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Clinical Study

Evaluation of a screening questionnaire for Parkinson's disease in a Chinese population

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ABSTRACT

A questionnaire designed to detect Parkinson's disease (PD) was developed by Tanner et al. in 1990. It consists of nine symptom questions and has been tested in several languages. We investigated the validity of the questionnaire in a Chinese population. Because handwriting is not common for elderly Chinese people, item 2 about "smaller handwriting" may be of no use, thus we also computed the performance of the questionnaire without item 2. The questionnaire was administered face-to-face to all 59 PD patients registered in our hospital and 217 non-neurological outpatients from the same hospital. All 217 outpatients were offered a short interview and examination related to PD. Of the 59 PD patients, 47 participated the study. None of the 217 non-neurological outpatients was diagnosed with parkinsonism. A combination of any three questions yielded the best balance between sensitivity (93.6%) and specificity (88.9%). There was no difference in validity between the questionnaire with and without item 2. This symptom questionnaire is an appropriate instrument to identify PD in a Chinese population. The questionnaire without item 2 is also satisfactory as a screening instrument to detect PD and may be more suitable for areas with a high illiteracy rate.

1. Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disorder, after Alzheimer's disease, in elderly people.[1] There are approximately 1.7 million patients suffering from PD in China.[2] Because the prevalence of PD increases significantly with age,[2] more patients will emerge as the aging population grows. But the etiology of PD remains unknown. Epidemiological data from different areas or ethnic groups are helpful to identify the genetic or environmental factors involved in the etiology of PD. However, epidemiological surveys, especially door-to-door surveys by clinicians, are usually costly and time-consuming.

A sensitive, specific and simple screening instrument for PD could meet the needs of accuracy and efficiency and provide equitable comparisons between different surveys. There have been several screening instruments designed to detect PD.[3] The most commonly tested and used is a screening questionnaire developed by Tanner et al.[4] It consists of nine symptom questions and can be used easily. The screening questionnaire has been translated from English and tested in several other languages including Spanish,[5] German,[6] Italian,[6] and Portuguese.[7] However, the performance and cut-off point of the questionnaire varied in different languages. This prospective study, approved by the local Ethical Committee, aimed to investigate the accuracy of the questionnaire in a Chinese population and to compute the optimal cut-off score.

2. Methods

2.1. Questionnaire

The questionnaire was translated from English into Chinese, giving particular attention to wording for local idiomatic expressions in Chinese (Table 1). The screening instrument can be used as a self-administered questionnaire in literate populations or can be administered by an interviewer.[3] In China, especially in rural areas, illiterate or semiliterate people account for a large proportion of the elderly residents, thus the practice of administering the questionnaire by interviewers was adopted. Furthermore, a bias result stemming from the diminished visual function of elderly people could be avoided. The interviewers were not medically sophisticated and were not informed of the affected and unaffected participants. Participants were able to answer the symptom questions with "yes", "no" or "don't know". "Don't know" responses were considered negative for the computation of sensitivity and specificity.

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Table 1
Screening questionnaire adapted for a Chinese population from Tanner et al[4]

Question	English version	Response	Chinese version	Response
1	Do you have trouble rising from a chair?	Yes/No/Don't know	你从椅子上起立有困难吗？	是/否/不知道
2	Is your handwriting smaller than it once was?	Yes/No/Don't know	你写的字和以前相比是不是变小了？	是/否/不知道
3	Has anyone told you that your voice is softer than it once was?	Yes/No/Don't know	有没有人说你的声音和以前相比变小了？	是/否/不知道
4	Is your balance, when walking, poor?	Yes/No/Don't know	你走路容易跌倒吗？	是/否/不知道
5	Do your feet suddenly seem to get stuck to the floor?	Yes/No/Don't know	你的脚是不是有时突然像粘在地上一样抬不起来？	是/否/不知道
6	Does your face seem less expressive than it used to?	Yes/No/Don't know	你的面部表情是不是没有以前那么丰富？	是/否/不知道
7	Do your arms or legs shake?	Yes/No/Don't know	你的胳膊或者腿颤抖吗？	是/否/不知道
8	Do you have trouble buttoning buttons?	Yes/No/Don't know	你自己系扣子困难吗？	是/否/不知道
9	Do you shuffle your feet and take tiny steps when you walk?	Yes/No/Don't know	你走路时是不是脚拖着地走小步？	是/否/不知道

