# Etiology and risk factors for scholastic backwardness in children – A retrospective study

## K Raghavendra[1], A N Venkatesh Reddy[2]

*From [1]Associate Professor, [2]Clinical Psychologist, Child Guidance Clinic, Department of Paediatrics, Basaveshwara Medical College Hospital, Chitradurga, Karnataka, India*

**Correspondence to:** K Raghavendra, Department of Paediatrics, Basaveshwara Medical College Hospital, Chitradurga - 577 501, Karnataka, India. E-mail: anaghawatson@gmail.com

## ABSTRACT

**Background:** Scholastic backwardness (SB) is estimated to affect 20–50% of schoolgoing children in India. The etiology includes low intelligence quotient (IQ), attention deficit hyperactivity disorder, specific learning disabilities (SLD), and chronic illnesses. Non-cognitive factors such as poor parenting, marital disharmony, and sibling rivalry could also affect learning. Early recognition and prompt remediation could obviate its negative impact on a child's self-esteem and achievements. **Objective:** The objective of the study was to study the etiology and risk factors for SB in children. **Materials and Methods:** This hospital-based retrospective study was done in the child guidance clinic of the Department of Pediatrics of a Tertiary Care Teaching Hospital in Karnataka. The records of children age 5–16 years, visiting the SB unit from January 2011 to January 2019, were reviewed. Children fulfilling the case definition of SB were included in the study and classified based on IQ, attention span, and performance on NIMHANS scale for SLD. The risk factors for SB were also assessed. **Results:** Among the 286 children with SB, the causes identified were attention deficit disorder (ADD) (4.5%), ADD with SLD (30.4%), SLD (24.1%), slow learners (SL) (20.6%), intellectual disability (ID) (3.1%), and others (17.1%). Consanguinity, developmental delay, seizure disorder, and lower educational status of parents were strongly associated with low IQ. Birth by cesarean section was associated with ADD. Psychosocial risk factors included disturbed home environment, poor parenting techniques, and poor relation with teachers and peers. **Conclusion:** SLD, ADD, SL, and ID are the major causes of SB. Disturbed relations with parents, peers, and teachers can also contribute to SB.

**Key words:** *Attention deficit, Intellectual disability, Scholastic backwardness, Slow learners, Specific learning disabilities*

Scholastic backwardness (SB) is an important issue in children, estimated to affect 20–50% of schoolgoing children in India [1,2]. In the absence of timely recognition and remediation, it has a lifelong impact on the children and also on their parents and teachers [3]. Repeated failure seriously affects the child's self-esteem, achievements, employment, and marriage prospects [4].

SB could result from a variety of causes which include chronic illnesses, vision and hearing defects, low intelligence quotient (IQ), attention deficit hyperactivity disorder (ADHD), and specific learning disabilities (SLD) [5,6]. The prevalence of slow learners (SL) (IQ: 70–90) in India is unknown but has been reported to be up to 7–13% in western literature [7]. ADHD is known to affect 2–9% of school children, with prevalence dropping slightly by adolescence [8]. In a review of Indian studies, the prevalence of SLD was reported to be 3–10% among the student's population [9]. In another study from rural India, the prevalence of SLD among primary school children was reported to be 13% [10].

A number of non-cognitive factors can also influence academic achievement, namely, cultural background, socioeconomic status, and home environment. Overprotection, rejection, marital disharmony, high expectations from child, lack of home training, comparison with siblings, and punishment could adversely affect learning [11,12]. A child is said to have SB if he/she failed regularly in all subjects or failed in class (detention) in the previous year [13]. The present study was conducted to determine the etiology of SB among children visiting our child guidance clinic and also to study the presence of known risk factors among SB children.

## MATERIALS AND METHODS

This hospital-based retrospective study was done in the child guidance clinic of the Department of Paediatrics of a Tertiary Care Teaching Hospital in Karnataka. Institutional Ethics Committee clearance was taken before the commencement of the study. This record-based study was conducted from October 2019 to January 2020 (3 months) and the records of children, who had visited between January 2011 and January 2019, were reviewed. Children between 5 and 16 years, fulfilling the case definition of SB, were included in the study. For the purpose of this study, we defined

SB as consistent poor school performance with grade C or below for at least 1 year or poor performance on NIMHANS index for SLD [14]. Children <5 years and more than 16 years, who did not fulfill the case definition of SB and those with incomplete case records, were excluded from the study.

The data collected were compiled in MS Excel and analyzed using SPSS.V.16.0. Continuous variables were expressed in the mean and standard deviation (SD) and categorical data were expressed in number and percentage. Chi-square test was applied to test the significance of association among categorical variables and associations with $p<0.05$ were considered to be statistically significant.

