A Cross-sectional Study on Awareness of Dyslexia Disorder among University Students

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Abstract

BACKGROUND: The condition of dyslexia is a learning disability leading to difficulty in acquiring basic skills of reading, spelling, and writing. It is a disorder with a neurological origin that does not affect the intelligence of a person. It is estimated that between 5% and 10% of the population suffering from dyslexia, but this number can also be as high as 17% because dyslexia may not be recognized and diagnosed in some individuals and because some of them may not disclose that they are diagnosed. In Malaysia, it is estimated that 4% to 8% of children attending school have dyslexia. Dyslexics tend to be more artistic and creative than others.

AIM: This study examines the awareness of dyslexia disorder among university students.

METHODS: The data are collected from the participants through self-made survey questionnaires that consist of 25 questions per questionnaire. A descriptive cross-sectional study is conducted from April 2019 to May 2019.

RESULTS: The current study reflected that dyslexia, not a disease, thus it is not curable. Individuals with dyslexia require extra patience and effort from the family members, teachers, as well as the public, especially in their learning process. We believe that a lack of understanding about this disorder by the public will bring negative impacts to dyadic individuals such as causing unwanted misunderstanding, causing mental stress to the dyslexics, bringing negative impact to their learning processes, and so on.

CONCLUSION: Our study results suggest that the knowledge level of dyslexia among university students considered as lower than average.

Introduction

The word dyslexia is a term that has been used over the years to describe children with literacy difficulties. According to The National Organization for Dyslexia Malaysia, dyslexia is defined as a learning disability leading to difficulty in acquiring the basic skills of reading, spelling, and writing [1]. Dyslexia is a language-based disability, but it is often misunderstood as a disease or an intellectual defect [2]. It is the neurological origin and it is characterized by difficulties with accurate and/or fluent word recognition and poor spelling and decoding abilities and does not affect the intelligence of the person [3]. The high incidence of suicide attempts in adolescents with dyslexia are three times as common as in others of the same age. The rate of anxiety disorders is three times as common and depressive disorders are twice as high [4].

According to The Ministry of Health Malaysia, there are no available statistics for dyslexic students in Malaysia, but it is estimated that 4–8% of children attending school have dyslexia [5]. Dyslexia refers to a cluster of symptoms. There are a few common traits found in dyslexic children, such as having difficulties in spelling, reading, writing, and differentiating words in reverse [6]. Individuals with dyslexia have difficulty in integrating sound and letter. They often get confused with words which have similar sounds. Moreover, they tend to read slow and have difficulties to copy notes from the board. Besides that, these individuals have diminished self-confidence due to their lack of achievement and tend to drift away into other thoughts [7].
Despite that, these individuals are good in art, acting, and more creative than non-dyslexic individuals. People with dyslexia often face social problems, trouble learning, or understanding certain subjects and also show signs of low self-esteem. Despite that, these individuals tend to be better in art, acting, and more creative than the others [8]. Dyslexia is the outcome of multiple risk factors. Including the family history of dyslexia and other learning disabilities, premature birth or low birth weight, exposure to nicotine, drugs, alcohol, or infection that might alter brain development of the fetus and individual differences in the brain that enable reading. There are multiple tests to diagnose dyslexia. They often cover background information, intelligence, word recognition, phonological processing, automaticity and fluency skills, reading comprehension, vocabulary knowledge, family history and development, and oral language skills [9].

**Study outcomes**

- A cross-sectional study was completed by MAHSA medical students (n = 250)
- The understanding of dyslexia is still a lower than average when students describe dyslexia
- This result demonstrated that there is no significant association between the age group of participants and their level of awareness of dyslexia
- There is a significant association between gender and dyslexia awareness.

