



## PREVALENCE OF DEVELOPMENTAL COORDINATION DISORDER IN SCHOOL GOING CHILDREN IN AGE GROUP 5-15 YEARS

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### ABSTRACT

Developmental Coordination Disorder (DCD) is a chronic neuro developmental condition that affects school going children. When unrecognized and unmanaged, it can lead to long term negative consequences including academic failure, poor social relationships, emotional difficulties, mental health problems, and poor physical fitness. The early diagnosis of DCD can be helpful to prevent and minimize these issues. Hence a study was carried out to find out the prevalence of developmental co-ordination disorder using DCDQ-07 in school going children. Children of age 5 to 15 years were selected randomly from one of the randomly selected schools of urban area. 850 questionnaires were distributed of which 750 responses were received. Prevalence was found out to be 6% of the total population where males were more affected than females.

**KEYWORDS** : Developmental Coordination disorder, DCDQ07, school going children

### INTRODUCTION

The knowledge regarding children with Developmental coordination disorder (DCD) has increased recently.<sup>1</sup> Developmental Coordination Disorder (DCD) is a chronic neuro developmental condition that affects school going children. When unrecognized and unmanaged, DCD can lead to long term negative consequences including academic failure, poor social relationships, emotional difficulties, mental health problems, and poor physical fitness.<sup>2</sup> According to DSM-IV, Developmental coordination disorder is a neurologically based disorder broadly characterized by impaired motor coordination and impaired performance of daily activities requiring motor skill.<sup>3</sup> A similar and perhaps overlapping syndrome, developmental dyspraxia, has been described as impairment of motor planning and execution. It is frequently tested with tasks requiring imitation. Individuals with DCD or developmental dyspraxia may have difficulty in learning and imitating skilled or sequenced movements, including object manipulation and tool use. They also face problems in assuming body postures, gesturing, and carrying out multi-step or goal-directed actions. Functionally, individuals with DCD or developmental dyspraxia have trouble coordinating their movements to learn new fine and gross motor tasks required to perform instrumental daily activities, such as tying shoelaces, dressing & handwriting along with playing sports, and using playground equipment. In addition, decreased educational performance and poor social emotional adjustment is also seen in these children which may be attributed to participation limitations, which is not only seen in children but persists in adolescents & adults identified with developmental coordination disorders.<sup>4,5,6,7,8,9,10,11,12,13,14,15,16</sup>

Developmental coordination disorder (DCD) is marked by a significant impairment in the development of motor coordination, which interferes with academic achievement and/or activities of daily living (ADL).<sup>17</sup> Before the DSM era, children with DCD were described as 'motor impairment', 'motor delayed', 'physically awkward', 'perceptuomotor dysfunction'/'motor perceptual dysfunction (MPD)', 'developmentally agnostic/apractic', or as 'clumsy child syndrome'. Developmental Coordination Disorder (DCD) is one of the most common disorders amongst school-aged children.<sup>18</sup>

The condition is idiopathic and the child has no identifiable medical, cognitive, psychological, social, or other obvious condition or

reason for the movement difficulty. Some studies have demonstrated that the children with DCD do not simply 'grow out of' their difficulties.<sup>19</sup>

Macnab identified 5 different subtype profiles of DCD.<sup>13</sup> Varieties of dysfunctions are seen in children with DCD. These dysfunctions can be grouped into 3 areas: gross motor, fine motor and psychosocial.<sup>13</sup> Due to the heterogeneity of DCD, identifying its cause has been complex. A number of theories have hypothesized that the aetiology of DCD is part of the continuum of cerebral palsy; is secondary to pre-, peri- or neonatal damage; or is secondary to neuronal damage at the cellular level in neurotransmitter or receptor systems. Relating the observed motor impairments and difficulties in DCD, is difficult. Current theories propose that difficulties found in children with DCD result from abnormalities in neurotransmitter or receptor systems rather than from specific brain areas or neuronal groups.<sup>4,13</sup>

Although considered a childhood disorder, the effects of DCD continue into adulthood. People with DCD generally have no other medical issues that can explain the disorder. In some cases, DCD can occur with other disorders, such as mental retardation or attention deficit-disorder, though these conditions are not linked. Parents, teachers and therapists are unaware of these integration deficits and neglect it. Without intervention, difficulties persist into adulthood and are frequently accompanied by other problems, both at home and at school, so assessment program should be done to evaluate children having motor deficit and early intervention should be given to avoid the risk of any neuromotor disturbance later.

