original article

Disruptive behavior in Down syndrome children: a cross-sectional comparative study

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BACKGROUND AND OBJECTIVES: Down syndrome (DS) is associated with intellectual disability, and patients with DS show significant psychopathology. The objectives of this study were to estimate the prevalence of disruptive behavior in DS patients compared to their siblings, and to find any association between the disruptive behavior and the degree of intelligence.

DESIGN AND SETTINGS: This is a cross-sectional comparative study done in Mansoura University Children's Hospital during the period March 1, 2012–February 28, 2013.

SUBJECTS AND METHODS: In this study, 100 cases of DS and an equal number of their brothers/sisters were enrolled in the study. The Arabic version of Vineland Adaptive Behavior Scale was used for assessing social and mental intelligence quotient (IQ). The Arabic version of Mini International Neuropsychiatric Interview for Children (MINI-KID) and disruptive behavior disorder (DBD) rating scale were used for assessing disruptive behavior disorders.

RESULTS: Both social and mental IQs were significantly higher in non-DS than in DS cases. The prevalence of different variants of attention deficit/hyperactive disorder (ADHD)—impulsive, inattentive, and combined types—was significantly lower in non-DS than in DS cases; however, there was no statistical difference between both groups as regards oppositional defiant disorder and conduct disorder (CD). Also among DS cases, impulsive and combined types varied significantly with the degree of their IQ.

CONCLUSION: ADHD was more common among DS patients with a special impact of IQ on the type of psychiatric illness. We recommend psychiatric assessment for DS patients as a part of multidisciplinary management.

Down syndrome (DS) is a commonly occurring chromosomal disorder that is associated with psychiatric comorbidity in 28.9% of cases.[1] In recent years, interest in the development of perceptual, memory, and attentional processes in infants and children has increased.[2] People with mental retardation (MR) often have behavioral problems.[3] Decreased attention, hyperactivity, and impulsivity are frequently reported in children with DS.[4]

Most of the previous reviews and research on DS have been done using a developmental approach. Several studies have used non-traditional assessments of these abilities in DS children.[2] A few studies assessed DS children based on reports by parents and teachers using the Reiss psychopathology rating scale for dual diagnosis (mental disability and mental illness).[5] Other studies examined the rates and types of parent-reported problems in children and adolescents with mild MR using the Five to Fifteen questionnaire.[6]

Martin and Fernández[7] found that 3% to 7% of school children in the general population have attention deficit disorder. However, Hastings et al[8] found that the prevalence was higher (up to 14.8%) in mentally handicapped children.[8,9]

Greater hyperactivity has also been described in DS children from 5-11 years of age when they are compared with a sibling group.[10] Disruptive behavior disorders were also common in patients with DS of less than 20 years.[11]

We aimed to assess the prevalence of childhood disruptive behavior in DS patients and their siblings,

and to find any association between the disruptive behavior and the degree of intelligence.

SUBJECTS AND METHODS

This study was carried out in Mansoura University Children's Hospital, Egypt, during the period from March 1, 2012, to February 28, 2013 (duration of 1 year). This is a cross-sectional comparative study including 100 cases of DS and an equal number of their brothers or sisters as a comparison group. All children with DS registered at the Genetics Unit of Mansoura University Children's Hospital, Egypt, were enrolled; they fulfilled the following inclusion criteria: positive karyotype of trisomy 21, age range from 6-16 years, and willingness of their parents/caregivers to participate in the study. Exclusion criteria were a positive family history of any psychiatric disorders including MR, childhood disruptive disorders, and substance abuse disorders. The control group was family based of nearly matched age and sex to minimize the impact of genetic, socioeconomic, and environmental factors on the prevalence rate of psychiatric disorders. The comparison group included 1 sibling per index case matched in sex and age (3 years above and below the index case).

All procedures followed were in accordance with the ethical standards of the Research Ethical Committee of Faculty of Medicine, Mansoura University, Egypt, and with the Declaration of Helsinki of 1975, as revised in 2000. All parents gave fully informed consents before their inclusion in the study.

Children of both groups and their parents were interviewed in the outpatient clinic in mutually agreed days. Social worker/psychologist/nurse contacted parents and arranged with them the day of interview. Out of 113 contacted parents, 100 completed the interview (response rate=88.5%). DS cases were suspected by phenotype and confirmed by karyotyping. These were registered cases in the Genetic Unit and were on regular follow-up. The siblings were phenotypically completely normal and there was no need for karyotyping.