**Materials and Methods**

The data are collected from the participants through self-made survey questionnaires that consist of 25 questions per questionnaire. A descriptive cross-sectional study is to be conducted from April 2019 to May 2019. All undergraduate students in MAHSA University (Saujana Putra Campus), for example, students from undergraduate courses such as Medicine and Surgery, Dentistry, Pharmacy, Nursing, Accountancy, Business, and Engineering. All samples chosen from undergraduate course students, any postgraduate, and diploma students will not be included in this study. All the staffs and lecturers excluded from this study.

The sampling method to be applied is a non-probability random sampling method. The sample size is set to be 250 participants, it is estimated by applying Cochran equation and Finite population correction method.

Cochran equation: 

\[ n_0 = \frac{Z^2 \times p \times q}{e^2} \]

\( n_0 \) = sample size for infinite population, \( Z = Z \) score, \( p = \) estimated proportion, \( q = 1 - p \), \( e = \) margin of error.

In this study, the confidence level is set to be 95%; hence, \( Z = 1.65 \) (13) and \( e = 1 - 0.95 = 0.05 \). \( p = 0.5 \), as the expected level of awareness of dyslexia, is assumed to be higher than 50%. \( q = 1 - p \), \( q = 0.5 \).

\[ n_0 = \frac{1.65^2 \times 0.5 \times 0.5}{0.05^2} = 272.25 \]

The sample size calculated from this equation is then rounded to 272.

Finite population correction method:

\[
 n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}
\]

\( n = \) sample size for finite population, \( n_0 = \) estimated sample size for infinite population, \( N = \) size of population.

The number of undergraduate students from MAHSA University (Saujana Putra Campus) is estimated to be approximately 3000 students. Hence, \( N = 2000 \).

\[
 n = \frac{272}{1 + \frac{272 - 1}{3000}} = 249.46
\]

The calculated sample size is then rounded to 250 students.

This study used several categorical variables. The following categorical variables are the course of study, gender, age group, and year of study (Table 1).

**Table 1: Association between level of Knowledge regarding Dyslexia with selected demographic variables**

| No. | Variables          | Description                        | Type of Variables | Value Units |
|-----|--------------------|------------------------------------|-------------------|-------------|
| 1.  | Course of study    | Course group of the participants   | Categorical       |             |
|     |                    | 1. Medicine                       |                   |             |
|     |                    | 2. Dentistry                      |                   |             |
|     |                    | 3. Pharmacy                       |                   |             |
|     |                    | 4. Biomedical Science             |                   |             |
|     |                    | 5. Nursing                        |                   |             |
|     |                    | 6. Physiotherapy                  |                   |             |
|     |                    | 7. Medical Imaging                |                   |             |
|     |                    | 8. Engineering                    |                   |             |
|     |                    | 9. Business                       |                   |             |
|     |                    | 10. Accounting                    |                   |             |
| 2.  | Gender             | Gender of the participants         | Categorical       |             |
|     |                    | 1. Male                           |                   |             |
|     |                    | 2. Female                         |                   |             |
| 3.  | Age group          | Age group of the participants      | Categorical       |             |
|     |                    | 1. <18                            |                   |             |
|     |                    | 2. 18–21                          |                   |             |
|     |                    | 3. >21                            |                   |             |
| 4.  | Year of study      | Year of study of the participants  | Categorical       |             |
|     |                    | 1. 1                              |                   |             |
|     |                    | 2. 2                              |                   |             |
|     |                    | 3. 3                              |                   |             |
|     |                    | 4. 4                              |                   |             |
|     |                    | 5. 5                              |                   |             |
| 5.  | Awareness          | Awareness of dyslexia by the       | Categorical       |             |
|     |                    | participants                       |                   |             |
|     |                    | 1. Aware                          |                   |             |
|     |                    | 2. Not aware                      |                   |             |

Ethical approval was obtained before the commencement of the study from the Institutional Ethics Committee. The ethics committee approval number is RMC/EC39/2019.

