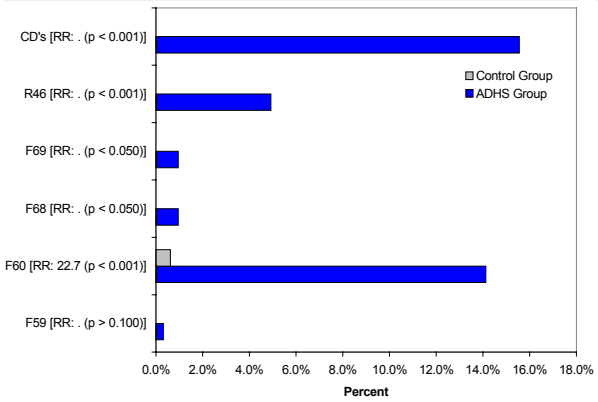
[1]Note that clusters reported here were defined on the basis of clinical judgment. For further information on cluster definition, please (a) see below, (b) contact us at www.innoval-hc.com.

For psychiatric comorbidity, only co-existing disorders with a prevalence rate >1% and a relative risk (RR) >3 are reported; for somatic comorbidity, only clusters with a prevalence rate >5% and a relative risk (RR) > 1.5 are reported.

Psychiatric Comorbidity

Conduct & Personality Disorders[2]

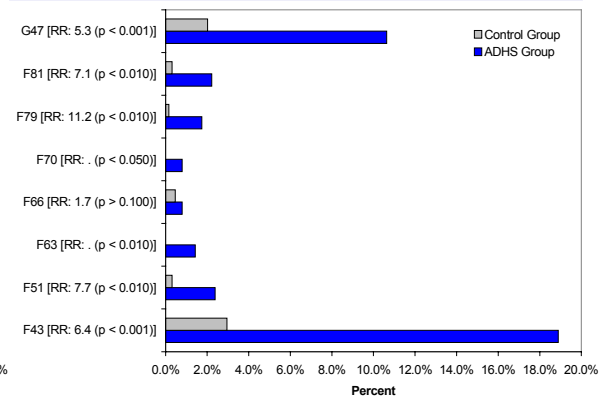
ADHD Group: 33.2% Control Group: 0.6% Ratio: 53.3 (p < 0.001)



[2] F59: Unspecified behavioural syndromes associated with physiological disturbances and; F60: Specific personality disorders; F68: Other disorders of adult personality and behaviour; F69: Unspecified disorder of adult personality and behaviour; R46: Symptoms and signs involving appearance and behaviour; CD's: Conduct disorders

Further Psychiatric Disorders[3]

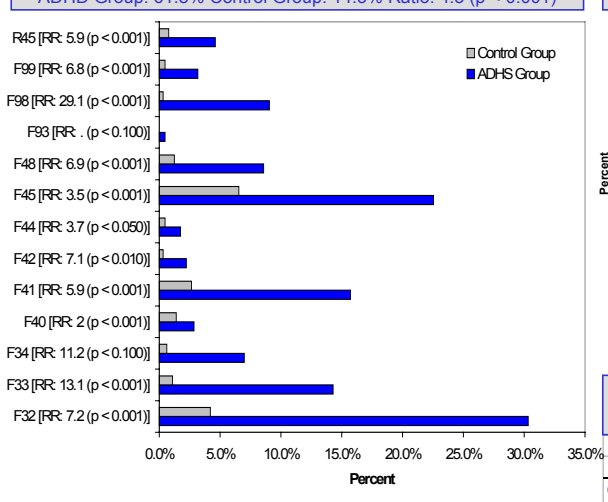
ADHD Group: 32.9% Control Group: 5.8% Ratio: 5.7 (p < 0.001)



[3]F43: Reaction to severe stress and adjustment disorders; F51: Nonorganic sleep disorders; F63: Habit and impulse disorders; F66: Psychological and behavioural disorders associated with sexual development and orientation; F70: Mild mental retardation; F79: Unspecified mental retardation; F81: Specific developmental disorders of scholastic skills; G47: Sleep disorders

Mood/Affective Disorders[3]

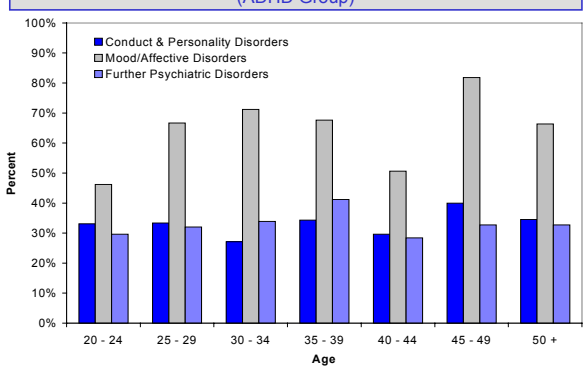
ADHD Group: 61.8% Control Group: 14.3% Ratio: 4.3 (p < 0.001)