## Definitions

SBs were defined as consistent poor performance in school tests with grade C or below for minimum 1-year duration or performance below the standard in which he is studying according to NIMHANS index for SLD [14].

SL: IQ of 70–89 on standard intelligence tests.

Intellectual disability (ID): IQ<70 on standard intelligence tests.

Attention deficit disorder (ADD): Attention span more than two standards below the class in which the child is studying in, on a single number cancellation test, with the IQ being 90 and above.

Specific learning disability (SLD): Children falling more than two standards below their class when tested with NIMHANS LD scale, with IQ above 90 and with no vision and hearing deficits.

## RESULTS

A total of 614 case records were reviewed, of which 307 fulfilled the definition of SB. Among these, 21 case records were excluded due to incompleteness and finally 286 were included in the study. Children were classified into six groups, namely, ADHD, ADHD+SLD, SLD, SL, ID, and "others." Children who did not fulfill the case definition for the above conditions were placed in the "others" category.

Among the study population of 286, 220 (76.9%) were males and 66 (23.1%) females. The average age of children was 10.72 years (SD-2.45). The medium of instruction was English in 247 students (86.4%) and Kannada in 39 (13.6%). Among them, 261 (91.3%) came from private schools and 25 (8.7%) from government schools. There were 161 (56.3%) children who studied in primary school (std. 1–5), 72 (25.2%), in middle school (std. 6–7), and 53 (18.5%) in high school (std. 8–10). Regarding the source of referral, 149 (52.1%) were referred by doctors, 112 (39.2%) by self, 21 (7.3%) by teachers, and 4 (1.4%) by other parents.

The educational level and occupational status of the parents have been described in Table 1. Most of parents were well educated, with 87% of the fathers and 86% of the mothers having studied high school and beyond. The majority of fathers belonged to arithmetic skills category (61.5%) of Kuppuswamy

classification [15]. The majority of mothers were homemakers (77.6%).

Children were brought with complaints of poor scholastic performance (84.6%), lack of interest in studies (62.2%), poor reading (82.1%), poor writing (84.6%), poor memory (83.5%), poor mathematical skills (77.9%), poor attention (74.8%), hyperactivity (21%), refusal to go to school (21.3%), and sleeping at school (7.7%). School grade was C or below in 55.2% children.

Children with SB were classified into six diagnostic groups, as mentioned in Table 2. There were 100 (35%) children with ADD, 156 (54.5%) had SLD and 68 (23.7%) had low IQ (SL and ID). Among the 156 children with SLD, 101 (64.7%) had dyslexia, 125 (80.1%) had dysgraphia, 95 (60.1%) had dyscalculia, and 82 (52.6%) had poor comprehension. It is to be noted that most children have different combinations of the above four forms of SLD.

The risk factors associated with SB are given in Tables 3 and 4. Poor vision was seen in 11 children (3.8%), poor hearing in 2 (0.7%), chronic illnesses in 8 (2.8%), history of brain fever

**Table 1: Educational level and employment status of parents of children with SB**

| Parameters | Fathers (n=286) (%) | Mothers (n=286) (%) |
|---|---|---|
| Education | | |
| Illiterate | 4 (1.4) | 10 (3.5) |
| Primary school (1ˢ–5th std.) | 11 (3.8) | 11 (3.8) |
| Middle school (6th–7th std.) | 12 (4.2) | 19 (6.6) |
| High school (8th–10th std.) | 81 (28.3) | 109 (38.1) |
| Pre-university college | 50 (17.5) | 58 (20.3) |
| Degree (beyond 12th) | 119 (41.6) | 78 (27.3) |
| Expired or not available (NA) | 9 (3.1) | 1 (0.3) |
| Occupation | | |
| Professional | 16 (5.6) | 3 (1) |
| Semi-professional | 16 (5.6) | 9 (3.1) |
| Arithmetic skills job | 176 (61.5) | 29 (10.1) |
| Skilled worker | 34 (11.9) | 8 (2.8) |
| Semi-skilled | 18 (6.3) | 0 (0) |
| Unskilled | 16 (5.9) | 14 (4.9) |
| Unemployed/home maker | 1# (0.3) | 222* (77.6) |
| Expired | 9 (3.1) | 1 (0.3) |
| Expired or NA | 8 (2.8) | 1 (0.3) |

#unemployed, *home maker

**Table 2: Principal diagnostic categories among children with SB**

| Diagnosis | Frequency (n=286) (%) |
|---|---|
| ADD only | 13 (4.5) |
| ADD+SLD | 87 (30.4) |
| SLD only | 69 (24.1) |
| SL | 59 (20.6) |
| ID | 9 (3.1) |
| Others | 49 (17.1) |

