



## Prevalence of Dyscalculia and Sex Difference Among Public Secondary School Students In Nigeria

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### ABSTRACT

This study examined sex differences in the prevalence of dyscalculia disorder among public secondary school students in Ika South Local Government Area of Delta, Nigeria. Two research questions were raised, with their corresponding hypothesis formulated and tested at a 0.05 alpha significance level. This research adopted the descriptive survey research design. The population comprised ten thousand, three hundred and ninety-two (10,392) students at the 2021/2022. The multistage sampling technique was employed to select one thousand, three hundred and forty-four (1,344) respondents. The instrument was a questionnaire titled "Dyscalculia Screening Questionnaire Among Secondary School Students" (DSQ), adapted from the Dyscalculia Screening Tool (DST) by Adaikala and Pio (1982). The data was analysed using descriptive statistics (mean and standard deviation) and inferential statistics (t-test). The findings of the study revealed that dyscalculia disorder was moderately prevalent among public secondary school students in Ika South Local Government Area of Delta State, Nigeria. There was no significant influence of sex and dyscalculia disorder among secondary school students. It was therefore recommended that psychotherapeutic intervention should be provided to secondary school students to manage the prevalence of dyscalculia among secondary school students.

#### Keywords:

Sex; Prevalence; Dyscalculia Disorder; Students

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## INTRODUCTION

Understanding the disparities in Dyscalculia Disorder prevalence by sex in Nigeria is needed, it helps in improving health outcomes, and tailoring interventions based on vulnerability. Evidence from literature has proven that basic number skills form the foundations for learning more complex mathematical skills (Li et al., 2018); and achievement in mathematics is dependent on early numerical skills (Zhang et al., 2017; Blume et al., 2021). Human experience which is as an active process and multifaceted has been observed to be the outcome of learning (Abu-Hamour & Al-hmouz, 2017). Specific Learning Disability (SLD) is a broad term for diverse group of neurobehavioral disorders characterized by significant unexpected and persistent difficulties in the acquisition and application of efficient reading (dyslexia), writing (dysgraphia), and mathematical (dyscalculia) abilities Eteng-Uket (2023).

The term dyscalculia is derived from a combination of Greek and Latin words: “Dys” comes from Greek word which means “difficulty”; “calculia” from Latin word which means calculation (Khing, 2016). Literally, dyscalculia means calculation difficulty. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), stated that Dyscalculia is an alternative term used to refer to a pattern of difficulties characterised by problems processing numerical information, learning arithmetic facts, and performing accurate calculations; it noted that the “prevalence of specific learning disorders across the academic domains of reading, writing and mathematics is 5%-15% among school age children” (APA, 2013). Different terms have been used to identify dyscalculia by different researchers. Some of the terms include developmental dyscalculia (Anobile et al, 2016; Attout & Majerus, 2015; Attout et al, 2015; Bugden & Ansari, 2016; McCaskey et al, 2017; Rosenberg-Lee et al, 2015; Sousa et al, 2016). Mathematics disability (Abu-Hamour, 2018; Radhika & Kiran, 2017).

Dyscalculia causes have been attributed to biological and environmental factors. Students with dyscalculia show significant reduced activity in the brain regions that belongs to networks of quantity and number processing (Aquil & Ariffin, 2020). Obani (2006) estimated the prevalence to be 15-30% among the pupils within the school age 45%. Dyslexia 25%, attention deficit 15%, while others have 5%. Bendova and Petrikova (2015) study indicates that 20% of children between the ages of 5-7 years in each school either are at risk or have PLD. The study also reveals that prevalence by gender is 1 girl to 3 boys, 60% of male and 40% of female have the disability. Bartonova (2014) studied 30 students with PLD in Bron city and discovered that 80% (n=24) are girls, 20% (n=6) are boys. The prevalence by subtype in the sample shows that 40% (n=12) have dyslexia, 7%(n=2) have dysgraphia, 7% (n=2) are dysgraphia, 7% (n=2) students have dyscalculia and 13%(n=4) of the students have dyslexia and dysgraphia while those with dysgraphia and dystrophic is 26% (n=8). The author observed that girls have this disability than the boys and attributes it to the choice of secondary schools preferred by girl.