[3]F32: Depressive episode; F33: Recurrent depressive disorder; F34: Persistent mood [affective] disorders; F40: Phobic anxiety disorders; F41: Other anxiety disorders; F42: Obsessive-compulsive disorder; F44: Dissociative [conversion] disorders; F45: Somatoform disorders; F48: Other neurotic disorders; F93: Emotional disorders with onset specific to childhood; F98: Other behavioural and emotional disorders with onset usually occurring in childhood and adolescence; F99: Mental disorder, not otherwise specified; R45: Symptoms and signs involving emotional state

Psychiatric Comorbidity by Age

(ADHD Group)



Psychiatric Comorbidity by Gender

(ADHD Group)

	Comorbidity male	Comorbidity female	male/female ratio	95% CI lower	95% CI upper
Conduct & Personality Disorders	30.1%	37.2%	0.81	0.65	1.01
Mood/Affective Disorders	55.9%	69.3%	0.81	0.71	0.91
Further Psychiatric Disorders	31.5%	34.7%	0.91	0.73	1.13

Implications

In Europe, thus far very few data only have been available on the prevalence of and comorbidity associated with ADHD in adults. Using the Nordbaden database, our analysis provides – for the first time – information on the number of patients recognized in a region of Germany in 2003.

A number of observations appear particularly noteworthy:

Administrative prevalence of ADHD in the adult population of Nordbaden

International follow-up studies of children and adolescents with ADHD have consistently documented persistence of the disorder into adulthood, with the estimated magnitude ranging widely from 8% (Mannuzza et al. 1991) to 30% (Gittelman et al.1985) or more (e.g., Wenwei 1996). Our findings, however, correspond to an administrative prevalence rate of ~0.04% among adults in Nordbaden, which is in striking contrast to the high prevalence rate (~5% among the population age 7-12 years) found for children and adolescents in the same region (cf. Schlander and Schwarz 2005). These data are consistent with the hypothesis that ADHD may remain unrecognized among many adult patients. They clearly point to a strong need for further research.

Gender differences

A puzzling finding is the male-to-female ratio, which in patients age 30 years or older is 1.05:1 in our sample. International studies have reported a ratio of about 3:2 in adults (Biederman et al. 1994), which is still lower than the ratio of about 3:1 observed in children and adolescents in Nordbaden (Schlander and Schwarz 2005). Interestingly, we also find relatively higher rates of psychiatric comorbidity in female compared to male patients in the adult sample. For instance, in patients age 40 years and older, the administrative prevalence of concomitant conduct disorder is higher in females, whereas the opposite is true in children and adolescents (Schlander et al. 2005).

Psychiatric comorbidity

Predominantly in U.S. studies, a number of conditions have been described to be associated with adult ADHD, including antisocial disorders (conduct disorder, oppositional defiant disorder, antisocial personality disorder), mood and anxiety disorders, and alcohol and drug abuse and dependence (Biederman 2004, Secnik et al. 2005). Our findings suggest that an even broader range of psychiatric disorders may be associated with ADHD in adults, thus underscoring both severity of the condition and clinical relevance of a diagnosis of ADHD. Further research will be required to elucidate the impact on health and social services utilization and associated costs.

Somatic comorbidity

Limited data have been available on somatic conditions associated with ADHD in adults. Our data suggest that a broad range of disorders, including diseases of the musculoskeletal system, gastrointestinal and metabolic disorders, pulmonary diseases and disorders of the upper respiratory tract, and hearing problems are diagnosed more frequently in adult patients with ADHD. Further research will be required to better characterize and understand patterns of co-existing conditions in adults with ADHD.

Limitations

Our findings should be interpreted in the context of the limitations of the study design. In particular, the use of diagnostic codes from claims data will not provide as rigorous information as formal diagnostic assessments would offer. More specifically, patients who receive medical attention for one condition should be more likely to have other conditions recognized, an effect which we cannot quantify reliably – though we note that not all conditions were reported more frequently in the ADHD group compared to controls matched by age, gender, and type of insurance. At the same time, some complications (such as injuries) may be underreported given the German reimbursement system.