

CHARACTERISTICS OF NEUROPHOBIA AMONG MEDICAL STUDENTS: A SINGLE-CENTRE STUDY IN INDONESIA

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Abstract

Backgrounds: Neurophobia is a fear of neurology among medical students. Early detection is necessary for prevention and further treatment because neurophobia will have a negative impact on patient care. The objective of this study is to investigate the occurrence of neurophobia among medical students. **Methods and Materials:** A cross-sectional study using the validated NeuroQ questionnaire was distributed to Faculty of Medicine, University of Indonesia (FMUI) students. Inclusion criteria are age ≥ 18 years, pre-clinical and clerkship students, able to read, understand, speak Indonesian and answer questions independently, and willing to participate in research. Exclusion criteria are questionnaire data that is not filled in completely. Descriptive and comparative tests were carried out to analyze variables. **Results:** A total of 89 FMUI students completed the questionnaire with an average NeuroQ score of 17.22 (SD 1.999). Most of the students (73 students; 82%) had a NeuroQ score ≥ 16 points, 32 students (36%) had neurophobia, and 41 students (46%) had marked neurophobia. Gender was not related to the total NeuroQ score ($p=0.815$). There was no significant difference between pre-clinical and clerkship students with the total NeuroQ score ($p=0.246$). **Conclusions:** Most students experience neurophobia. New strategies are needed to change students' perceptions of neurology.

Keywords

Medical education, neurophobia, neuroQ

Introduction

Neurological disorders are a health problem that continues to provide a significant burden for society and healthcare workers. It caused over 10 million deaths and 349 million disability-adjusted life-years (DALYs) worldwide in 2019. According to the study of Global Burden of Disease, neurological and cerebrovascular disorders continue to increase in low and middle-income countries (low-income and middle-income countries/LMICs). The

magnitude of this disorder results in the need for trained health workers to provide quality neurological services and care.^{1,2}

A study in England and the World Health Organization (WHO) recommends a minimum of one neurologist per 100,000 population.³ Another study in the United States stated that the availability of neurology doctors increased by 11% between 2013 and 2025, but the demand is expected to increase by up to 16%.⁴ This condition illustrates the global need for an increasing number of neurologists.⁵

Neurology itself has become a field in which few medical students are interested.⁶ This is illustrated in Gutmann et al.'s research that only 2.8% of students have plans to pursue a neurology residency study program.⁷ Many studies reveal that medical students around the world have shown fear of neurology, which is known as neurophobia. In 2023, research in Brazil discovered that 63.6% of medical students suffered from neurophobia.⁵ Neurophobia is measured and detected using the NeuroQ.^{5,8}

Knowing the condition of neurophobia is essential to implementing a new learning system for medical students. Currently, there is no scoring to assess neurophobia in Indonesia and there are no studies that provide an overview of neurophobia in Indonesia. So, this research is expected to produce an Indonesian version of NeuroQ that is valid and reliable and can be used to provide an overview of neurophobia in Indonesia that has never been presented before. It is hoped that the results of this study can help, especially teaching staff, in the education process and improve the quality of neurology patient services and the number of neurology doctors in the future.

Materials and Methods

This study used a cross-sectional design using the Indonesian version of the NeuroQ questionnaire. This study applies the total sampling method from October 2023–August 2024. The NeuroQ questionnaire was translated into Indonesian and then tested for validity and reliability using IBM SPSS Statistics 25 software. The validity test was conducted using Pearson correlation and the reliability test was assessed using Cronbach's Alpha scale. After testing validity and reliability, the questionnaire was distributed to the target research population. Inclusion criteria are age ≥ 18 years, pre-clinical and clerkship students at the Faculty of Medicine, University of Indonesia (FMUI), able to read, understand, speak Indonesian and answer questions independently, and willing to participate in research by signing the informed consent form. Exclusion criteria are questionnaire data that are not filled in completely. Data will be presented descriptively and processed using IBM SPSS Statistics 25 software. Comparative tests for categorical and numerical variables use the unpaired T-test if the data is normally distributed and the Mann-Whitney test if it is not. This study has been approved by the FMUI's research ethics committee under the number KET-1385/UN2.F1/ETIK/PPM.00.02/2023.

Results

A total of 89 FMUI students participated in this research by filling in all 5 points of the NeuroQ questionnaire. The five questions in NeuroQ consisted of: Q1. I find neurological concepts difficult to understand; Q2. I have confidence in my ability to understand neurological concepts; Q3. Compared to other medical specialties, I find neurology to be more complicated; Q4. I have confidence in my ability to study neurology; Q5. I find it difficult to apply theoretical knowledge in neurology to the clinical examination (Figure 1). The Pearson correlation coefficient showed a strong correlation between the question scores. Reliability with a Cronbach's Alpha coefficient of 0.644 showed that the 5 point NeuroQ questions have a fairly good level of reliability. The student demographic data collected was 48 women (53.9%) and 41 men (46.1%) with the educational level of 10 pre-clinical students (11.2%) and 79 clerkship students (88.8%). Students were aged 18 to 25 years, with a mean age of 22.37 years (SD: 1.352).