Social and mental intelligence quotients (IQs) were examined by the Arabic version of Vineland Adaptive Behavior Scale.[12] The Arabic version was validated with good reliability and validity and used in many studies in Arab Countries.[13] The parent/caregiver rating form used in this study was presented in the checklist format and was translated into Arabic.[14] For assessing disruptive behavior disorders (attention deficit/hyperactive disorder [ADHD], oppositional defiant disorder (ODD), and conduct disorder [CD]), all patients and their brothers or sisters were interviewed by a psychiatrist using the Arabic version of Mini International Neuropsychiatric Interview for Children (MINI-KID)[15,16] and disruptive behavior disorder (DBD) rating scale.[17,18] For children under 13 years, the psychiatrist interviewed the parent and the child together. Questions were directed to the child, but the parent was encouraged to interject if s/he felt that the child's answers were unclear. We sometimes needed to use more examples and explanations to help the child understand the scale question. The final decision was made based on the best clinical judgment, whether the child's answers met the diagnostic criterion in question. Finally, the diagnoses were done according to DSM-IV-TR criteria.[19]

The DBD rating scale consists of 42 items with response categories ranging from not at all (0) to very much.[3] DBD parent/teacher rating scale includes items related to symptoms of ADHD-inattentive (9 items), ADHD-hyperactivity/impulsivity (9 items), CD (16 items), and ODD (8 items). Moreover, the ADHD subscale also measures the ADHD-combined type (items 9, 18, 23, 27, 29, 34, 37, 42, 44, 1, 7, 12, 19, 22, 25, 30, 33, and 35) in children. If 6 or more items are endorsed for ADHD-inattentive type and 6 or more items are endorsed for ADHD-hyperactive/impulsive type, then criteria is met for ADHD-combined type. CD subscale measures symptoms related to aggression toward people and animals, destruction of property, deceitfulness or theft, and serious violation of rules. All items of the DBD rating scale were completely in accordance with the DSM-IV diagnostic criteria 19. Moreover, items 10, 14, and 21 were not included in the scoring when DSM-IV criteria were used for assessing childhood behavioral disorders[20]; therefore, these items were not recorded in this study. These items were present in the DSM-III-R20 but were not included in the DSM-IV.[19] The test was translated into Arabic by 4 authors, which resulted into 4 different Arabic forms of the DBD scale. Then 4 translators and 3 professors of psychiatry in Mansoura Faculty of Medicine, who were not involved in the translation process, created a single form of the test. The professors of psychiatry were asked to evaluate the clarity of the items and their suitability for measuring the concept of the scale within the Egyptian population. After that, the Arabic version of the DBD was back translated into English by a native English speaker living in Mansoura 5 years ago in British Council for translation and language training; this person was unaware of the original English document. Once the back translation finished, the board was asked to review and determine the difference between back translation and the original scale. Then, it was tested on 30 patients.

Item-total correlations for the scale ranged from 0.140 to 0.778, and Chronbach α was 0.948, which is very highly significant.

Data was analyzed using SPSS, version 16.0 (SPSS Inc, Chicago, IL, USA). Quantitative variables were measured as mean (SD), and unpaired *t* test was used for comparison between the 2 groups. Qualitative variables were presented as percent, and chi-square test (χ^2) or Monte Carlo (in small frequencies) test was used for group comparisons. $P \leq .05$ was considered statistically significant.

RESULTS

Both groups were comparable (no statistically significant differences) in their age and sex. The mean age of DS was 8.2 (2.6) compared to 8.2 (2.7) in the control group (t=0.46, P=.65). The males accounted for 58% in the DS group versus 66% in the control group (χ^2=1.4, P=.24) (data not shown in tables).

The means of both social and mental IQs were significantly higher in non-DS than in DS cases (97.2 and 98.3 vs. 53.3 and 50.1, respectively) (**Table 1**).

Table 2 shows that the prevalence of ADHD, ADHD-impulsive, ADHD-inattentive, and ADHD-combined, was significantly lower in non-DS than in DS cases ($P \leq .001$). Oppositional defiant and CDs were more prevalent in non-DS than in DS cases; however, the differences between both groups were not statistically significant. All non-DS cases had normal IQ, whereas the majority of DS cases were either of moderate (48.0%) or mild (36.0%) IQ.

Among DS cases, ADHD-impulsive and ADHD-combined types varied significantly with the degree of their IQ. The prevalence of ADHD-impulsive was 62.5% and 66.7% in moderate MR and severe MR, respectively, as compared to none in other categories of MR. The prevalence of ADHD-combined was 29.2% and 33.3% in moderate MR and severe MR, respectively, as compared to none in other categories of MR (**Table 3**).

Table 1. Social and mental IQs in both groups.

	Non-Down (100) Mean (SD)	Down (100) Mean (SD)	*t*	*P*
Social IQ	97.2 (2.7)	53.3 (13.8)	31.2	≤.001
Mental IQ	98.3 (2.9)	50.1 (13.6)	34.8	≤.001

IQ: Intelligence quotient; SD: standard deviation.

Table 2. Prevalence (%) of disruptive disorders and degree of mental retardation in both groups.

