Prevalence of cognitive impairment: results from the MRC trial of assessment and management of older people in the community

Greta Rait¹, Astrid Fletcher¹, Liam Smeeth¹, Carol Brayne², Susan Stirling¹, Maria Nunes³, Elizabeth Breeze¹, Edmund Siu-Woon Ng¹, Chris J. Bulpitt³, Dee Jones⁴, Alistair J. Tulloch⁵

¹Department of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK
²Institute of Public Health, University of Cambridge, Cambridge, UK
³Section of Care of the Elderly, Imperial College School of Medicine, Hammersmith Campus, London, UK
⁴University Department of Geriatric Medicine, Llandough Hospital, Penarth, Cardiff, UK
⁵Unit of Health Care Epidemiology, Institute of Health Sciences, University of Oxford, Oxford, UK

Address correspondence to: G. Rait. Fax: (+44) 207 794 1224. Email: g.rait@pcps.ucl.ac.uk

Abstract

Background: cognitive impairment is an important part of the diagnostic criteria for dementia. The Mini-Mental State Examination (MMSE) is recommended to test for cognitive impairment and to monitor medication response.

Objectives: we examined the prevalence of cognitive impairment in the UK and assessed associations with cognitive impairment.

Design: cross-sectional survey as part of a cluster randomised trial.

Subjects: representative sample of people aged 75 years and over.

Methods: all subjects had a detailed baseline health assessment including the MMSE.

Results: a total of 15,051 subjects completed the assessment (71.9%). Almost two-thirds of subjects were female (61.5%) and almost half were aged between 75 and 79 years (47.0%). The prevalence of cognitive impairment was 18.3% (95% confidence intervals (CI) = 16.0–20.9) at a cut-off of 23/24, and 3.3% (95% CI = 2.8–4.0) at 17/18. Those with impairment (MMSE 23/24) were significantly more likely to have hearing (odds ratio (OR) 1.7), vision (OR 1.7) and urinary incontinence problems (OR 1.3), have two or more falls in the previous 6 months (OR 1.4), and report poorer health (OR 1.9). Almost half the participants lived alone (n = 7,073; 47.0%) and of these almost one-fifth were impaired (MMSE 23/24; 19.4%).
Prevalence of cognitive impairment

Conclusions: there was a high prevalence of cognitive impairment. This representative sample demonstrates the potential burden of disease and service demands. It supports the need for a broader assessment of functioning as recommended by the National Service Framework for Older People, particularly in people with cognitive impairment.

Keywords: cognition disorders, aged, primary health care, elderly

Introduction

Dementia increases in prevalence with age, with a doubling of prevalence every 5 years [1]. It is a progressive disease process affecting families, carers, health and social care providers. Cognitive impairment is an important part of the diagnostic criteria for dementia. The most commonly used screening instrument for cognitive impairment is the Mini-Mental State Examination (MMSE) [2]. The MMSE has been validated in community and primary care settings, where it has been shown to increase the recognition of cognitive impairment, be acceptable to patients and have consistency between interviewers [3]. It is scored out of 30 and although a low score on the MMSE is suggestive of cognitive impairment, it is not diagnostic of dementia syndrome or any subtypes. It is recommended as a test for cognitive impairment [4–7] and for monitoring medication response [8]. The MMSE has been recommended as one of the first stage assessment scales for case finding in older people [9]. Prevalence studies of cognitive impairment provide varying estimates depending on factors such as age, education, culture and screening instrument used [10–15]. UK community prevalence estimates of cognitive impairment measured using the MMSE range from 3.9% to 5.4% for moderate to severe impairment, to 8.5% to 9.8% for mild impairment [16], with higher rates in older age groups, and for women.

We used data from baseline assessments from the Medical Research Council (MRC) Trial of the Assessment and Management of Older People in the Community [17]. The trial was investigating different approaches to multidimensional screening of older people. The study is the one of the largest in the UK with large numbers of older people and a representative sample of general practices. We aimed to examine the prevalence of cognitive impairment in a large nationally representative sample of people aged 75 years and over living in the community in the UK and assess associations with cognitive impairment.