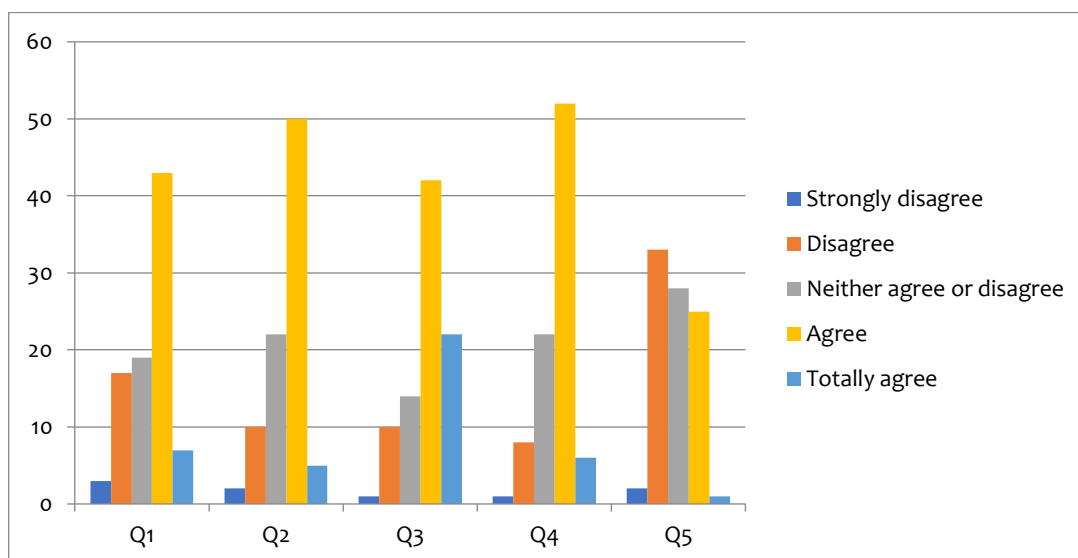


Figure 1. Distribution Graph of Answers to NeuroQ

The average NeuroQ score obtained was 17.22 (SD 1.999). A total of 73 students (82%) had a NeuroQ score ≥ 16 points, 32 students (36%) with neurophobia, and 41 students (46%) were truly neurophobic. Gender was not related to the total NeuroQ score ($p=0.815$). There was no significant difference between pre-clinical and clerkship students with the total NeuroQ score ($p=0.246$).

Discussion

This study used the NeuroQ questionnaire which contained 5 questions with a 5 point Likert scale (strongly disagree to totally agree). The NeuroQ questionnaire came from Sorbonne University, Paris and was translated into Indonesian. The Pearson correlation coefficient showed a strong correlation between question scores. Reliability with a Cronbach's alpha coefficient of 0.644. The initial study in Paris tested the NeuroQ

questionnaire and obtained strong Pearson correlation values between all items, while Cronbach's alpha internal consistency was 0.58. The minimum and maximum scores for the NeuroQ are 5 and 25, respectively. Neurophobic students have a threshold score of 16-17, while marked neurophobia requires a score of ≥ 18 .⁸

Prior to the NeuroQ score, there was no specific approach for measuring the prevalence of neurophobia that was appropriate for pre-clinical students.⁵ The Schon Questionnaire has been used to assess neurophobia which consists of 4 question points that assess interest, knowledge, difficulty, and level of confidence in dealing with neurological patients. The last two questions assessing the difficulty and level of confidence in dealing with neurology patients have a score of 1 to 5. The lowest score indicates high level of difficulty and low confidence. A cumulative score of ≤ 4 on these 2 items indicates as neurophobic. However, this questionnaire is not entirely appropriate for students who have never had interaction with neurological patients.⁹ The study in Saudi Arabia also created a questionnaire to assess neurophobia which consisted of 2 parts: demographic data and a section assessing student attitudes towards neurology using a 4-point Likert scale with 12 questions. However, the questionnaire results only described descriptive data from each question point and there was no limit to the neurophobia enforcement score.¹⁰

Of the total 89 research samples, 73 (82%) FMUI students had a total NeuroQ score ≥ 16 experiencing neurophobia. McGovern's research showed that 99/395 (25.1%) medical students experienced neurophobia in the 2020 academic year, and 29/395 (7.3%) students were marked neurophobic. There were 358/395 (91.1%) students who said neurology was difficult. Gender was unrelated to the total NeuroQ score ($p=0.815$) in this study, whereas according to McGovern, women had a higher NeuroQ score than men ($p=0.002$).⁸ Neurophobia was also found in 63.3% of medical students in Brazil in 2022.⁵ Previous studies in Singapore found that 47.5% of students were neurophobic.¹¹ As many as 85.5% of medical student respondents in Saudi Arabia thought that neurology was a challenging subject, 91.5% thought that neurological diseases were very complex and difficult to study, and 82.5% agreed that neurological examinations were more complex.¹⁰ Schon's research results also showed that the level of knowledge of medical students in England was lowest in the field of neurology compared to other medical sciences ($p 0.001$).⁹