Children with DCD are assessed in a variety of ways, but currently there is no appropriate gold standard assessment instrument and no instrument that goes from child to adulthood. An instrument that is useful in identifying children with DCD is the DCDQ (Developmental coordination disorder questionnaire), which is a parent questionnaire developed in Canada and recently re-validated and extended for use with children aged 5 years to 15 years. It shows good sensitivity and specificity.<sup>3</sup>

The early diagnosis of DCD can be helpful to prevent the psychosocial problems of children with DCD. Hence this study was carried out to find out the prevalence of developmental co-ordination disorder using DCDQ-07 in school going children in age group between 5 to 15 years and to find the correlation of the

findings with the scholastic performance of the children.

**Materials and methodology:**

Permission and approval to carry out the research work was obtained from the head of the institution and the institution's ethical committee. It was a Cross-sectional Study carried out on 750 school going children which were selected by multistage sampling method.

In the first stage, the number of schools in urban area was counted and it was found to be 151. In the second stage, one school from the total number of schools was selected randomly by lottery method in which name of schools were sealed in opaque envelopes.

In the next stage, on the basis of inclusion criteria, 850 questionnaires were distributed randomly in the already selected school from class 1<sup>st</sup> through 10<sup>th</sup>. Total 750 positive responses were received out of distributed questionnaire making the sample of 750 children. In the final stage, on the basis of chronological age used in questionnaire children were categorized into 3 groups viz. 5-8 years, 8.1-10 years, 10.1-15 years

The study was carried out over a period of 18 months. Parents of the children between age 5 to 12 years and those who were able to understand the questionnaire were included in the study. Parents who were unwilling were excluded. Children who were prediagnosed cases of DCD were excluded from the study. Developmental coordination disorder questionnaire 2007 (DCDQ07) was used to assess the children.

The Developmental Coordination Questionnaire (DCDQ) is a parent report measure developed to assist in the identification of Developmental Coordination Disorder (DCD) in children. Parents are asked to compare their child's motor performance to that of his/her peers using a 5 point Likert scale. It provides a standard method to measure a child's coordination in everyday, functional activities. The DCDQ'07 consists of 15 items, which group into three distinct factors. The first factor contains a number of items related to motor control while the child was moving, or while an object was in motion, and is labelled "Control during Movement". The second factor contains "Fine Motor and Handwriting" items and the third factor relates to "General Coordination".

According to inclusion and exclusion criteria, Total 850 questionnaires were distributed among the students of class 1<sup>st</sup> to 10<sup>th</sup> standards, as the study started.

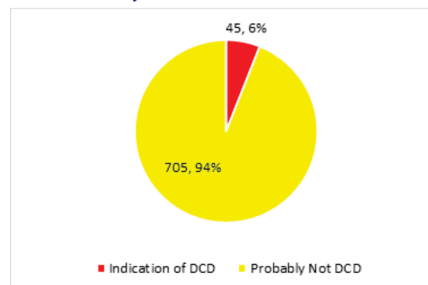
Each selected child was given an envelope which contained the DCDQ'07, letter regarding what was the study about, along with written informed consent. The parents were asked to read the questionnaire and consent form and were requested to complete questionnaire & send it to school teacher within a week. They were also informed if they face any query regarding filling of the questionnaire, at any point of time they should feel free to contact the therapist either by phone call or personal meeting. Duly filled questionnaires were returned to the therapist from the school teacher and therapist scored it according to summary score sheets. Only 750 responses were received. Children were categorised into three groups- 5 to 8 years, 8.1 to 10 years, 10.1 to 15 years. Scholastic data was obtained from the school authorities. The data collected was analysed statistically.

**Results:**

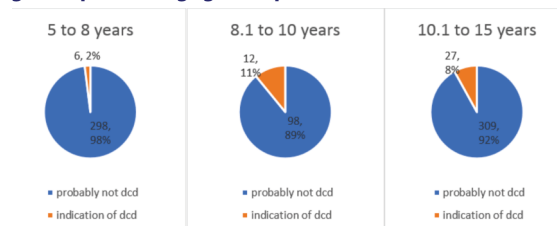
Statistical software EPINFO version 7 was used for data analysis. Chi-square Test was used to calculate age and gender wise prevalence in indication of DCD children. Unpaired t-test was used to compare total scores and scholastic performance in indication of DCD and probably not DCD children and to compare scores of three parameters gender wise. Spearman rank correlation was used to correlate scholastic performance with total scores of DCDQ'07 in indication of DCD children. p value <0.05 was considered to be statistically significant.

Out of 750 children, 436 were females (181 in age group 5 to 8 years, 59 in age group 8.1 to 10 years, 196 in age group 10.1 to 15 years), 314 were males (304 in age group 5 to 15 years, 110 in age group 8.1 to 10 years, 336 in age group 10.1 to 15 years) It was seen that DCD most prevalent (10.9%) in age group 8.1-10 years. (Fig 1) Out of total population of 750 children, 45 children were considered as probable to have DCD i.e 6%. (Fig 2) Gender wise prevalence showed that males were more affected than females (1.8:1) (Table 1) When compared the three parameters of DCDQ07, it was seen that general coordination and control during movement better in boys whereas, fine motor skills better in girls. It was seen that DCDQ07 scores and Scholastic performance showed a positive correlation.

