Lay versus expert interviewers for the diagnosis of migraine in a large sample of elderly people

C Tzourio, B Gagnière, M El Amrani, M-G Bousser, A Alpérovitch

Objective: To determine the agreement between lay interviewers and experts in the diagnosis of migraine by questionnaire.

Subjects: A population based sample of 1188 individuals aged 64 to 73 years.

Methods: Participants who declared that they had recurrent headaches (n = 238) answered a structured questionnaire by lay interviewers with special training in migraine. A migraine expert subsequently interviewed all the headache sufferers using the same questionnaire. Migraine was defined according to the International Headache Society criteria.

Results: In comparison with the expert, the diagnosis derived by the lay interviewers had high values for specificity (97%) and positive predictive value (86%), and a low sensitivity (50%) and negative predictive value (57%). Agreement between the expert and the lay interviewers was low, with a $\kappa$ value of 0.36 (95% confidence interval 0.26 to 0.47). The most serious discrepancies concerned the duration of attacks, the worsening of headaches by physical activity, the presence of nausea or vomiting, and the unilaterality of headaches. As a result, the lifetime prevalence of migraine headaches was greatly underestimated by lay interviewers (6.5%) in comparison with the expert (11.1%).

Conclusions: A low level of agreement between lay interviewers and a headache expert in the diagnosis of migraine headaches by structured questionnaire may result in a substantial underestimation of migraine prevalence.

Although the diagnosis of migraine often requires some level of expertise, in large studies it is impractical for all the participants to be interviewed by an expert in headaches. Thus in most epidemiological studies the diagnosis of migraine is made by self administered questionnaire or after an interview with lay interviewers. In 1988 the International Headache Society (IHS) set up an algorithm for the diagnosis of migraine which can easily be incorporated into a structured questionnaire and administered by lay interviewers. There have been few studies involving substantial numbers of cases in which migraine diagnosis based on the IHS criteria obtained by lay interviewers has been compared with that made by a migraine expert.

Our aim in this study was to compare the diagnosis of migraine obtained by trained lay interviewers and by a headache specialist using the same IHS criteria-based structured questionnaire in a large population of elderly people.

METHODS

Study design

The EVA (epidemiology of vascular aging) study is a population based longitudinal study of cognitive and vascular aging which has been described in detail elsewhere. Briefly, men and women born between 1922 and 1932 were recruited from the electoral rolls of the city of Nantes, France. A standardised questionnaire was administered to obtain information about demographic background, occupation, medical history, drug use, and personal habits. Cognitive function was assessed by the mini-mental state examination (MMSE). Written informed consent was obtained from all participants, and the study was approved by the ethics committee of the Hôpital de Kremlin-Bicêtre.

Migraine diagnosis

The migraine study was undertaken during the second follow up visit, which was four years after the baseline visit and involved 1188 participants. Migraine assessment involved the use of a structured questionnaire reproducing all the items of the IHS criteria. This questionnaire had been tested previously in another study and showed high reproducibility between experts. The 1188 participants were first asked about recurrent attacks of headache during their lifetime as part of the general questionnaire during a face to face interview with two lay interviewers (fig 1). Those who did not complain of having had recurrent attacks of headache at any time (n = 946) were considered to be headache-free and the remainder of the questionnaire on headaches was ignored.

The 238 participants who answered yes to the screening question were asked specific questions about their headaches. Instructions were given to the interviewers to obtain a lifetime history of headaches by asking participants questions about headaches in their early adulthood. It was decided not to include questions on aura, which requires an experienced interviewer. From the answers to this questionnaire it was therefore possible to reach a diagnosis of migraine by applying the IHS algorithm (lay interviewer diagnosis).

Participants who answered yes to the screening question were also asked to participate in a telephone interview with a headache specialist. The interview was undertaken by a neurologist specialising in headaches, using the same structured questionnaire as the lay interviewer. The expert was blinded to the results of the questionnaire by the lay interviewer, as well as to all clinical and laboratory data concerning the participants. With this questionnaire, a diagnosis of migraine based on the IHS algorithm was then derived (expert diagnosis). This expert based diagnosis was considered to be the reference diagnosis. Participants with migraine were also asked if their attacks were persistent—defined as at least one attack during the past year. The one year prevalence of migraine was derived from this question.

Among the 238 subjects screened positive for recurrent headaches, four had died by the time of the interview and one had hearing difficulties and could not participate in a
The final sample thus consisted of 1179 participants (99% of the initial sample) among whom 233 were screened positive for recurrent headaches (fig 1).

Statistical methods
Sensitivity, specificity, positive and negative predictive values, κ index, and the McNemar test were used to compare the lay interviewers with the expert for the diagnosis of migraine. The accuracy of the lay interviewers in identifying migraine as compared with the expert based diagnosis was expressed as positive and negative predictive values (per cent). Guidelines suggest that values of κ above 75% indicate excellent agreement, values between 75% and 40% indicate good to fair agreement, and those below 40% are considered to show poor agreement. The McNemar test compares the difference between false positive and false negative diagnoses and addresses the question of whether the two types of inconsistency are equally common. A 5% level of significance and 95% confidence intervals were used. All analyses were done using the SAS® statistical package (version 8.00).