In Nigeria, Orim and Uko, (2017) shows that the number of Pupils with SLD within the ages of 6-21 was 2.67million in the 90s to over 8.1 million, estimating the

dyscalculia prevalence to be 15-30%, while Osuroji, (2013) put the prevalence among children within the school age to be 45%, dyslexia alone have 25%, attention deficit has about 15% and others has 5%. Department of Special Education University of Calabar (2015) screened 100 pupils in Calabar metropolis and the result indicated that 25% has dyscalculia, 35% with dyslexia, 15% are dysgraphic, 10% has dyspraxia, attention deficit and others have 8% and 7%. It is difficult to distinguish individuals with dyscalculia from those who are 'slow learners' (delayed acquisition), or suffering from impaired acquisition due to low cognitive ability (Butterworth, 2018). These challenges in identifying dyscalculia further contribute to the lack of its recognition. Dyscalculia does not affect students' academic work in school; it also affects their daily lives (out-of-school activities). These include poorer life outcome such as health achievement, quality of life, inability to manage finance and limited career opportunities. Students with dyscalculia show significant reduced activity in the brain regions that belongs to networks of quantity and number processing (Aquil & Ariffin, 2020).

Students often face challenges in the area of calculation and solving simple arithmetical problems which may be attributed to the intensity of school activities, duration of school, impact of school workload, social functioning, and students' poor coping skills which could set significant stress on the students (Nkomo, 2020). Some secondary school students do not perform well in numeracy related subjects from the results of national examinations as evident in West African Senior Secondary Schools Certificate Examination (WASSCE) and National Examination Council (NECO). From the records of the different National Examinations, learning difficulties can be said to be present as revealed from the poor academic performances in mathematics. The results of Senior Secondary School Certificate Examination (SSCE) in the National Examination Council (NECO) and West African Examinations Council (WAEC) in the recent times have attested to the fact that the prevalence of learning disabilities might be high in Nigeria. It is generally believed that more than 40% of registered candidates who sat for the Senior School Examinations failed either English Language or Mathematics, with less than four credits pass out of eight or nine registered subjects. Presumption of this might be learning disabilities: dyslexia and dyscalculia, since these disorders affect reading and mathematical skills (Westwood, 2016).

Table 1. Statistics of students Performance in Mathematics in WAEC in Nigeria

| Year | Number of Students who sat | No of students with A1-C6 | % of students with A1-C6 | No of students with D7-F9 | % of students with D7-F9 |
|------|----------------------------|---------------------------|--------------------------|---------------------------|--------------------------|
| 2016 | 1,544,234                  | 597,310                   | 38.68                    | 946,924                   | 61.32                    |
| 2017 | 1,559,162                  | 796,041                   | 59.22                    | 54,8169                   | 40.78                    |
| 2018 | 1,572,396                  | 786,016                   | 49.98                    | 786,380                   | 50.02                    |
| 2019 | 1,590,173                  | 447,809                   | 28.16                    | 1,142,364                 | 71.84                    |
| 2020 | 1,538,445                  | 425,022                   | 27.53                    | 1,113,423                 | 72.37                    |
| 2021 | 1,560,261                  | 688,858                   | 44.15                    | 871,403                   | 55.85                    |

Source: West African Examination Council (WAEC) Website (2016-2021) and National Bureau of Statistics, (2022).

