PREVALENCE RATE OF DYSCALCULIA AMONG PRIMARY SCHOOL STUDENTS

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ABSTRACT --In the modern world, mastery over basic academic skills- reading, writing and arithmetic is a necessary pre-requisite for success in all walks of life. In fact, numeracy skills are needed for effective citizenship in knowledge based society. These skills provide the base to an individual to realize his/her potentialities. Impairments of skills in these areas among children, which occur despite appropriate levels of intelligence and opportunities to learn, are termed as specific learning disabilities. There are a great number of students who have serious difficulties in learning mathematics, but find the rest of academic subjects easy. These students have high IQs, are excellent readers, creative writers and learn quickly. But when it comes to any subject that requires understanding and application of the language of mathematics, they fail miserably (Newman, 1998). The goal of the investigator was to identify the students of Grade III who seem to have learning disabilities in mathematics. The prevalence rate of dyscalculia among Primary School Students studying in English Medium Schools of Yamuna Nagar district of Haryana was found to be 7.1%

Key words-- Numeracy Skills, Primary School Students, Dyscalculia.

I.   INTRODUCTION

Learning Disabilities is a term within whose scope lie a number of disabilities. Often, a child displays a combination of these disabilities. The inherent complexities of the notion of LD are further complicated by an acute lack of teacher awareness, of clear-cut assessment procedures or indigenous tools for assessment of processing deficits, intelligence testing and testing for proficiency in reading and writing (Karanth, 2002). Teachers today are challenged to find ways to identify students who struggle and provide them with the very best instruction possible. That is, teaching based on the highest quality research and professional wisdom, and that takes into account not just subject matter, but a student's rate of learning and his or her ability to achieve the highest standards possible within the general education curriculum. Teachers are also challenged due to the lack of resources in schools.

It is hard not to exaggerate the importance of mathematical literacy in our society (Swanson, Jerman, & Zheng, 2008). In everyday life situations we need to be in time, pay bills, follow directions or use maps, look at bus or train timetables or comprehend instruction on the flyers and expiry dates. A lack of mathematical literacy was found to affect people's ability to gain full time employment and often restricted employment options and often low paying jobs (Desoete, 2007; Dowker, 2005). Most practitioners and researchers currently report a prevalence of mathematical disabilities between 3-14% (Barbaresi, Katuskic, Colligan, Weaver, & Jacobsen,

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2005; Desoete, 2007a; Dowker, 2005; Shalev, Manor, & Gross-Tsur, 2005). In general, the specific learning disability in mathematics is called dyscalculia. Dyscalculia is a structural disorder of mathematical abilities which has its origin in genetic or congenital disorder in those parts of the brain that are the anatomical and physiological subtract of the maturation of the mathematical abilities adequate to age, without a simultaneous disorder of general mental function. (Kosc, 1974). Dyscalculia is an inability to conceptualize numbers, number relationships (arithmetical facts) and the outcome of numerical operations estimating the answer to numerical problems before actually calculating (Sharma, 1997).

II. PREVALENCE OF DYSCALCULIA

For many children, mathematics is an inherently difficult subject to learn. Between 5 - 8 percent of children between the ages of 6 and 14 have a particular type of cognitive deficiency that limits their aptitude to acquire knowledge and understanding of fundamental ideas in numeracy (Geary, 2004). Increasingly, researchers in the cognitive sciences are studying this deficiency under the name dyscalculia, a disorder in which normally intelligent children demonstrate specific disabilities in learning mathematics (Ansari & Karmiloff-Smith, 2002).

Specific Learning disabilities in mathematics is also called developmental dyscalculia. It is a difficulty in the numeral mathematical ability, among children of normal intelligence without other cognitive disabilities (Butterworth et al., 2011). According to the DSM-IV, developmental dyscalculia is a rare learning disability, with a prevalence of 1% in the school age population (American Psychiatric Association, 1994). Population studies for the United States, Europe, India and Israel demonstrate that the prevalence of developmental dyscalculia in these countries is similar, ranging from 3%-6.5% (Gross-Tsur et. al 1996; Badian, 1983; Lewis, 1994; Hein, 1999; Rekha, 2008). However, it is estimated in the literature that 5%–10% of school children have learning disabilities in different levels and characteristics, which affect the learning in math (Mazzocco &Thompson, 2005). According to Professor Brian Butterworth proposes that the best estimates indicate a prevalence of between 3% and 6% of the population. These estimates are derived from the proportion of children who have special difficulty with maths despite good performance in other curriculum areas.

Objectives of the Study

The study was carried out with the objective of identification of students with dyscalculia at primary school level in Yamuna Nagar district of Haryana.

Population and Sample

The population for present study consisted of all the students studying in grade III in CBSE Affiliated English medium schools of Yamuna Nagar city.

Sample: The main sampling technique used in the study was random sampling. The list of existing CBSE affiliated English medium schools in the city was collected. There are 45 English Medium Schools in the city. Out of these, only 14 schools were randomly selected for the purpose of data collection. Therefore, the grade III students of 14 CBSE affiliated English medium schools of Yamuna Nagar city of Haryana state constituted as sample of the present study.

Tools used for the Study

- Previous academic records.
- Teacher's referral form (prepared by the researcher).
- General Mental Ability test for children (1985) by Shrivastva & Saksena.
- Arithmetic Achievement Test (Self Constructed).
- Diagnostic test of Learning Disability (1993) by Swarup & Mehta.
- Diagnostic Test for Numeracy skills (Self Constructed).