**Statistical calculation and data analysis**

The questions are generated in a self-made manner by referring to reliable resources and consist of 25 questions. The questions are divided into two
sections (Section A and Section B). Section A includes five multiple-choice questions, whereas Section B includes 20 yes/no questions (each question from both sections consists of only one correct answer). The questionnaire collected back from the participant after he/she finished answering all the questions. The result of each participant evaluated through the scoring system shown below:

- 1 score: question with correct answer
- 0 score: question with wrong answer.

The maximum score considered as 25 of 25 questionnaires and the lowest score is 0 of 25. Any question sheet collected back from any participant which does not have any answer presented is considered as invalid. Participants who answered ≥21 questions are considered as aware of dyslexia. The sample prevalence of dyslexia awareness among MAHSA undergraduates is compared with the hypothesized prevalence using one sample single-tailed t-test. The associations between the parameters and awareness are tested using Fisher’s exact test and Pearson’s Chi-square test. The result of the tests used by SPSS Version 23.0.

Results

Prevalence of dyslexia awareness among MAHSA undergraduates (regardless of course of study, gender, age group, and year of study)

The study recorded a total of 250 valid responses from the participants. Among them, 35.6% (n = 89) are aware of dyslexia, 64.4% (n = 161) are not aware of dyslexia. Table 2 shows that the prevalence of dyslexia awareness among MAHSA students is 35.6%.

Table 2: Frequency of awareness

| Awareness | Frequency | Percent (%) | Valid percent | Cumulative percent |
|-----------|-----------|-------------|---------------|--------------------|
| Not aware | 161       | 64.4        | 64.4          | 64.4               |
| Aware     | 89        | 35.6        | 35.6          | 100.0              |
| Total     | 250       | 100.0       | 100.0         |                    |

The null hypothesis set is tested using one-sample single-tailed t-test.

Prevalence of dyslexia awareness among MAHSA undergraduates

Table 3 shows the percentage and number of participants that are aware and not aware of dyslexia among the different course groups of participants. The prevalence of dyslexia awareness studied with undergraduate courses such as Medicine (MBBS), Accounting, Dentistry (DDS), Pharmacy (PHM), Biomedical Science (BioMed), Nursing, Physiotherapy (Physio), Medical Imaging (Med imaging), Engineering, and Business are 0.355, 0.077, 0.439, 0.333, 0.412, 0.429, 0.367, 0.500, 0.200, and 0.000, respectively.

Table 3: Prevalence of dyslexia awareness among undergraduate students

| Medical students | Awareness Not aware | Aware | Total |
|------------------|---------------------|-------|-------|
| Count            | 12                  | 1     | 13    |
| % within course  | 92.3%               | 7.7%  | 100.0%|
| % within awareness| 7.5%               | 1.1%  | 8.6%  |
| % of total       | 4.8%                | 0.4%  | 5.2%  |
| Dental            | 37                  | 29    | 66    |
| % within course  | 56.1%               | 43.9% | 100.0%|
| % within awareness| 23.0%             | 32.6% | 55.6% |
| % of Total        | 14.8%               | 11.6% | 26.4% |
| Pharmacy         | 20                  | 10    | 30    |
| % within course  | 60.7%               | 33.3% | 100.0%|
| % within awareness| 12.4%              | 11.2% | 23.6% |
| % of total        | 8.0%                | 4.0%  | 12.0% |
| Nursing          | 4                   | 3     | 7     |
| % within course  | 57.1%               | 42.9% | 100.0%|
| % within awareness| 2.5%              | 3.4%  | 6.8%  |
| % of total        | 1.6%                | 1.2%  | 2.8%  |
| Medical imaging  | 19                  | 11    | 30    |
| % within course  | 63.3%               | 36.7% | 100.0%|
| % within awareness| 11.8%             | 12.4% | 24.2% |
| % of Total        | 7.6%                | 4.4%  | 12.0% |
| Engineering       | 5                   | 5     | 10    |
| % within course  | 50.0%               | 50.0% | 100.0%|
| % within awareness| 3.1%              | 5.6%  | 8.7%  |
| % of total        | 2.0%                | 2.0%  | 4.0%  |
| Business          | 4                   | 1     | 5     |
| % within course  | 80.0%               | 20.0% | 100.0%|
| % within awareness| 2.5%              | 1.1%  | 3.6%  |
| % of total        | 1.6%                | 0.4%  | 2.0%  |
| Total             | 161                 | 89    | 250   |
| % within course  | 64.4%               | 35.6% | 100.0%|
| % within awareness| 100.0%            | 100.0%| 100.0%|
| % of total        | 64.4%               | 35.6% | 100.0%|

