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Review Article

Tourette's Syndrome; Is there a causal link to Violence?

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Abstract

A narrative review of current literature was carried out to see whether Tourette's syndrome is a cause of violence among patients. Two internet based resources were searched and seventeen eligible original studies were included in the review. Majority of the studies demonstrated that Tourette's syndrome on its own does not cause violence but instead co-morbid conditions like Attention deficit hyperactivity disorder (ADHD) increased the likelihood of violence in patients directed towards self and others.

Key words

Violence, Tourette's syndrome, Tics, ADHD

Introduction

Tourette's syndrome (TS) was first described by Gilles de la Tourette (de la Tourette, 1885). It is primarily a genetic disorder, causing neurological abnormalities through disrupting chemical balance of the brain, which in turn causes secondary physical motor and vocal tics, leading to psychological and social problems (De Lange & Olivier 2004). Behavioural problems have been reported in 60% to 80% of patients with Tourette's syndrome and take the form of explosive & disruptive behaviour, anger outbursts or rage attacks, refusal to follow directions, excessive argumentativeness and even physical aggression (Burd et al.1994). Implications of aggressive behaviour are significant for patients as well as families, who suffer physically and psychologically (De Lange & Olivier 2004).

Violence, in general, is a combination of aggressive and disruptive behaviour. According to The World Health Organization (WHO), violence can be directed against oneself, another person or against a group or community (Krug et al., 2002). As behavioural problems are common in Tourette's syndrome, aggressive and disruptive behaviour may or may not be a direct consequence of Tourette's syndrome. This literature review was carried out to see if violence is independently associated with Tourette's syndrome.

Methodology

A literature search was carried out using two resources; Medline and Psychinfo. Several key words were used individually as well as in different combinations (tic* and aggression or tourette*, tic* and aggression and tourette*, tic* or tourette* and angry, tourette* and violence, tic* and tourette* and violence, tic* and violence, tourette* and violence, tic* and aggression*, tourette* and aggression).

Original articles published before May 2015 were included if relevant. 17 original relevant studies were included in this narrative review. These studies included case reports, observational cross sectional studies and case control studies.

Results

Studies demonstrating co-morbid conditions in Tourette's syndrome:

In a prospective cohort, Budman et al., (2003) studied 48 children with Tourette's syndrome (TS) between ages 7 and 17 years consecutively presenting with rage attacks using Rage Attacks Screen and Questionnaire. Co-morbidity and rage status were assessed by a research clinician blinded to the patient's previous diagnosis, co-morbidity, rage status and concurrent medication usage. The mean number of current psychiatric co-morbidities was 2.8 (range 0 to 5, S.D 1.3).

Cheung et al., (2007) retrospectively studied case records of patients from movement disorder clinic over the previous 3 years and patients meeting the Tourette syndrome's diagnostic criteria were identified and their case records were further reviewed for evidence of malignant TS (a rare and severe form of TS). Of 411 patients with tic disorders, 333 met the Tourette Syndrome Classification Study Group (TSCSG) criteria for TS. 17 (5.1%) of these patients met criteria for malignant TS and their clinical characteristics were compared with those of patients with non-malignant TS. Out of these 17 patients, 47.1% (8) were admitted for tic or self-injurious behaviour related injuries, 17.6% (3) for suicidal ideation and/or attempts, 17.6% (3) for uncontrollable tantrums or rage, and 17.6% (3) for a combination of the above factors. Co morbid current or historical Attention Deficit Hyperactivity Disorder (ADHD) and Obsessive Compulsive Disorder (OCD) were also noted. Authors also reported following two illustrative cases as shown in Table 1 below:

Table 1:

Case #	Age & Sex	Diagnosis and co morbid condition	Symptoms
Case report 1	43 years Female	Tourette's Syndrome and Obsessive compulsive behaviour	Obsessive compulsive behaviour, pounding of her abdomen causing bruising and damage to ovary, cervical disc herniation due to head jerk, stomping tic causing hip dislocation and hitting her abdomen with objects
Case report 2	36 years Male	Tourette's Syndrome and ADHD (diagnosed in childhood)	Urges to hit and pinch other people and spitting with ritualistic behaviour and serious self-harm behaviour

Studies demonstrating co-morbid conditions as causes of aggression:

Comings & Comings (1987) carried out evaluation of overt conduct in this follow up study of 250 children, asking questions from patients and parents to produce the variables (table 2). Only 14.75% of TS patients without Attention deficit disorder (ADD) had a conduct score >13, whereas 48% of those with ADD had such a score. In the earlier study in this series, Comings & Comings (1985) summarized clinical aspects of 250 consecutive cases of Tourette's syndrome seen over a period of 3 years with 61% having significant anger and violence problems, and 54% having a diagnosis of attention deficit disorder with hyperactivity.