Approximately 10-20% of hospital acute inpatients are patients with neurological illnesses. Over the last few decades, the number of neurological illnesses has increased from 134.1 per 100,000 people in 1985 to 274.7 in 2006. General practitioners rather than neurologists manage the majority of neurological illnesses.¹² As many as 82% of students experienced neurophobia in this study. These figures show a very large prevalence of neurophobia. Prolonged neurophobia will lead to inaccurate diagnoses, increased referrals in the field of neurology, and poor patient outcomes.⁸ The high number of cases of neurophobia will also result in a decrease in career interests in the field of neurology. Neurology was initially a popular career choice, ranking 8th out of 17 specialty categories. A total of 1,403 (2.7%) new students were interested in becoming neurologists, but over

graduation, the field of specialization in neurology fell to 11th out of 17 specialty categories. Only 19.8% of students maintained an interest in the specialty of neurology.⁷ According to Loftus research from 2016, neurology is a difficult subject with low interest among medical students and general practitioners when compared to other specialties.¹³ Previous studies also found that more than half of medical graduates no longer consider neurology as a future career option, compared to 20% in their pre-clinical years.¹⁴

Neurophobia may begin to develop during the pre-clinical period. A late identification of a phobia can result in the inavoidance of neurology courses and failure to implement corrective actions. Neurophobia may worsen during medical school and will continue into clinical practice. Therefore, appropriate strategies are needed to overcome this problem early on. A study at Penn State College of Medicine showed that 36% of student respondents experienced less than satisfactory teaching in neurology during the pre-clinical period, the majority of respondents wished they had more exposure to neurology during the pre-clinical period (42.8%).⁶ A study in Saudi Arabia also showed that the majority of students (70.4%) explained their lack of interest in neurology due to poor learning experiences.¹⁰ A recent review offered 3 strategies for combating neurophobia by 1) building continuous neurology education, 2) combining active learning and observation, and 3) increasing socialization in the field of neurology.¹⁵

The decline in interest in the field of neurology suggests that neurophobia is an acquired trait and may be related to the teaching methods used. Several studies corroborate this idea, pointing to poor teaching methods as a cause of neurophobia.^{10,16} Effective and innovative teaching methods can increase pre-existing interest in neurology as McGovern 2021 found.⁸ Teaching methods with an in-depth and intuitive approach need to be used to understand the pathophysiology of neurological diseases.¹⁷ Through role-playing, students, as patients with clinical symptoms of neurology, can increase empathy and greater understanding of the manifestations of neurological disease. An intuitive teaching style can be useful in teaching difficult theoretical subjects like neuroanatomy. McGovern found that the average NeuroQ score decreased 22.3% in neurophobic students, the baseline NeuroQ score was 14.1 [SD 2.4] and after adopting the new learning method, the average NeuroQ score became 12.9 [SD 2.8]. Neurophobic students after following the new teaching method were 77 (19.5%) which had a significant difference with the number of neurophobic students in baseline ($p=0.7$). The absolute risk reduction score was 5.6%, whereas the alternative risk reduction was 22.2%. There were 20 students who were truly neurophobic (5.1%), with an absolute risk reduction of 2.3% and an alternative risk reduction of 31.0%. However, there was no control group in this study, so it was impossible to evaluate the differences between the learning methods used.⁸ Bedside teaching is the most popular learning method that is frequently recommended by students to improve the quality of learning (pre-clinical: 86.5%, clinical: 89.9%, and internship: 92.3%).⁵ Basic neuroscience learning methods must have clinical correlation with evidence-based learning, including problem-based learning (PBL) which is then applied at the clinical stage. The 10-week pre-clinical neurology module should consist of clinically oriented neurology

cases and neurologic examinations. Neurology clerkships that included patient meetings, interdisciplinary conferences, teaching with consultants, and integrated scientific discussion sessions have been shown to help reduce neurophobia while strengthening deeper learning.⁶

One of the limitations of our study included the small sample size. The small sample size allowed limited variability and reliability of the questionnaire. Most of the respondents for this research were clerkship students. A homogeneous sample can cause response bias, so this study may not reflect all medical student situations. Therefore, it is envisioned that further study will encompass all levels of medical student education with a bigger sample.

Conclusions

The prevalence of neurophobia is very high among FMUI students. To overcome this condition, a surveillance system is needed to monitor and track neurophobia incidents. The updated assessment of neurophobia, as determined by the NeuroQ score, may serve to lower the prevalence of neurophobia in the future through innovative learning method solutions. NeuroQ can be a reference for future research to evaluate and compare the incidence of neurophobia at various levels of medical education. Long-term prospective studies are required to investigate the long-term effects of neurophobia, clinical behavior, and patient care quality.

Competing Interests

There is no conflict of interest in this study.

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