RESULTS
The sample included 1179 individuals (689 women, 58.4%), mean age 69 years (range 63 to 75). Cognitive status was quite high, with a median MMSE of 28 (interquartile range 27 to 29) and no participant had severe cognitive impairment or dementia.

Among the 233 participants screened positive for recurrent headaches, lay interviewers were unable to collect precise information on some aspects of the headaches in eight, who were therefore considered as missing (fig 1). Migraine headaches were diagnosed in 76 participants (64 women) by the lay interviewers’ questionnaire. The lifetime prevalence (95% confidence interval (CI)) of migraine based on the lay interviewers’ questionnaire was therefore 6.5% (5.1% to 7.9%). The expert was able to interview all 233 participants with recurrent headaches, and diagnosed migraine in 131 of them (114 women, 17 men). The expert also determined that 18 of the participants with migraine but without aura also had attacks of migraine with aura. The lifetime prevalence of migraine headaches diagnosed by the neurologist was 11.1% (9.3% to 12.9%). The one year prevalence of migraine was 3.9% (2.7% to 5.0%) according to the lay interviewers’ questionnaire and 6.8% (5.3% to 8.2%) according to the expert.

The level of agreement between the neurologist and the lay interviewers was low (table 1), with a κ value of 0.36 (95% CI, 0.07 to 0.64). The proportion of migraine headaches diagnosed by the lay interviewers was lower than that diagnosed by the expert, and the difference was statistically significant for several characteristics (table 2). The agreement between the neurologist and the lay interviewers for each IHS criterion is shown in table 2. The proportion of subjects with the IHS criterion according to the lay interviewers and without it according to the expert was higher for unilateral headache, moderate to severe headache, aggravation by physical activity, and nausea and/or vomiting. However, the proportion of subjects with the IHS criterion according to the expert and without it according to the lay interviewers was higher for pulsating headache, exacerbation by physical activity, and at least one associated symptom. The McNemar test showed that the agreement was statistically significant for all criteria except for the presence of at least one associated symptom.

Table 1

<table>
<thead>
<tr>
<th>Lay interviewers</th>
<th>Migraine</th>
<th>No migraine</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No migraine</td>
<td>85</td>
<td>64</td>
<td>149</td>
</tr>
<tr>
<td>Migraine</td>
<td>11</td>
<td>65</td>
<td>76</td>
</tr>
<tr>
<td>Total</td>
<td>96</td>
<td>129</td>
<td>225</td>
</tr>
</tbody>
</table>

Values are numbers of subjects. Sensitivity 50.4%, specificity 96.6%, positive predictive value 85.5%, negative predictive value 57.0%.

Table 2

<table>
<thead>
<tr>
<th>IHS criteria</th>
<th>Lay</th>
<th>Expert</th>
<th>Agreement*</th>
<th>False positive†</th>
<th>False negative‡</th>
<th>p Value§</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least five attacks during life</td>
<td>98.0</td>
<td>98.5</td>
<td>96.5</td>
<td>1.5</td>
<td>2.0</td>
<td>0.71</td>
</tr>
<tr>
<td>Attacks lasting 4 to 72 hours</td>
<td>54.0</td>
<td>77.3</td>
<td>64.7</td>
<td>6.1</td>
<td>29.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>At least two of the headache characteristics below</td>
<td>80.3</td>
<td>77.5</td>
<td>73.5</td>
<td>14.7</td>
<td>11.8</td>
<td>0.41</td>
</tr>
<tr>
<td>Unilateral</td>
<td>67.3</td>
<td>42.1</td>
<td>65.8</td>
<td>20.7</td>
<td>39.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pulsating</td>
<td>56.3</td>
<td>41.7</td>
<td>69.1</td>
<td>12.8</td>
<td>18.1</td>
<td>0.17</td>
</tr>
<tr>
<td>Moderate to severe</td>
<td>89.2</td>
<td>89.7</td>
<td>87.7</td>
<td>5.9</td>
<td>6.4</td>
<td>0.84</td>
</tr>
<tr>
<td>Aggravated by physical activity</td>
<td>41.6</td>
<td>67.2</td>
<td>61.8</td>
<td>6.3</td>
<td>31.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>At least one associated symptom</td>
<td>68.4</td>
<td>71.8</td>
<td>79.4</td>
<td>8.6</td>
<td>12.0</td>
<td>0.29</td>
</tr>
<tr>
<td>Nausea and/or vomiting</td>
<td>40.2</td>
<td>56.9</td>
<td>74.7</td>
<td>4.3</td>
<td>21.7</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Photophobia and phonophobia</td>
<td>59.8</td>
<td>65.6</td>
<td>75.1</td>
<td>9.6</td>
<td>15.3</td>
<td>0.096</td>
</tr>
</tbody>
</table>