ADD: Attention deficit disorder, SLD: Specific learning disabilities, SL: Slow learners, ID: Intellectual disability

in 5 (1.7%), and head trauma in 3 (1%). Low IQ (SL and ID) showed significant association with consanguinity (p=0.001), developmental delay (p<0.00001), seizure disorder (p=0.001), and lower educational status of parents (Table 4). Delivery

**Table 3: Occurrence of known risk factors among children with SB**

| Risk factors | Frequency (n=286) (%) |
|---|---|
| Medical | |
| Consanguinity | 91 (31.8) |
| Cesarean section | 80 (28) |
| Prematurity/low birth weight | 52 (18.2) |
| Perinatal insult | 23 (8) |
| Neonatal jaundice | 51 (17.8) |
| Seizure disorder | 23 (8) |
| Developmental delay | 145 (50.7) |
| Poor sleep (snoring/ frequent awakening) | 75 (26.2) |
| Psychosocial | |
| Parental alcoholism | 26 (9.1) |
| Marital disharmony | 26 (9.1) |
| Sibling rivalry | 50 (17.5) |
| Disturbed relation with parents | 32 (11.2) |
| Dominant parenting | 26 (9.1) |
| Overindulgent parenting | 65 (22.7) |
| Inconsistent discipline | 22 (7.7) |
| Multiple caretaking | 120 (42) |
| Recent change in school | 54 (18.9) |
| Disturbed relation with peers | 22 (7.7) |
| Fear of teachers | 26 (9.1) |

SB: Scholastic backwardness

by cesarean section was significantly associated with ADD (p=0.028). There was no association between cesarean section and hyperactivity (p=0.297). Among the study subjects, 6 cases (2.1%) had single parent, 3 (1%) had psychiatric disorders in family, and 2 (0.7%) had parents with an indifferent attitude.

## DISCUSSION

A total of 286 students were included in the study. As the hospital is located in a district headquarters, the majority of referrals were from local private schools (91.3%). The majority of referrals were by doctors (52.1%) and self (39.2%) as compared to teachers (7.2%). There were 87% of fathers and 85.6% of mothers having studied high school and beyond (Table 1). This could also indicate a growing awareness of learning disabilities among professionals and public alike. This is in contrast to the study by Ramadas and Vijayan [16] in which most referrals were by teachers. The majority of fathers belonged to the arithmetic skills job (61.5%) of Kuppuswamy classification [15], while most of the mothers were homemakers (77.6%).

In our study, the most common cause of SB was ADD combined with SLD (30.4%) followed by SLD (24.1%) and SL (20.6%). Only a small percentage of children had pure ADD and ID. We can see that SLD affected almost 55% of children. Karande *et al.* [17] also found SLD to be the predominant cause of SB. Ramadas and Vijayan [16] and Haneesh *et al.* [18] reported low IQ as the most common cause of SB. However, in both these studies, the children were from a rural area, studying in government schools and from poor socioeconomic background.

**Table 4: Risk factors significantly associated with specific etiologies of SB**

| Risk factors | Number (n=286) | Etiological categories | | | | p value |
|---|---|---|---|---|---|---|
| | | ADD±SLD (100) | SLD (69) | Low IQ (SL+ID) (68) | Others (49) | |
| Consanguinity | | | | | | |
| Present | 91 | 24 (26.4%) | 23 (25.3%) | 34 (37.4%) | 10 (11%) | $\chi^2$: 16.193 p=0.001 |
| Cesarean section | | | | | | |
| Absent | 195 | 76 (39%) | 46 (23.6%) | 34 (17.4%) | 39 (20%) | |
| Present | 80 | 33 (41.25%) | 19 (23.75%) | 10 (12.5%) | 18 (22.5%) | $\chi^2$: 9.068 p=0.028 |
| Absent | 206 | 67 (32.5%) | 50 (24.3%) | 58 (28.2%) | 31 (15.1%) | |
| Developmental delay | | | | | | |
| Present | 145 | 41 (28.3%) | 24 (16.6%) | 51 (35.2%) | 29 (20%) | $\chi^2$: 28.234 p<0. 00001 |
| Absent | 141 | 59 (41.8%) | 45 (31.9%) | 17 (12.1%) | 20 (14.2%) | |
| Seizure disorder | | | | | | |
| Present | 23 | 5 (21.7%) | 4 (17.4%) | 13 (56.5%) | 1 (4.3%) | $\chi^2$: 15.387 p=0.0015 |
| Absent | 263 | 95 (36%) | 65 (24.7%) | 55 (21%) | 48 (18.3%) | |
| Father's education | | | | | | |
| 0–7th std. | 27 | 6 (22.2%) | 4 (14.8%) | 14 (51.9%) | 3 (11.1%) | $\chi^2$: 12.955 p=0.0047 |
| ≥8th std. | 250 | 90 (36%) | 64 (25.6%) | 52 (20.8%) | 44 (17.6%) | |
| Expired/NA | 9 | 4 | 1 | 2 | 2 | |
| Mother's education | | | | | | |
| 0–7th std. | 40 | 7 (17.5%) | 10 (25%) | 17 (42.5%) | 6 (15%) | $\chi^2$: 11.383 p=0.0098 |
| ≥8th std. | 245 | 93 (38%) | 59 (24.1%) | 50 (20.4%) | 43 (17.6%) | |
| Expired/NA | 1 | 0 | 0 | 1 | 0 | |

