

## Prevalence and correlates of reading and spelling difficulty in 10 year old children in a semi-urban population in Sri Lanka

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### Abstract

**Introduction:** Reading and spelling disability in children is neurodevelopmental in nature and is associated with a range of cognitive deficits. The condition is of clinical importance due to its comorbidity with other developmental disorders and disruptive and antisocial behaviour disorders.

**Objective:** To estimate the prevalence of reading and spelling difficulty in Sinhala language in 10 year old children attending main-stream education and its relationship between socio-economic and family factors.

**Method:** In this community based cross sectional study, the sample was randomly selected from children attending Grade 5 in all main stream schools in a geographically defined area. The working definition of reading and spelling difficulty was adopted from standards set by the National Institute of Education for Sri Lankan in children 10 years old and attending Grade 5. Assessment was objectively structured into 5 different tasks, which were independently scored by 2 assessors. Data were obtained on developmental adversities, physical health and socio-economic status of family.

**Results:** The total sample was 275 with 56.3% males. Of the 5 domains (reading, comprehension, spelling, sentence writing, expressive written language) assessed, spelling difficulty was the most prevalent

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(22.5%). Correlation between the performance in the 5 domains was significant ( $p < 0.01$ ). Odds Ratio for reading and spelling was 2.3 (95% CI 2.107 to 2.593) for low education level of mother. Similar figure for low income of family was 2.3 (95% CI 2.161 to 2.439).

**Conclusions:** The study found a high prevalence of reading and spelling disability in Sinhala language in 10 year old children attending main-stream education. The risk of such disability is significantly higher in the presence of low educational level of mother and low family income

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(Key words: Reading and spelling difficulty, children, Sri Lanka, prevalence)

### Introduction

Learning to read and write is one of the most important academic achievements for school age children. Reading and spelling at a level below that expected for age may have serious long term consequences to their educational and social wellbeing and deserves early identification and remediation. Significant deficit in reading and spelling is a neuro-developmental disorder, which may exist as part of global developmental delay or as an isolated condition in a child with a normal intellectual ability. Impaired phonological awareness, auditory processing, meaningful sequencing of written language, decoding of sound – letter association and developmental motor coordination are some of the recognized deficits associated with reading / spelling difficulties in children<sup>1,2</sup>. Functional neuro-imaging studies have shown reduced connectivity in visual word-form area and other abnormalities in neural pathways in the brain<sup>3</sup>. The isolated reading and spelling disability is given the diagnostic label “specific reading and spelling disorder” or popularly known as “developmental dyslexia”<sup>4</sup>. It accounts for almost 75% of all specific developmental disorders<sup>5</sup>.

Reading and spelling difficulty is a clinically important entity due to its associated high comorbidity, which are mainly of 2 types. One is the co-occurring of other developmental disorders such

as for language, numbers and fine motor coordination. The other is disruptive behaviour disorders such as attention deficit and hyperactivity, oppositional defiant disorder and for antisocial conduct<sup>6-8</sup>. In addition, emotional problems may co-exist due to the social impact of poor achievement in education<sup>9,10</sup>. Hence, reading and spelling problems are bound to be over-represented in child mental health clinic populations<sup>1</sup>. Accordingly, it is imperative that children presenting with major behaviour problems are further assessed for possible reading and spelling deficit.

In estimating prevalence of reading and spelling difficulty, there are no specific tests that are used in screening populations of children. Also, there is no universally agreed clear-cut definition for reading and spelling ability or disability, or a cut-off point for diagnosis<sup>10,11</sup>. Hence, the definition may vary according to age of the study population and the form of the language, whether phonetic or otherwise, that they use<sup>7</sup>. This discrepancy in definition has posed a challenge in epidemiological studies in different populations of school children leading to disparity in criteria used<sup>12,13</sup>. The diagnosis of reading / spelling disorder essentially requires that accuracy of both reading and spelling are assessed using standardised tests. Additional criteria are that comprehension of written language is substantially below that expected for the age and IQ of the child. Also, the problem should be evident despite the child receiving age-appropriate education and cause significant interference to academic achievement<sup>4</sup>. However, psychological research has shown a low correlation between IQ and reading ability<sup>14,15</sup>. The estimated prevalence for English-speaking populations varies as widely as 4-12%, based on documented studies<sup>8,16</sup>. There is no prevalence rate known for children in Sri Lanka.

### Objectives

The main objective of this study was to estimate the prevalence of reading and spelling difficulty in Sinhala language in a selected group of 10 year old children attending main-stream education in a semi-urban administrative region. A further aim was to estimate the relationship between selected socio-economic and family factors in these children and their reading and spelling ability.