Values are per cent.
*Agreement rate including positive and negative responses.
†Proportion of subjects with the IHS criterion according to the lay interviewers and without it according to the expert.
‡Proportion of subjects with the IHS criterion according to the expert and without it according to the lay interviewers.
§McNemar test.
IHS, International Headache Society.
0.26 to 0.47). Compared with the expert diagnosis, the diagnosis of migraine based on the lay interviewers’ questionnaires was characterised by a sharp contrast between a high specificity and positive predictive value (96.6% and 85.5%, respectively) and a low sensitivity and negative predictive value (50.4% and 51.8%, respectively). Misclassification by the lay interviewers occurred in 49.6% of migraine sufferers (64/129) erroneously classified as non-sufferers, and in 11.3% of non-sufferers (11/96) erroneously classified as sufferers (McNemar test, p < 0.0001). To determine whether this lack of sensitivity of the lay interviewer assessment could be related to the characteristics of the participants, we compared the participants incorrectly diagnosed as non-migrainous by the lay interviewers (false negative, n = 64) with those correctly diagnosed as migrainous (true positive, n = 65). There was no difference between these two groups with regard to characteristics that might have had some influence on the recall of headache characteristics (age, sex, occupation, body mass index, alcohol and tobacco consumption, cognition, education, severity of headaches, and persistence of attacks at the time of interview (data not shown)). Participants’ characteristics did not explain why those with migraine according to the expert were incorrectly classified as non-migrainous by the lay interviewers.

We then compared the answers for each IHS criterion in all patients who had been interviewed by both the lay interviewer and the headache specialist (n = 225) (table 2). Compared with the headache specialist, lay interviewers underestimated the duration of attacks, the worsening of headaches by physical activity, and the presence of nausea or vomiting (false negative between 20% and 30%). Conversely, unilaterality of headaches was more frequent on the lay interviewers’ assessment than on the expert’s, resulting in a 30% false positive rate.

To evaluate whether the overall agreement could be improved by a simple modification of the algorithm, we used the code 1.7 of the IHS classification—that is, headache attacks fulfilling all IHS criteria but one, and not fulfilling any headache criteria (migrainous disorders fulfilling all but one of the IHS criteria, and not fulfilling any tension type headache criteria) improved the sensitivity but led to a deterioration in positive predictive value and specificity, while the κ value remained almost unchanged. Other simple modifications of the IHS algorithm did not lead to substantial improvement in agreement (data not shown).

These results of low sensitivity and relatively high specificity are reflected in those obtained in two other studies done to validate the IHS questionnaire either self administered (sensitivity 51%; specificity 92%) or administered by lay interviewers (sensitivity 42%; specificity 91%).

Analysis of the agreement for each IHS criterion showed that the greatest misclassification occurred for four items: the duration of attacks, aggravation of headaches by physical activity, the presence of nausea or vomiting, and unilaterality of the headaches. Granella et al noted that the worst agreement between four clinicians was obtained for the duration of the attacks. Our study had limitations and strengths. It was based on a sample of elderly participants recruited from the general population. Any observations concerning the validity of the diagnosis are therefore applicable only to participants in that age group and should not be directly extended to younger populations. Because of their relatively old age the participants might have had memory impairment, leading to an underestimation of migraine frequency. However, they were closely monitored for cognitive function, as this was an important outcome variable in the study. In fact, the overall cognitive level was relatively high and there were no cases of dementia among the study population at the time of interview.

Another potential limitation of the study was the lack of any physical examination of the patients with headaches. Participants in the EVA study were, however, followed up over a long period and most secondary causes of headache could therefore be excluded. Further, 70% of the participants (828/1179) had cerebral magnetic resonance imaging as part of the EVA study, and no haemorrhage or brain tumour was diagnosed in patients with recurrent headaches.

An important strength of the study was the large sample and the high percentage of responders. There were few missing data, and all the participants with recurrent headaches agreed to take part in the expert interview. One expert undertook all the interviews, and it was deemed impracticable to test his reproducibility in the setting of the study. Moreover, in a previous study the questionnaire proved to be highly reproducible between experts in the same team (κ = 0.83).

The lifetime prevalence of migraine was 6.5% according to the lay interviewers’ questionnaire results—much less than the 11.1% obtained with the expert interview. Similarly, the one year prevalence was much lower in the lay interviewers’ assessment (3.9%) than in the expert’s assessment (6.8%). Thus, if the diagnosis of migraine had been based only on lay interviewers’ questionnaire, there would have been an important underestimation of the prevalence of migraine in this population.
population. Moreover, about half the participants with migraine would have been misclassified as non-migrainous, which would have been a major limitation of any study of the correlates of and risk factors for migraine in this population.

Overall, our results suggest that in elderly people the best study design to obtain a reliable estimate of the prevalence of migraine and to avoid misclassification would be a two step one. The first step could be a screening procedure with simple questions on recurrent headaches. This could be done by lay interviewers or possibly by a self administered questionnaire. The second step would be an interview of the participants screened as positive by an expert in migraine blinded to all other characteristics of the participants. This strategy seems to be a good compromise between a high quality diagnosis and expert availability. If this optimal design could not be used, and if interviews have to be performed by non-specialists, then the training of lay interviewers should be concentrated on the items which were shown to be highly discordant in our study. Further, the agreement between lay interviewers and headache specialists should be monitored closely, including during the collection of the data, in order to avoid significant misclassification.

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REFERENCES