Budman et al., (2000) studied 68 children and compared 37 with Tourette's syndrome and explosive outbursts and 31 without explosive outbursts and found co morbid conditions to play a significant role in aggression (table 2).

Ghanizadeh & Jafari (2010) interviewed 74 children and adolescents suffering from ADHD using DSM-IV diagnostic criteria. ADHD was the primary focus of the study. Though Tourette's syndrome was not studied, tics were studied as co morbid diagnoses.

Ghanizadeh & Mosallaei (2009) studied 35 children and adolescents with the diagnosis of TS from child and adolescent psychiatry clinic using DSM-IV diagnostic criteria. The mean age of subjects with TS with Disruptive behaviour disorder (DBD) and TS without DBD was 11.7 and 12.1 years, respectively (p 0.7). According to authors, probability of some children with TS, developing co morbid disorders in future cannot be ruled out which can make these findings more significant.

Stephens & Sandor (1999) concluded from their case control study that aggressive behaviour observed in children with Tourette's syndrome may be associated with co morbid ADHD or OCD. They studied aggressive behaviour in 33 non medicated patients with TS (ages 6 to 14 years) and 6 healthy control subjects (ages 7 to 12 years). Semi structured interview and multi informant questionnaires were used to study following groups: TS & ADHD (42.4%), TS only (30.3%), and TS & OCD & ADHD (27.3%).

Stokes et al., (1991) studied 29 patients with mild to moderate Tourette's disorder to explore the social adjustment and peer relationships of children with Tourette's disorder. Patients, parents & teachers and classmates completed self-esteem scale, behaviour rating scale and pupil evaluation inventory, respectively.

Sukhodolsky et al., (2003) studied 207 children (144 boys and 63 girls) between the ages of 7 and 18 years, 42 children with TS only, 52 with ADHD, 52 with TS & ADHD, and 61 unaffected control children. Co morbid ADHD was found to be highly associated with disruptive behaviour and functional impairment in children with TS.

In another study, 446 patients with Tourette Syndrome (TS) and/or their parents completed a 52 item self-report survey (Wand et al., 1993) on the study variables (245 under the age of 18 and 177 adults).

Table 2 summarizes the studies demonstrating co-morbid conditions to cause aggressive behaviour. Following studies have directly or indirectly shown significant association of aggressive behaviours in TS with co morbid conditions, in particular with Attention deficit hyperactivity disorder (ADHD).

Table 2:

Authors	Type of study	Variables	Results
Comings & Comings 1987	Cross sectional, comparative study.	Running away, lying, stealing, starting fires, vandalism, trouble with law, fights, shouting, attacking,	Presence of Attention deficit disorder (ADD) played an important role in these conduct problems as 17 patients with ADD alone had conduct scores significantly different from those of controls (P 0.01)

		disrespect to adults, short temper, hurting animals, hatred and drugs & alcohol use	
Comings & Comings 1985	Prospective cohort	Discipline issues, anger and violence	54% patients had ADHD as well
Budman et al., 2000	Case control study	Explosive outbursts of anger	Children with explosive outbursts demonstrated significant co-morbid conditions, particularly attention deficit hyperactivity disorder, obsessive-compulsive disorder, and oppositional defiant disorder, with no correlation with Tic type and Tic severity
Ghanizadeh & Jafari 2010	Observational study	Aggression and abuse from children towards parents	More than half of the parents were suffering from at least one of the forms of abuse by their ADHD children. Oppositional defiant disorder but not tics were found to be one of the predictors of abuse
Pollak et al., 2009	Case control study	Tic severity, ADHD symptoms, OCD, aggression and anxiety	Aggression was predicted in Tourette's syndrome by tic severity, inattention and hyperactivity/impulsivity. However OCD symptoms were not relevant.
Ghanizadeh & Mosallaei 2009	Observational study	Behavioural problems using child behaviour checklist, characteristics of tics	Scores on Externalizing (externalizing behaviours include aggression, delinquency, and hyperactivity) scale ($p = 0.02$), Aggression scales ($p = 0.02$) in TS cases co-morbid with Disruptive behaviour disorders (DBD) were significantly more than those in TS cases with no DBD
Stephens & Sandor 1999	case control study	Aggression, Tourette's syndrome, ADHD, OCD	The conduct disorder subscale score on the Conners Parent Rating Scale (CPRS) was significantly higher ($P < 0.005$) in the TS + co-morbidity group. The control and the TS-only groups were identical in their low level of aggressive behaviour and significantly lower than those with TS + co-morbidity.