Awareness of dyslexia awareness among different age groups

Table 4 shows that the prevalence of dyslexia awareness within the age group of below 18 years old, age between 18 and 21, and above 21 years old is 0.500, 0.333, and 0.389, respectively.

Table 4: Age groups * awareness cross-tabulation

| Age groups | Awareness | Total |
|------------|-----------|-------|
| Not aware  | Aware     |       |
| <18        | 1         | 1     |
| % within age groups | 50.0% | 50.0% | 100.0%
| 18-21      | 102       | 51    | 153   |
| % within age groups | 66.7% | 33.3% | 100.0%
| >21        | 58        | 37    | 95    |
| % within age groups | 61.1% | 38.9% | 100.0%
| Total      | 161       | 89    | 250   |
| % within age groups | 64.4% | 35.6% | 100.0%

Awareness of dyslexia in male and female

Table 5 shows that the prevalence of dyslexia awareness of male and female participants is 0.256 and 0.401, respectively.
Awareness of dyslexia in YOS

Table 6 shows that the prevalence of dyslexia awareness of year 1, year 2, and year 3 students is 0.340, 0.350, and 0.410, respectively.

Table 5: Gender * awareness cross-tabulation

| Gender | Variable | Awareness | Total |
|--------|----------|-----------|-------|
|        |          | Not aware | Aware |
| Male   | % within gender | 74.4% | 25.6% | 100.0% |
| Female | Count | 103 | 69 | 172 |
| Female | % within gender | 59.9% | 40.1% | 100.0% |
| Female | Count | 161 | 89 | 250 |
| Female | % within gender | 64.4% | 35.6% | 100.0% |

Table 7 shows that the association testing between the course of study, age group, gender, and year of study with awareness is 0.176, 0.177, 0.032, and 0.361, respectively.

Table 6: YOS * awareness

| Response | Year of study | Variable | Awareness | Total |
|----------|---------------|----------|-----------|-------|
|          |               | Not aware | Aware |
| YOS      |               |           |          |
| 1        | Count | 62 | 32 | 94 |
| 2        | Count | 76 | 41 | 117 |
| 3        | Count | 23 | 16 | 39 |
| Total    | Count | 161 | 89 | 250 |
|          | % within YOS | 66.0% | 34.0% | 100.0% |
|          | % within YOS | 65.0% | 35.0% | 100.0% |
|          | % within YOS | 59.0% | 41.0% | 100.0% |

Result of association testing between the parameters (course of study, age group, gender, and year of study of participants) and awareness of dyslexia of participants.

Table 7: Result of association testing between the parameters set and awareness

| Parameters | Types of test used | Value | p-value (single-sided) |
|------------|--------------------|-------|------------------------|
| Course of study | Fischer’s exact test | 8.992 | 0.176 |
| Age group | Fischer’s exact test | 2.102 | 0.177 |
| Gender | Pearson’s Chi-square test | 3.926 | 0.032 |
| Year of study | Pearson’s Chi-square test | 0.725 | 0.361 |

Conclusion

The current study suggests that a majority of students not aware of dyslexia disorder. The research results show that the understanding of dyslexia is very minimum level when correlates with the course of study, age group, and year of study. The understanding of dyslexia is still lower than average when students describe dyslexia. Moreover, findings from this research reflected that the implementation of awareness such as study courses, seminars, and visual aids must be encouraged by educators and to raise awareness of the dyslexia disorder among university students.