Table 2. Statistics of students Performance in Mathematics in NECO in Nigeria

| Year | Number of Students who sat | No of students with A1-C6 | % of students with A1-C6 | No of students with D7-F9 | % of students with D7-F9 |
|------|----------------------------|---------------------------|--------------------------|---------------------------|--------------------------|
| 2016 | 1,022,474                  | 812,846                   | 80.16                    | 209,628                   | 19.84                    |
| 2017 | 1,051,472                  | 745,053                   | 70.85                    | 306,419                   | 29.15                    |
| 2018 | 1,032,729                  | 738,195                   | 71.48                    | 294,534                   | 28.52                    |
| 2019 | 1,151,016                  | 829,787                   | 71.59                    | 321,229                   | 28.41                    |
| 2020 | 1,209,992                  | 984,101                   | 73.89                    | 225,891                   | 26.11                    |
| 2021 | 1,225,631                  | 945,853                   | 77.17                    | 279,778                   | 22.83                    |

Source: National Examination Council (NECO) Website (2016-2021)

Osisanya et al, (2018), observed that sex is not a factor in dyscalculia prevalence as they found no significant difference between male participants with dyscalculia and female participants with dyscalculia. In the same vein, while symptoms of dyscalculia occur in both sexes, females are more prone to the manifestation of dyscalculia than their male counterpart (Nkomo, 2020; Lambert & Spinath, 2014; Landerl & Moll, 2010). In a study by Cheng., Miao and Zhou, (2021), to access Prevalence of Learning Disabilities among Chinese Children, Adolescents, and Young Adults: Comorbidity, Age Trend, and Gender Differences, a significant gender difference in the prevalence rate of dyscalculia existed among all participants: males had a higher prevalence (6.4%) than females (5.3%).

**METHOD**

The population of this study consists of all students in the public secondary schools in Ika South Local Government Area of Delta State. The Local Government Area has a total of twenty-one (21) public secondary schools with a total population of ten thousand, three hundred and ninety-two (10,392) students as at 2021/2022 academic session. This is made up of five thousand and fourteen (5,014) male students and five thousand, three hundred and seventy-eight (5,378) female students from JSS 1 to SSS 3 (Ministry of Education, Ika South Local Government Area, 2022). The local government area is delineated into two constituencies (namely: Agbor and Abavo constituencies). Agbor constituency has sixteen (16) secondary schools, while Abavo constituency has five (5) secondary schools. Secondly, the purposive sampling technique was used to select seven (7) secondary schools from the twenty-one (21) secondary schools. This was used so that a section of the two constituencies will not be under-populated. Five (5) secondary schools were selected from Agbor constituency while two (2) secondary schools were selected from Abavo constituency. from which a total of 1,344 respondents which is 12.93% of the total population for the study were selected.

## RESULTS AND DISCUSSION

Is dyscalculia disorder prevalent among public secondary school students in Ika South Local Government Area of Delta State?

Table 3. Mean and Standard Deviation of Dyscalculia Disorder Prevalence Among Public Secondary School Students

| SN | Items                          | N    | Mean | Std. Dev. | Decision |
|----|--------------------------------|------|------|-----------|----------|
| 1  | Numerical Difficulties         | 1344 | 2.67 | 0.54      | Moderate |
| 2  | Identification Difficulties    | 1344 | 2.77 | 0.56      | Moderate |
| 3  | Cognitive Difficulties         | 1344 | 2.70 | 0.55      | Moderate |
| 4  | Problem Solving Difficulties   | 1344 | 2.79 | 0.52      | Moderate |
| 5  | Logical/Reasoning Difficulties | 1344 | 2.85 | 0.59      | Moderate |
| 6  | Understanding Difficulties     | 1344 | 2.87 | 0.60      | Moderate |
|    | Dyscalculia Prevalence         | 1344 | 2.78 | 0.33      | Moderate |

Key: 1.00 – 2.33 = Low level; 2.34 – 3.67 = Moderate level; 3.68 – 5.00 = High level

Table 3 showed that the mean value for numerical difficulties of respondents is 2.67 and standard deviation is 0.54; for identification difficulties, mean of respondents is 2.77 and standard deviation is 0.56; for cognitive difficulties, mean of respondents is 2.70 and standard deviation is 0.55; for problem solving difficulties, mean of respondents is 2.79 and standard deviation is 0.52; for logical/reasoning difficulties, mean of respondents is 2.85 and standard deviation is 0.59; for understanding difficulties mean of respondents is 2.87 and standard deviation is 0.60. Since all the difficulties fall within 2.34 – 3.67, therefore, the difficulties have moderate prevalence. The mean response is 2.78 and standard deviation is 0.33, falling within 2.34 – 3.67, therefore dyscalculia disorder is said to be moderately prevalent among all public secondary school students in Ika South Local Government Area.