### Method

In this community based cross sectional study, the geographical area for the study was the Sri Jayewardenepura Education Zone. In Sri Lanka schools are classified by the Ministry of Education according to resources as follows: 'A' schools have

grades 1-13 or 6-13 with science streams for advanced level, 'B' schools have grades 1-13 or 6-13 without advanced level science streams, 'C' schools have grades 1-11 only and 'D' schools have grades 1-5 only. From the list of all main-stream schools in the region, 4 were randomly selected. All children in Grade 5 class in the 4 schools were included in the study sample.

The working definition of reading and spelling difficulty was adopted from the standards set by the National Institute of Education (NIE) for Sri Lanka in children 10 years old and attending Grade 5<sup>17</sup>. Assessment was done using 5 objectively structured tasks that covered reading and spelling and related literacy skills in written language. All tasks were adopted from the Teacher Guide for Grade 5, compiled by the NIE<sup>17</sup>. The 5 tasks were (i) read aloud a paragraph from the Grade 5 Sinhala textbook (Reading), (ii) respond to 5 questions asked by the class teacher on the content of a short paragraph from a simple story read by the child (Comprehension), (iii) spell 20 words read out by the class teacher (Spelling), (iv) write 5 simple sentences read out by the class teacher (Sentence Writing), (v) write 5 sentences about "Myself" (Expressive Written Language). The first 2 tasks assessed reading and comprehension and the other 3 tasks assessed competence for written language and spelling. Each task was independently scored out of 10 by the first author and the class teacher, except for (iii) where the scoring was out of 20. The average of the 2 sets of scores was taken as the final score for each task. The maximum score possible for each child was 60.

A semi-structured interviewer administered questionnaire was used to obtain information from a parent on early development and general physical health of the child, socio-economic status of the family. In addition, relevant information for each child was obtained from the Child Health Development Record (CHDR) to prevent recall bias in mother. Ethical clearance for the study was obtained from the Ethical Review Committee of the Faculty of Medicine, University of Colombo. Written permission to carry out the study was obtained from the Director, Zonal Education Office, Sri Jayewardenepura and Director, Primary Education, Ministry of Education.

### Results

The total sample of children assessed was 275. All were attending Grade 5 of main-stream education. Ages ranged from 9 years 10 months to 10 years 8 months. Males comprised 156 (56.3%) of the sample.

The number of children who earned a score below the cut-off for each of the 5 domains of assessment is given in Table 1. The score for each measure below one standard deviation was taken as cutoff. The

correlation between the scores in the 5 domains of assessment is given in Table 2. The association between the performance by the children in the assessment domains and the socio-economic variables is given in Table 3.

**Table 1: Profile of performance in reading and spelling**

Variable	Mean score n=275	Number scoring below cut-off
Reading (Rd)	8.6 (SD 3.7, Range 0-10)	47 (17.1%)
Comprehension (Cp)	8.5 (SD 2.5, Range 0-10)	45 (16.4%)
Spelling (Sp)	11.3 (SD 4.9, Range 0-20)	62 (22.5%)
Sentence writing (Sw)	7.5 (SD 3.2, Range 0-10)	57 (20.7%)
Expressive language (El)	8.7 (SD 2.3, Range 0-10)	36 (13.1%)

**Table 2: Distribution of scores and correlations of reading and spelling measures**

Variable	Rd	Cp	Sp	Sw	El
Reading (Rd)	1.0	0.537**	0.402**	0.625**	0.548**
Comprehension (Cp)	0.537**	1.0	0.567**	0.685**	0.684**
Spelling (Sp)	0.402**	0.567**	1.0	0.756**	0.611**
Sentence writing (Sw)	0.625**	0.685**	0.756**	1.0	0.701**
Expressive language (El)	0.548**	0.684**	0.611**	0.701**	1.0

\*\*The correlation was significant at 0.01 level

**Table 3: Association between the reading and spelling measures and family income per month, mother's level of education and gender of child**