Authors’ Contribution Statement

VS and NKC conceived of the presented idea and wrote the main manuscript draft. PNH, DS, and GS carried out the study. LPO, MMA, WYS, RRRP, and RMZ developed the questionnaires. VKS and NKC verified the statistical analysis. All authors discussed the results and contributed to the final manuscript.
References

1. Anis MY, Normah CD, Mahadir A, Norhayati I, Rogayah AR, Dzalani H. Interventions for children with dyslexia: A review on current intervention methods. Med J Malaysia. 2018;73(5):311-20. PMid:30350811

2. Giofrè D, Toffalini E, Provazza S, Calcagni A, Altoè G, Roberts DJ. Are children with developmental dyslexia all the same? A cluster analysis with more than 300 cases. Dyslexia. 2019;25(3):284-95. https://doi.org/10.1002/dys.1629 PMid:31332875

3. Protopapas A, Parrila R. Is dyslexia a brain disorder? Brain Sci. 2018;8(4):61. https://doi.org/10.3390/brainsci8040061 PMid:29621136

4. Daniel SS, Walsh AK, Goldston DB, Arnold EM, Reboussin BA, Wood FB. Suicidality, school dropout, and reading problems among adolescents. J Learn Disabil. 2006;39(6):507-14. https://doi.org/10.1177/00222194060390060301 PMid:17165618

5. Rahim SK, Nasrudin NH, Azmi AZ, Junid RA, Mohamed Z, Abdullah II. Designing mobile application for dyslexia in reading disorder problem. Int J Acad Res Bus Soc Sci. 2018;8(1):628-46.

6. Snowling JM. Early identification and interventions for dyslexia: A contemporary view. J Res Spec Educ Needs. 2013;13(1):7-14. PMid:26290655

7. Ismail MA, Balakrishnan V, Haruna K. Dyslexic children: The need for parents awareness. J Educ Hum Dev. 2018;7(2):91-9.

8. Hulme C, Snowling MJ. Reading disorders and dyslexia. Curr Opin Pediatr. 2016;28(6):731-5. PMid:27496059

9. de Oliveira GD, da Silva BP, Dias MN, Seabra GA, Macedo CE. Reading component skills in dyslexia: Word recognition, comprehension and processing speed. Front Psychol. 2014;5:1339. https://doi.org/10.3389/fpsyg.2014.01339 PMid:25506331

10. Pino M, Mortari L. The inclusion of students with dyslexia in higher education: A systematic review using narrative synthesis. Dyslexia. 2014;20(4):346-69. https://doi.org/10.1002/dys.1484 PMid:25293652

11. van Viersen S, de Bree HE, de Jong FP. Protective factors and compensation in resolving dyslexia. Sci Stud Read. 2019;23(6):461-77. https://doi.org/10.1080/10888438.2019.1603543

12. O’Brien EG, McCloy RD, Yeatmana DJ. Categorical phoneme labeling in children with dyslexia does not depend on stimulus duration. J Acoust Soc Am. 2019;146(1):245-55. https://doi.org/10.1121/1.5116568 PMid:31370631

13. Khanam US, Al Masud KN, Khurshed T, Chakma U. Antibiotics prescription pattern in rural area of Bangladesh: A cross-sectional study in Debidwar Upazila of Comilla district. Int J Pharm Pharm Sci. 2018;10(12):1246-50. https://doi.org/10.22159/ijpps.2018v10i12.29437

14. Nawarathna NG, Herath HM, Wickramarathne DB, Sakeena MH, Gunawardhane CB, Sudeshika SH. Awareness of usage of sunscreens among school children in Kandy, Sri Lanka. Int J Pharm Pharm Sci. 2016;9(1):311-4. https://doi.org/10.22159/ijpps.2017v9i1.111863