	Non-Down (100)	Down (100)	χ^2	*P*
ADHD	8.0	56.0	52.9	≤.001
ADHD--impulsive	6.0	34.0	24.5	≤.001
ADHD-inattentive	4.0	38.0	34.8	≤.001
ADHD-combined	2.0	16.0	11.97	≤.001
Oppositional defiant	14.0	8.0	1.8	.18
Conduct disorders	10.0	4.0	2.8	.1
IQ categories				
Normal	100.0	0		
Below average	0	2.0	≤.001 *	
Borderlines	0	8.0		
Mild MR	0	36.0		
Moderate MR	0	48.0		
Severe MR	0	6.0		

ADHD: Attention deficit/hyperactive disorder ; IQ: intelligence quotient; MR: mental retardation.
*Monte Carlo test

DISCUSSION

The present study shows that the means of both social and mental IQs were significantly higher in non-DS than in DS cases. All non-DS cases had normal IQ, whereas the majority of DS cases were either of moderate or of mild MR. This could be explained by the fact that trisomy 21 is the most common genetic cause of MR.[22] Hastings et al.[8] cited that 18% to 38% of children with DS are mentally retarded. So, many authors considered MR to be the invariable hallmark disorder of DS and the most invalidating pathological aspect contributing to about 30% of all moderate-to-severe cases of MR.[23-25] Early infants with DS show delayed cognitive development, leading to mild-to-moderate MR and decrease of the IQ from early in the first year to late childhood.[26,27]

This study found that the prevalence of ADHD, ADHD-impulsive, ADHD-inattentive, and ADHD-combined types were significantly lower in non-DS than in DS cases. Hyperactivity and impulsivity mean that children with DS and ADHD have a high risk of hurting themselves as a result of an accident, running away, getting lost, etc. Similar results were found by Pueschel et al[10] who cited that greater hyperactivity was described in DS children from 5–11 years of age when they were compared with a sibling group. Moreover, Carter et al.[28] found that there was also a strong link between autistic spectrum disorders and ADHD and DS. Martin and Fernández[7] found that, attention deficit disorder with or without hyperactivity or impulsivity (ADHD) affects approximately 3% to 7% of school children in the general population; however, in mentally handicapped children this figure was as high as 14.8%[8] and in DS it could reach 9%.[9]

Table 3. Prevalence (%) of disruptive disorders according to the degree of IQ in DS.

Degree of mental retardation	Below average (2)	Borderlines (8)	Mild (36)	Moderate (48)	Severe (6)	*P*[a]
ADHD	0	50	50	62.5	66.7	.4
ADHD-impulsive	0	0	0	62.5	66.7	≤.001
ADHD-inattentive	0	50	50	29.2	33.3	.3
ADHD-combined	0	0	0	29.2	33.3	.005
Oppositional defiant	0	0	0	16.7	0	.06
Conduct disorders	0	0	5.6	4.2	0	1.0

[a]*P* for Monte Carlo test. ADHD: Attention deficit/hyperactive disorder; DS: Down syndrome; IQ: intelligence quotient.

ADHD does not normally appear in isolation, and it is usually associated with other disorders (comorbidity).[29] A total of 40% to 60% of the ADHD population has an ODD; 20% to 40% have an antisocial behavior disorder.[30] In the contrary, the present study found that although oppositional defiant and CDs were more prevalent in the non-DS group of patients than in the DS group, the differences between both groups was not statistically significant. A possible explanation is that in our culture when a family has a handicapped child, all family members try to provide them with best care, which may be at the cost of care provided to other family siblings who in turn react by aggression, refusal rules, and disruptive behavior. These behaviors consist of a number of persistent activities such as destructiveness, stealing, fighting, fire-setting, temper tantrums and uncooperativeness. This is not in harmony with previous studies In which disruptive behaviors, anxiety disorders, and repetitive behaviors were common in patients with DS aged less than 20 years.[11] Also, Prasher and Shaffulia[31] found that psychiatric disorders are more common in children and adults with DS than in the general population, with a wide range of disorders reported including CDs. Gath and Gumley[9] and Myers and Pueschel[32] confirmed the presence of oppositional defiant and CDs in children with DS. Prasher and Shaffulia[31] cited that these and subsequent studies dispelled the myth that all children with DS were "friendly and loveable" and caused little distress to their parents. A small group of children with DS can be extremely difficult to care for. Their management is not too dissimilar to children from the general population where a strict regime and/or medication are required. The difference in the results between previous studies and the current study could be attributed to the difference in cultural norms and study design (control group in this study).

Among DS cases, ADHD-impulsive and ADHD-combined varied significantly with the degree of their IQ. The prevalence of ADHD-impulsive was 62.5% and 66.7% in moderate MR and severe MR, respectively, compared to none in other categories of MR. The prevalence of ADHD-combined was 29.2% and 33.3% in moderate MR and severe MR, respectively, compared to none in other categories of MR. This is in harmony with a previous study that found ADHD is more frequent in patients with MR than in the general population with a prevalence rate between 4% and 15%.[33] In a study in the US, at least 15% of individuals with a profound level of MR may meet criteria for ADHD even if the mental age has been taken into account.[34]

We can conclude that ADHD was more common among DS patients with a special impact of IQ on the type of psychiatric illness. Children with ADHD show persistent restlessness, impulsiveness and/or inattention. Moreover, Children with ADHD are also more likely than average to have other problems such as anxiety, depression, coordination difficulties, reading difficulties, and dyslexia. Therefore, psychiatric assessment as a part of multidisciplinary management is recommended for all DS patients to avoid any adverse social effects and to allow for the future ordinary school merge. We suggest performing this assessment as early as child could express himself (6 years or older) and to repeat it annually.

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