Variable	Rd	Cp	Sp	Sw	El
<i>Family income</i>	$\chi^2$ 35.35 <i>p</i> 0.001	$\chi^2$ 32.26 <i>p</i> 0.000	$\chi^2$ 43.66 <i>p</i> 0.002	$\chi^2$ 42.12 <i>p</i> 0.000	$\chi^2$ 23.98 <i>p</i> 0.004
<Rs.10,000 (n=71)	19(26.8%)	23(32.4%)	24(33.8%)	26(36.6%)	18(25.3%)
>Rs.10,000 (n=204)	28(13.7%)	22(10.7%)	38(18.6%)	31(15.2%)	23(11.3%)
<i>Educational level of mother</i>	$\chi^2$ 132.59 <i>p</i> 0.000	$\chi^2$ 93.27 <i>p</i> 0.000	$\chi^2$ 133.76 <i>p</i> 0.014	$\chi^2$ 227.07 <i>p</i> 0.000	$\chi^2$ 102.28 <i>p</i> 0.000
Did not attend school	01(50.0%)	01(50.0%)	01(50.0%)	01(50.0%)	01(50.0%)
Attended up to grade 5	11(39.3%)	13(46.4%)	11(39.3%)	14(50.0%)	12(42.8%)
Attended up to O Level	15(26.3%)	15(26.3%)	17(29.8%)	19(33.3%)	11(19.3%)
Passed O Level	06(16.7%)	6(16.7%)	10(27.8%)	6(16.7%)	05(13.9%)
Passed A Level	13(11.8%)	10(09.1%)	20(18.2%)	16(14.5%)	08(07.3%)
Had Tertiary Education	02(4.8%)	0(0%)	03(07.1%)	01(02.4%)	0(0%)
<i>Gender</i>	$\chi^2$ 24.58 <i>p</i> 0.026	$\chi^2$ 17.13 <i>p</i> 0.071	$\chi^2$ 35.12 <i>p</i> 0.019	$\chi^2$ 20.23 <i>p</i> 0.027	$\chi^2$ 25.04 <i>p</i> 0.003
Male (n=156)	31(19.9%)	32(20.5%)	47(30.1%)	39(25.0%)	28(17.9%)
Female (n=119)	16(13.4%)	13(10.9%)	14(11.8%)	18(15.1%)	08(06.7%)

Rd – reading, Cp – comprehension, Sp – spelling, Sw – sentence writing, El – expressive language. O Level – GCE Ordinary Level, A Level – GCE Advance Level,  $\chi^2$  – chi square. The associations were significant at *p* 0.01.

The Odds Ratio for reading and spelling was 2.3 (95% CI 2.107 to 2.593) for low education level of mother. Similar figure for low income of family was 2.3 (95% CI 2.161 to 2.439)

Mothers reported assisted birth in 10 (3.6%), antenatal adversities in 4 (1.4%), postnatal adversities in 8 (2.9%) and recurrent physical illness needing treatment or hospitalization in 31 (11.2%). There was no statistically significant association between the

performance in reading and spelling and any of these variables.

#### Discussion

Up to 22.5% of children in the study sample had a difficulty with reading, spelling and related skills (Table 1). This figure is far higher than that given in most studies. Reading and spelling difficulties is known to occur in all linguistic systems. However, its prevalence is said to be significantly lower in populations where the written language is more phonetically consistent, such as Spanish, Italian, Greek and Czech, when compared to languages such as English and French<sup>18</sup>. Accordingly, the low figure that could be expected, because Sinhala too is a phonetic language, was not seen in the results of this study. Hence, it is possible that environmental factors were directly responsible for the high prevalence. This is supported by the finding that the risk of having a reading and spelling difficulty was 2.3 times higher if the mother had poor education and the family income was less than Rs. 10,000 a month (Table 3). At the same time, possible confounding variables that were not directly measured in this study were nutritional status of the child and whether adequate early stimulation was lacking. However, these variables are directly or indirectly related to low family income and poor education of parents. Both environmental and genetic factors contribute to reading ability and disability in children. It is well recognized that socio-economic factors, mother's educational level, time spent reading at home and the availability of reading material are important in the development of reading<sup>7,19</sup>. At the same time, the significant male preponderance reported in other studies was not evident here<sup>20,21</sup>.

In this study, standards relevant to Sri Lankan children were used in the assessment of reading and spelling. Universally accepted criteria to fix a threshold for disability are unavailable, which has been a source of disparity in prevalence studies<sup>13</sup>. Hence, to allow a reasonable margin, the cut-off score for individual domains of assessment was taken as one standard deviation below the mean. However, the findings are validated by the statistically significant correlation between the 5 different domains of assessment (Table 2).

The strength of this study is that the sample was drawn from across all levels of resource availability in education. Nevertheless, the outcome cannot be generalized to Sri Lanka. Other drawback is that by focusing on the language domain, the study did not differentiate the contribution to the outcome from global and specific developmental issues. As the IQ

was not assessed it was not possible to differentiate between IQ-discrepant and IQ-consistent reading / spelling disability. However, it is known that the core cognitive deficits that are responsible for poor reading and spelling are the same whether high or low IQ<sup>14</sup>. Because the sample was drawn from main stream education, it is rather unlikely that children with intellectual impairment of mental retardation range, (IQ less than 70) would have been included. Also, comorbid behavioural problems were not considered in this study even though a close association is known. For the outcome of this study to be of greater value for clinical and education sectors, these aspects too are useful to explore in Sri Lankan children.

#### Conclusions

The study found a high prevalence of reading and spelling disability in Sinhala language in 10 year old children attending main-stream education. The risk of such disability is significantly higher in the presence of low educational level of mother and low family income

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