There is no significant influence in dyscalculia disorder among public secondary school students in Ika South Local Government Area of Delta State by sex.

Table 4. T-test of Influence in Dyscalculia Disorder Among Public Secondary School Students in Ika South Local Government Area of Delta State by Sex

| Sex    | N   | Mean   | Std. Deviation | T    | Sig. (2 tailed) |
|--------|-----|--------|----------------|------|-----------------|
| Male   | 756 | 111.19 | 13.66          | .315 | .753            |
| Female | 588 | 110.96 | 13.00          |      |                 |

$\alpha = 0.05$  level of significance

Table 4 shows a t-test value of 0.315 and a p-value of 0.753 testing at an alpha level 0.05; the p-value is greater than the alpha level. So, the null hypothesis which states that there is no significant influence in dyscalculia disorder among public

secondary school students in Ika South Local Government Area of Delta State by sex is retained. This means that sex has no moderating effect on the prevalence of dyscalculia disorder among public secondary school students in the local government area.

The findings revealed that dyscalculia disorder is said to be moderately prevalent among all public secondary school students in Ika South Local Government Area. The aforementioned finding however lends credence to studies which opined that dyscalculia quite common among adolescents with age bracket 11-19 years' secondary school age for which the age bracket of the sample population falls with (APA, 2013). Corroborating with the aforementioned findings, evidence in Nigeria estimated the prevalence rate to be 15-30% (Orim & Uko, 2017); while the prevalence among children within the school age to be 45%, dyslexia alone have 25%, attention deficit has about 15% and others has 5%.

Finally, it was revealed that sex had no influence on the prevalence of dyscalculia disorder among public secondary school students in Ika South Local Government Area, this assertion corroborates findings from Osisanya et al, (2018) which observed that sex was not a contributing factor in dyscalculia prevalence as they found no significant difference between male participants with dyscalculia and female participants with dyscalculia, alluding to the fact that symptoms of dyscalculia occur in both sexes. Contrary to the aforementioned finding while symptoms of dyscalculia occur in both sexes, however females are more prone in the manifestation of dyscalculia than their male counterpart (Nkomo, 2020; Lambert & Spinath, 2014). While Miao and Zhou, (2021), opined from their study that males had a higher prevalence (6.4%) than females (5.3%).

## **CONCLUSION**

This study has provided meaningful insight into the prevalence of dyscalculia disorder and sex difference among public secondary school students in Ika South Local Government Area of Delta State of Nigeria. It was concluded from this study that dyscalculia disorder was moderately prevalent among all public secondary school students in Ika South Local Government Area, while sex had no influence on dyscalculia disorder prevalence among public secondary school students in Ika South Local Government Area.

## **RECOMMENDATIONS**

Students should be pre-tested for dyscalculia disorder at the point of entering school in order to identify and manage the disorder on time. Attention should be given to students manifesting dyscalculia disorder by referring them to the Counsellors and Counselling Psychologists by teachers and parents. Adequate exposure needs to be carried out on the adverse effect of dyscalculia disorders among students, using media like mobile phones, television, and the internet to promote awareness. Counselling/Psychotherapeutic interventions should be promoted and

provided in secondary schools to manage dyscalculia disorder among public secondary school students. The government and school authorities should employ Counsellors and Counselling Psychologists to provide psychotherapeutic interventions to manage dyscalculia disorders among public students in secondary schools. Finally, students should be encouraged to visit the Counsellor/Counselling Psychologist when the need arises..

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