			Tic severity and age on presentation had no effect on aggressive behaviour
Stokes et al., 1991	Observational, questionnaire based survey	Social withdrawal, aggression, class popularity, self esteem	Social problems were not predicted by the frequency or duration of tics. A clinical diagnosis of attention deficit hyperactivity disorder and teachers' ratings on the summary scale of the Child Behavior Checklist and the Pupil Evaluation Inventory did predict poor adjustment
Sukhodolsky et al., 2003	Case control study	Disruptive behaviour, social & family functioning, adaptive behaviour	There was no difference between TS only group and unaffected controls. However, TS and ADHD group and ADHD only group were similar with regards to aggressive behaviour and showed significantly more aggressive and disruptive behaviour than the TS only and unaffected children.
Wand et al., 1993	Comparative study	Vocal & motor tics, aggression, obsessions & compulsions, attentional problems, sleep disturbance, mood disturbance, anxiety and self mutilative behaviour	Subjects under age 18 (N=245) experienced significantly more difficulties with temper control ($p < 0.001$), aggression ($p < 0.001$), sleepwalking ($p < 0.001$), and hyperactive behaviours ($p < 0.05$). Reasons for such differences based on age are not known. Maturational growth factors or patients' deliberate avoidance of stimuli may be possible explanations.

Studies either demonstrating Tourette's syndrome as main cause of aggression or studies which did not consider co-morbid conditions:

Eldridge et al., (1977) carried out a cross sectional observational study and selected 21 families of patients with Tourette's syndrome who participated in a one day clinic. 12 out of 21 patients had troublesome sexual and aggressive impulses but these only differed "quantitatively" from the other 9 patients and had no correlation with plasma dopamine hydroxylase or norepinephrine levels.

Kano et al., (2008) concluded that Rage attacks and clinically significant aggressive symptoms are common problems in Tourette's syndrome in Japan and psychiatric morbidity appears to be associated with impulsive-aggressive symptoms. They studied 29 patients (23 males and 6 females with mean age of 13.5 years) using DSM IV TR diagnostic criteria. 19 had only TS while 11 had co morbid conditions like ADHD (5), OCD (5) and ADHD & learning disorder (1). 47.8% subjects were found to have clinically significant aggression and 12 (52.2%) did not. Scores on CBCL scale were significantly higher in the aggressive group than in the

non-aggressive group for the anxious/depressed, thought problems, aggression, internalizing, externalizing, and total problems subscales (P 0.003, P 0.002, P 0.02, P 0.031, P 0.031, P 0.013, respectively). Tic severity and self-injurious behaviours appeared associated with clinical significant aggression.

Robertson et al., (1988) studied 90 patients who fulfilled DSM III criteria for Tourette's syndrome. Each patient was seen by at least two of the three authors. Mental status and neurological examinations were performed. The important associated features and the numbers of patients exhibiting each were as follows (table 3)

Table 3:

Features	Number of patients effected
Compulsion of feeling forced to touch people or objects	48
Echolalia	40
Obsessive compulsive behaviour	33
Coprolalia	30
Self-injurious behaviour	30
Echopraxia	29
Aggression to people or property	28
Copropraxia	16
Inappropriate sexual behaviour	9
arithmomania	6

28 patients had been physically aggressive to other people (family members being most involved), animals, and property. Aggressive behaviour was found to be significantly associated with the symptoms of being forced to touch (P=0.04) and copropraxia (P 0.01). No significant associations were found between aggressive behaviour and age of onset of symptoms, personal or family history of psychiatric illness, EEG or neurological abnormalities, medication, distribution of tics, hyperactivity, or difficulty in concentration or attention as a child.

Suzuki M. (1996) reported 10 cases of Tourette's syndrome and described the psychopathological features. These patients were divided in to two groups of 'sadistic self-conversion type' and 'masochistic personality type'. They concluded that self-injurious behaviours and aggression was a result of frustrations due to rejection by others or experience of harm from others. Tics were described as a form of self-injurious behaviour.

Discussion and Conclusion

Due to significant heterogeneity among studies in this area, as a result of differences in methodologies, systematic review is not possible. Hence a narrative review was carried out.

One of the limitations of our review was that we did not search for relevant studies from gray literature. This may have led to missing some studies with lack of evidence of any causative links between Tourette's syndrome and violence.

Researchers over the past few decades have continued to study the associated phenomenology in Tourette's syndrome and most studies have directly or indirectly demonstrated that aggressive behaviour in

Tourette's syndrome is associated with co morbid ADHD or similar symptoms (Table 2), unless these studies were not designed to assess co morbid conditions. Another consistent finding has been the lack of association between aggressive behaviour and severity of Tics in Tourette's syndrome, with the exception of Suzuki M. (1996) and Kano et al., (2008). While aggression is considered a component of violence, presence of deliberate intentions to bring harm whether to self or others is not demonstrated to be a result of Tourette's syndrome directly by any studies and co morbid conditions like ADHD and OCD have been implicated. Despite some severe Tics being source of significant distress to patients and others around them, current literature cannot establish a causative link of Tourette's syndrome to violence in the absence of any co morbidities.

Competing Interests

None.

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