Disruptive mood dysregulation disorder: neurophysiologic aspects.

Suprakash Chaudhury*, Samiksha Sahu

Department of Psychiatry, Dr. D. Y. Patil Medical College, Hospital & Research Center, Pune, India

Accepted on September 25, 2017

Irritability is an emotional state characterized by having a low threshold for experiencing anger in response to negative emotional events [1]. Chronic Irritability from an early childhood interferes with the normal development, along with that frequent temper tantrums make the child prone to morbid and mortal health hazards and increases the care taker's burden due to associated complications. Irritability has always shared a spectrum of many diseases traversing from organic to mental problems but it became clinically relevant since the late 1990's albeit its diagnostic applicability remains controversial. Regardless of this, irritability in childhood persisted as a nonspecific symptom and shared the domains of various diseases that was listed among criteria for various disorders listed in Diagnostic and Statistical Manual of Mental Disorders, 4th ed., Text Revision (DSM-IV-TR) including oppositional defiant disorder (ODD), major depressive disorder (MDD), intermittent explosive disorder, and generalized anxiety disorder [2].

According to some authors pediatric bipolar disorder could be bifurcated into ''narrow'' and ''broad'' phenotypes with the former displaying classical symptoms of mania/ hypomania (i.e., grandiosity/euphoria) in an episodic course; whereas the latter was characterized by unyielding irritability as a primary symptom. Subsequently those with the ''broad'' phenotype were named as severe mood dysregulation disorder (SMDD) manifesting with chronic, non-episodic, impairing irritability and hyper arousal in absence of symptoms of mania [3]. It is probable that as a consequence of this broad classification, a dramatic rise in rates of pediatric bipolar disorder was seen from the mid-1990s to the early 2000s. In the year 2011, Leibenluft study result's suggested that there is a tremendous rise in proportion of children and teenagers being diagnosed with Bipolar Disorder in America during the past 20 years [4].

Decades passed and the undiagnosed sufferer of irritability and emotional dysregulation underwent various diagnosis and prescriptions of many medications, until 2013 when DSM-5 included the diagnosis of 'Disruptive Mood Dysregulation Disorder' (DMDD) [5] which describes temperamental children who primarily suffer from frequent, severe, recurrent temper outbursts and chronically irritable and/or angry mood [6].

These recurrent temper outbursts that are grossly out of proportion in intensity or duration to the situation. These occur, on an average, three or more times each week for one year or more. In between the temper outbursts also DMDD subjects are observed by parents, teachers, or peers to remain in irritable or angry mood for most of the day and nearly every day. To meet the diagnostic criteria of DMDD these symptoms should be present in at least two settings (at home, at school, or with peers) in at least one of which the symptoms must be severe, and the symptoms must persist for at least 1 year. Irritability has a vast dimension ranging from mood disorder on one side, ADHD and disruptive behavior in the center and psychotic disorder at the other end of spectrum. The diagnosis of DMMD was aimed at dissecting and distinguishing between chronic non episodic v/s episodic irritability [7]. Initial studies on DMDD have claimed it to be a valid and relatively rare diagnosis in the community, with three months prevalence range of 0.8-3.3% [7]. A previous cross-sectional study done in a child and adolescence clinic showed only 21 out of 70 subjects of chronic irritability (30%) who met the diagnostic criteria for DMDD [1].

Clinically, it is a common belief that unlike Bipolar Disorder which is treated with mood stabilizers or atypical antipsychotics as first choices, DMDD should be treated with SSRIs as the first choice. However, many clinical studies on the treatment for children's aggression or chronic irritability symptoms indicate that the range of choosing DMDD's pharmacological treatment is very wide. A systemic review has shown that pharmacological treatment for the aggression and chronic irritability in individuals with DMDD includes anti-depressants (SSRIs, SNRIs), mood stabilizers (lithium salts, valproate, lamotrigine, carbamazepine), psychostimulants (methylphenidate), typical antipsychotics (haloperidol), atypical antipsychotics (quetiapine, aripiprazole, risperidone), and other drugs (α-2 agonist, β blocker, trazodone) [8].

DMDD as a mental disorder has low morbidity but prospective follow-up study with large sample sizes has shown that compared to children with other mental disorders and healthy controls, children with DMDD are not only more prone to develop a depressive or anxiety disorder in their adulthood, but also have other co-morbid mental disorders [7]. Studies have shown that children born to the parents diagnosed with bipolar disorder have high chance of meeting DMDD criteria [9]. Functional consequences associated with DMDD are that the children have difficulty in schools and are unable to participate in activities, they also have other impairments like poorer physical health, poorer economic conditions, lower education levels and higher crime rates [10]. As DMDD is a novel diagnosis, limited research is available currently. Various radiological and neurological investigations have succeeded in formulating a framework of anatomical and physiological correlates of irritability in various disorders viz. ADHD, SMD, Bipolar disorder and DMDD. However there is a paucity of studies that focused only on neurophysiology of DMDD.