**Fig 1: Graph showing prevalence of DCD among the school going children 5 to 15 years**



**Fig 2: Graph showing age wise prevalence of DCD**



**Table 1: Table showing age wise distribution of probable DCD among both genders**

Age	Indication of DCD	
	Females	Males
5 to 8	1	5
8.1 to 10	0	12
10.1 to 15	15	12
Total	16	29

**Discussion:**

The study aimed to investigate the prevalence of probable DCD and risk of DCD in school going children of age group 5-15 years using developmental coordination disorder questionnaire '07.

According to the data of present study, the prevalence of probable DCD among 750 children was 6% (i.e. 45 children). This is in accordance with study done by **Raghu Lingam** (2010) 5% children met criteria for probable DCD.<sup>20</sup> A study conducted by **Wright and Sugden (1996)** have found the prevalence of DCD 4-5% in mainstream primary schools but their study differs from present study in assessment.<sup>21</sup> American psychiatric association (APA) suggests a figure of around 6% of prevalence for the age range 5-11 years.<sup>42</sup> **Komal K.B.** in 2014 observed prevalence of DCD is 21.33% (i.e. 64 children out of 300) in age group 5-15 years.<sup>22</sup> Henderson and Hall (1982) also indicate a prevalence of between 5-6%.<sup>23</sup>

The current study shows age wise prevalence of DCD in all the three age group which is of 10.9% (12 children) in age group of 8.1-10 years and also to be higher prevalence when compared with other age groups viz 5-8 years and 10.1-15 years. This is comparable to result found in the study done by **Nadia Valentini** in 2012, who found higher prevalence of probable DCD and risk of DCD in 11 and 12 years.<sup>24</sup>

It was observed in present study that prevalence of DCD is more in boys than girls with ratio 1.8:1. The study done by **Thomas Kourtessis et al**, in 2008 also observed more prevalence in boys than girls. **Smyth (2003)** has noted that motor problems may be more easily observed in boys due to the fact that boys tend to engage more frequently in physical activities.<sup>11</sup>

When three parameters i.e. control during movement, fine motor/handwriting and general co-ordination in boys and girls were compared the result showed that control during movement and general co-ordination skills are reduced in girls and fine motor skills are significantly reduced in boys compared to girls. The harmonic differences seen among the sexes, which results into the lower levels of estrogen in boys may result in better performance of gross motor skills while the presence of higher estrogen level in girls results in better performance of fine motor skills.<sup>5</sup>

Better performance of girls compared to boys in fine motor skills is a fact which is also well described by other studies. **Causgrove-Dunn and Watkinson (1996)** attributed the above trend to the fact that girls usually prefer to engage in fine manipulation activities and therefore becoming more experienced than boys who, on the other hand, tend to relate strongly with larger objects such as balls, thus practicing and performing better compared to the opposite sex.<sup>25</sup>

This was mirrored in the study by **Nadia Valentini (2012)**, who found boys are at lower level of performance in the manual dexterity and balance tasks, while girls of all age groups had more difficulties related to ball skills. Difficulties in manual dexterity of children with DCD and at risk of DCD become gradually higher with increasing age. Moreover, boys with probable DCD from age group 3 and 4 i.e. (9-10 & 11-12 years) tend to present an even more unsatisfactory development than girls.<sup>13</sup>

On comparison of total scores on DCDQ'07 & scholastic performance between suspect of DCD children and probably not DCD children, it was seen that there is reduced scores on DCDQ'07 as well as decreased scholastic performance of suspect of DCD children. A positive correlation was seen between the mean scores on DCDQ'07 with scholastic performance in the children who were suspect for DCD when assessed statistically in the present study. No published articles are available where comparison of scores on DCDQ'07 and scholastic performance of children has been done.

Thus early diagnosis of DCD can be helpful to prevent the problems faced by children in daily activities as well as in school setting which is continued to be seen in adolescence also. Children with probable DCD shows difficulties in gross motor activities, fine motor skills and general co-ordination. These difficulties will have an impact on scholastic performance of children with indication of DCD.

In the current study, only one screening tool was used and the data was collected from single centre.

#### Conclusion:

Prevalence of DCD in school going children in age group 5-15 years using developmental coordination disorder questionnaire, in the present study is found to be 6%. Interventions were not given and without interventions these children will continue to exhibit poor motor skills and show deficits in scholastic performance. So it is suggested to take a futuristic, multi-centric study to decide the appropriate level of intervention which will help to improve motor skills and may minimize the effects on scholastic performance.

**Conflict of interest:** None

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