The denominator for the percentages is the number mentioned at the beginning of each row in the frequency column. SB: Scholastic backwardness, ADD: Attention deficit disorder, SLD: Specific learning disabilities, SL: Slow learners, ID: Intellectual disability

This finding was observed in our study also with parents of children with lower IQ having lower educational status.

There was a marked preponderance of males (76.9%) in the study group with a male:female ratio of 3.3:1. Male preponderance has been observed in children with ADHD and SLD in many studies [12,19]. This has been attributed to slower processing speed among males compared to females [20]. The difference could also be because boys with their rambunctious behavior easily come to the attention of the teacher and are referred early, compared to girls with SLD who are less likely to misbehave [21].

The majority of the children were from primary school (56%) compared to middle (25%) and high school (18%). A similar observation was made by Arun *et al*. [19]. This is because, with each passing year, children are introduced to more complex concepts which challenge them and make their disability obvious. Literature states that the most common form of SLD is dyslexia, affecting 80% of children identified as having a learning disability [21]. However, in our study, dysgraphia was the most common problem (80%), followed by dyslexia (65%), dyscalculia, and poor comprehension. Most of the children had a combination of problems. Isolated deficits in reading, writing, and maths were seen very rarely. A similar observation has been made in other studies by Ramadas *et al*. and Arun *et al*. [16,19]. This explains the fact that children with SLD tend to score poorly in all subjects.

In our study, we found that developmental delay (50.7%) and consanguinity (31.8%) showed a significant association with low IQ. This is understandable as consanguinity predisposes to recessive genetic disorders and delayed milestones reflect abnormal brain development [22]. Seizure disorder was also significantly associated with low IQ.

We observed a significant association between cesarean section and ADD (p=0.045). This is supported by many past studies, but a recent meta-analysis by Xu *et al*. stated that the increased risk is marginal and could be due to confounding factors [23]. However, hyperactivity was not associated with C-section (p=0.297). Other antenatal, natal, and postnatal risk factors were identified, but none of them showed any significant relation to specific etiologies. Poor sleep due to snoring and frequent awakening was present in 26.2% children. Disturbed sleep is known to affect scholastic performance [24].

Disturbing home influences could adversely affect school performance. Some factors observed to occur in higher frequency in the study population included parental alcoholism (9.1%), marital disharmony (9.1%), and disturbed relationship with parents (11.2%). Similar observations have been made by Haneesh *et al.* [18]. Sibling rivalry was seen in 17.5% children. This could result from a comparison with a sibling who is studying well which demotivates the child with SB and could affect his/her school performance.

Parenting styles could have an impact on home training which in turn affects school performance. Multiple caretaking (42%) and overindulgent parenting (22.7%) were most frequently observed in our study population. When there are multiple caretakers, as in the case of joint families, the parents tend to neglect the child's studies assuming that it is being taken care of by somebody else.

Overindulgent parents are usually lax in home-training, giving in to every demand of the child [12]. Frequent change in school was observed in 18.9% which could be due to poor performance in the previous school, with parents attributing poor performance to poor teaching. Sometimes, change in the medium of instruction or syllabus could precipitate drop in performance in an otherwise adjusted child [12]. Disturbed relationship with peers (7.7%) and fear of teachers (9.1%) was also observed among children with SB. This could result in school refusal and thus affect scholastic performance.

This study had several limitations. Being a record-based study, the results were dependent on the accuracy of data entry. Second, there was no control group with good scholastic achievement for comparison.

## CONCLUSION

The common causes for SB in children include ADD, SLD, SL, and ID. Disturbed relationship with parents, teachers and peers, and poor parenting techniques might be contributing factors for SB. Therefore, a child presenting with SB should be evaluated exhaustively and psychosocial factors at home and school should be addressed.

## ACKNOWLEDGMENTS

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