Magnetoencephalographic studies have showed that, youth with SMD displayed significantly greater activation of the medial frontal gyrus and the anterior cingulate cortex in response to negative feedback, whereas youth with bipolar disorder had decreased insula activation and greater superior frontal gyrus activation. Data also supports the hypothesis that patients with ADHD shows hyperactivity of left amygdala and youth with SMD shows hypoactivity [11].

EEG based studies done on pediatric bipolar patients with history of impulsivity, aggression and comorbid mood and disruptive behavior disorders suggested that there is relative increase in left frontal activity compared with right frontal activity. The results also indicated that greater left frontal activity correlated positively with the severity of psychiatric disturbance. Based on the findings of a relative increase in left frontal activity it has been suggested that it may be a locus of neurophysiological disruption manifesting with behavioral and affective disinhibition. A similar disruption may also occur in DMDD [12].

Functional MRI studies done on youth, with DMDD and bipolar disorder, using emotional face cards which used 3 kind of emotions i.e., happy, fearful, and angry faces showed similar levels of irritability and did not differ from each other or from healthy youths who were used as controls. In DMDD subjects a strong association of all intensities of irritability with amygdala activity was observed; while in bipolar disorder subjects a correlation was reported only for angry faces [13]. Functional MRI studies in people having DMDD suggests under-activity of the amygdala, the brain area that plays a role in the interpretation and expression of emotions. Furthermore, youth with DMDD showed markedly greater activity in the medial frontal gyrus and anterior cingulate cortex compared to controls. These brain regions are important because they are involved in evaluating and processing negative emotions, monitoring one's own emotional state, and selecting an effective response when upset, angry, or frustrated [13].

It is hoped that the inclusion of DMDD in the official classification will encourage investigators to also focus on the neurophysiological aspects of DMDD.

References

1. Tiwari R, Agarwal V, Arya A, et al. An exploratory clinical study of disruptive mood dysregulation disorder in children and adolescents from India. Asian J Psychiatr. 2016;21:37-40.
2. Tufan E, Topal Z, Demir N, et al. Socio-demographic and Clinical Features of Disruptive Mood Dysregulation Disorder: A Chart Review. J Child Adolesc Psychopharmacol. 2016;26(2):94-100.
3. Brotman MA, Schmajuk M, Rich BA, et al. Prevalence, clinical correlates, and longitudinal course of severe mood dysregulation in children. Biol Psychiatry. 2006;60(9):991-7.
4. Leibenluft E. Severe mood dysregulation, irritability, and the diagnostic boundaries of bipolar disorder in youths. Am J Psychiatry. 2011;168(2):129-142.
5. American Psychiatric Association. Depressive Disorders in Diagnostic and Statistical Manual of Mental Disorders (5th Edn). Arlington, VA: American Psychiatric Pub. 2013.
6. Averna R, D'Agati E, Vicari S. Low-dose aripiprazole monotherapy in a young child with disruptive mood dysregulation disorder. Ther Adv Psychopharmacol. 2016;6(2):149-151.
7. Copeland W, Angold A, Costello E, et al. Prevalence, Co morbidity and Correlates of DSM-5 Proposed Disruptive Mood Dysregulation Disorder. Am J Psychiatry. 2013;170(2):173-179.
8. Tourian L, LeBoeuf A, Breton JJ, et al. Treatment options for the cardinal symptoms of disruptive mood dysregulation disorder. J Can Acad Child Adolesc Psychiatry. 2015;24(1):41-54.
9. Sparks, Garrett M. Disruptive mood dysregulation disorder and chronic irritability in youth at familial risk for bipolar disorder. J Am Acad Child Adolesc Psychiatry. 2014;53(4):408-416.
10. Copeland WE, Shanahan L, Egger H, et al. Adult diagnostic and functional outcomes of DSM-5 disruptive mood dysregulation disorder. Am J Psychiatry. 2014;171(6):668-674.
11. Mayes S, Baweja R, Hameed U, et al. Disruptive mood dysregulation disorder: current insights. Neuropsychiatr Dis Treat. 2016;12:2115-2124.
12. Rybak M, Crayton J, Young I, et al. Frontal alpha power asymmetry in aggressive children and adolescents with mood and disruptive behavior disorders. Clin EEG Neurosci. 2006;37(1):16-24.
13. Wiggins J, Brotman M, Adleman N, et al. Neural Correlates of Irritability in Disruptive Mood Dysregulation and Bipolar Disorders. Am J Psychiatry. 2016;173(7):722-730.

***Correspondence to:**
Suprakash Chaudhury
Department of Psychiatry
Dr D Y Patil Medical College
Pune
India
Tel: 9370386496
E-mail: suprakashch@gmail.com