III. ANALYSIS AND INTERPRETATION OF DATA

To identify the students with learning disabilities in mathematics, four Phases were followed by the researcher:

Table 1: Phases

Phase I	Screening of low achievers in mathematics
Phase II	Screening of students having symptoms of Dyscalculia
Phase III	Measuring the Intelligence level of the selected students
Phase IV	Identification of students with Learning Disabilities

Phase I: Screening of low achievers in mathematics

In this phase, the researcher surveyed the randomly selected 14 CBSE affiliated English Medium private schools of Yamuna Nagar district of Haryana and the marks obtained in the subject mathematics in the last annual examination and two terminal examinations were obtained. The students who obtained less than 40% marks were screened out as low achievers in mathematics. Out of total 1240 students in Grade III, researcher screened out 525 students who are weak in subject mathematics on the basis of their previous academic records.

Phase II: Screening of students having symptoms of Dyscalculia

In the second phase, the researcher screened out the students having symptoms of dyscalculia. Researcher provided the Teacher's referral form (self-constructed) to maths teachers to obtain their perception of the nature of various learning difficulties in mathematics, experienced by the students. The items in this form were related to general difficulties, attention deficits, visual- spatial deficits, auditory processing deficits and motor difficulties. The 308 students were identified as having symptoms of dyscalculia.

Phase III: Measuring the Intelligence level of the selected students

In this phase, the students with average or above average intelligence level were selected out of the identified weak students in mathematics by using General Mental Ability test for children (1985) by Shrivastva & Saksena. It was found that out of 308 students, 182 students were having average and above average intelligence level. This means that in spite of having average or above average intelligence, the numeracy skills of Grade III students are poor.

***Phase IV: Identification of students with Learning Disabilities***

In the final phase, the researcher confirmed whether the students who have been selected on the basis of previous steps, are learning disabled or not. For this, Diagnostic test of Learning Disability (1993) by Swarup & Mehta was administered on 182 students. At the end of phase IV, 88 students suffering from dyscalculia were found in the study.

IV.   INTERPRETATION OF RESULTS

From the above results, the prevalence rate of dyscalculia among Grade III students of Yamuna Nagar district in Haryana was found to be 7.1 % approximately. The detailed description is shown in table no. 2:

Table 2: Prevalence Rate of Dyscalculia

Total No. students in Grade III	(Phase-I)	(Phase-II)	(Phase-III)	(Phase-IV)	Percentage of Dyscalculic Students
	No. of Low Achievers in Mathematics	No. of students referred by the Maths Teacher	No. of Students having average or above average IQ level	No. of Students having Dyscalculia	
1240	525	308	182	88	7.096
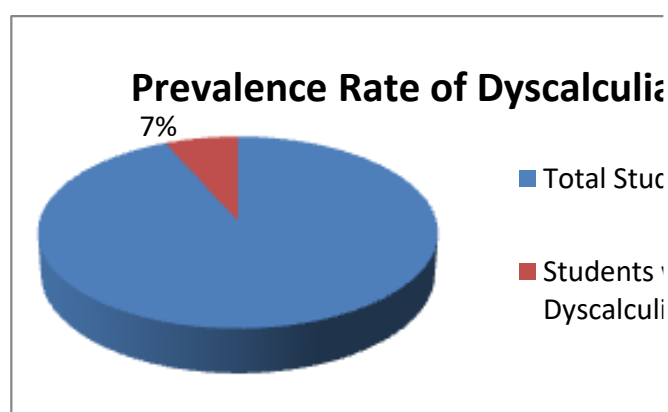
Figure 1: Prevalence rate of dyscalculia

From the above results, the prevalence rate of dyscalculia among Grade III students of CBSE affiliated Schools in Yamuna Nagar was found to be 7% approximately which means that these students have average or above average intelligence level but their numeracy skills are poor. These students were identified on the basis of Teacher Referral form, General Mental Ability test for children (1985) by Shrivastva & Saksena and Diagnostic test of Learning Disability (1993) by Swarup & Mehta. The prevalence rate can be understood by following diagram.

V.   DISCUSSION OF RESULTS

The findings of the study reveals that the prevalence rate of dyscalculia among the Grade III students of CBSE affiliated private School students is 7% approximately which is equal to the rate of prevalence evident in a study (Doeste et. al. 2004) i.e 7.7% students were having learning disabilities in mathematics. Near about 6.4% students (Badian, 1993) demonstrated poor arithmetic ability with or without associated reading difficulty. Also in India, the prevalence rate of dyscalculia was found out 6% among primary students (Ramma, 1990). Mathematics learning disability (MLD) is estimated to affect between 4% and 8% of school-age children in the United States (Badian, 1983; Geary, 2004) and in other countries, including Israel (Gross et. al., 1996) and India (Ramaa & Gowramma, 2002; Rekha, 2008).

This discrepancy may be due to the complexity associated with the study of mathematics (Landerl et. al., 2004). There is a dearth need to identify the learning disabilities in mathematics for finding the problematic areas of numeracy skills of students and remedial programs should be implemented for the strong development of numeracy skills among school going children. Most common numeracy skills are addition, subtraction, multiplication and division and a person should be well equipped with these skills to excel in life. Therefore it is clear that teachers should adopt critical attitude toward the identification of such students in regular class room settings and should provide instructional or remedial programs to handle the disabilities in mathematics

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