2.2. Sensitivity

The sensitivity of the questionnaire was tested using all 59 PD patients who were registered in the Department of Neurology at the First Affiliated Hospital of Shanxi Medical University. All patients were diagnosed according to the United Kingdom Brain Bank Criteria.[8] The patients were telephoned and asked to participate in a routine consultation at the hospital. Before the consultation, interviewers gained informed consent from every patient and administered the questionnaire face-to-face in separate rooms. A second call was employed to contact patients if they did not response within 2 weeks after the first call. A further 2 weeks was allowed for a subsequent response.

2.3. Specificity

We advertised in the clinic of the same hospital for 1 month to recruit patients for evaluating the specificity of the questionnaire. All patients who gave informed consent were enrolled unless they were younger than 40 years old or attending a neurological clinic. The specificity was verified in a population of 217 patients. The questionnaire was also administered in separate rooms in the clinic. Each patient was interviewed and examined for tremor, rigidity, bradykinesia, masked face, gait disturbance and postural stability according to the Unified Parkinson's Disease Rating Scale by a neurologist blinded to the questionnaire results.

2.4. Statistical analysis

For each individual question of the screening instrument, we computed a "don't know" rate, the sensitivity, and specificity. The differences between affected and unaffected subjects for each question were also tested using the chi-squared test. In addition, we computed the total score by assigning each of the nine questions a score of one with a positive answer and a score of 0 with a negative answer. The average total scores were compared between the two groups using the Mann–Whitney U test. We investigated the performance of the total score and assessed the optimal cut-off score to distinguish affected from unaffected subjects through a receiver operating characteristic (ROC) analysis. Because handwriting is not common for elderly Chinese people, item 2, referring to "smaller handwriting", may be of no use and we also computed the performance of the questionnaire without item 2. All tests were two-tailed, and a p value of less than 0.05 was considered statistically significant. Data are presented as mean ± standard deviation unless otherwise specified.

3. Results

Of the 59 PD patients, 47 completed the interviews (response rate = 80%). The patients with PD were 20 women and 27 men, ranging from 43 to 83 years old at the time of the study. The participants without PD were 108 women and 109 men ranging in age from 40 to 89 years. None of the 217 non-neurological clinic participants was diagnosed with parkinsonism (Table 2).

The "don't know" response rate, sensitivity, and specificity of the nine individual symptom questions are shown in Table 3. All nine symptom questions showed significant differences between participants with and without PD and were valid to distinguish the two groups ($p = 0.000$; chi-squared test). The "don't know" response rate was the highest for the "smaller handwriting" question. The symptom questions with the highest sensitivity were "inexpressive face" and "small steps". The question "trouble buttoning" had the highest specificity.

The mean total score of patients affected by PD (5.30 ± 1.955) was significantly higher than that of participants unaffected by PD (1.18 ± 1.668; $p = 0.000$, Mann–Whitney U test). If the item 2 "smaller handwriting" was not included in the questionnaire, the mean total score of patients with PD (4.85 ± 1.911) was also significantly higher than that of participants without PD (1.12 ± 1.593; $p = 0.000$, Mann–Whitney U test).

Table 4 shows the sensitivity, specificity and Youden's index of the total score of the questionnaire with or without item 2 "smaller handwriting" at each cut-off point. For example, a cut-off of 3 means that participants who responded positively to three or more symptom questions were considered "positive" to the test (likely to have PD). A cut-off of 3 obtained the best Youden's index with a sensitivity of 93.6% and a specificity of 88.9%. With a cut-off of 2, sensitivity was a slightly higher (97.9%) at the expense of lowering specificity (73.7%). The questionnaire without item 2 "smaller