Methods

This study uses data obtained from the MRC Trial of the Assessment and Management of Older People in the Community. This was a community-based cluster randomised controlled trial, comparing different methods of multidimensional screening of older people, and is described in more detail elsewhere [17, 18]. One hundred and six general practices were selected from the MRC General Practice Framework in England, Scotland and Wales. Practices were stratified by UK tertiles of Jarman score and standardised mortality ratios (SMRs) to provide a representative sample of deprivation and mortality experience. The study population was all patients aged 75 years and over registered with the practice, excluding anyone in long-stay hospitals, nursing homes or with terminal illness. Baseline assessments occurred between 1995 and 1999. The trial is summarised in Figure 1.

Practices were computer randomised to targeted (detailed assessment only if problems identified on brief screening) or universal assessments (detailed assessment on all subjects). Participants in the targeted arm were not included in the analyses, as they were not a representative sample. The detailed assessment covered a wide range of health and social problems including cognitive impairment (MMSE) and was administered by practice nurses. All nurses attended a two-day training session, which included administration of the MMSE. Local research ethics committee approval was obtained for each participating practice.

The MMSE is a 20-item questionnaire that is scored out of 30. Demographic data were collected (age, sex, place of residence, marital status) as well as self-reports of physical limitations (activities of daily living, falls, co-morbid conditions, health status, incontinence), number of medications and tests of impairment (vision and hearing tests), smoking and alcohol.

Analysis

Analyses were performed using the survey commands in Stata 7 software [19]. Cluster sampling and practice stratification were taken into account in the estimation of standard errors [20]. Associations between age, sex, MMSE scores and other variables were modelled using logistic regression.

MMSE scoring

There are clear guidelines for scoring the MMSE, but not for interpreting missing values and people who refuse to answer one or more questions. Zero is often assigned to missing values, but there is no clear rationale behind this [21]. There are no guidelines on how to interpret the MMSE when most of the language section is missing so these participants were excluded from the analysis. Subjects who had more than half missing items on the MMSE were also excluded.

Various cut-offs distinguishing between impaired and non-impaired have been used. Most studies classify subjects who score below 24 as cognitively impaired [22]. Scores can be subdivided to indicate the severity of cognitive impairment, which may be used as a proxy for the severity of dementia. A score of 17 or less is often classified as moderate/severe cognitive impairment. Uniform cut-offs have not been agreed as performance is related to many factors including population type (hospital versus community), socio-economic...
factors and cultural context. We therefore also present details of all scores obtained.

Results

Response rate
In the universal screening arm, 15,051 completed the detailed assessment out of 20,934 eligible subjects (71.9%). The characteristics of the study population are summarised in Table 1. Almost two-thirds of the sample were women and the majority were aged between 75 and 84 years (78.4%). Most subjects rated themselves as being in good health (83.9%). Almost half reported that they lived alone (47.0%).

Missing data on the MMSE
Crude MMSE scores were available on 15,051 subjects. Subjects with more than half missing values in the language section were excluded \(n=411; 2.7\%\). Of the remaining subjects \(n=14,640; 97.3\%\), those who had missing data on more than half the items (15/30) were excluded \(n=19; 0.1\%\).

In total, 430 subjects \(n=430/15,051; 2.9\%\) were judged not to have completed the MMSE (missing responses, or refusal to answer). Information on the reasons for missing data was not available. Non-completers were significantly more likely to be women \((P=0.002)\), older and live in sheltered/residential homes and have hearing or visual problems \((P<0.001)\). These variables were entered stepwise into a logistic model and the adjusted odds ratios (OR) for non-completion of MMSE were: visual (OR 11.8, \(P<0.001\)) and hearing impairment (OR 2.0, \(P<0.001\)), increasing age (75–79 years: OR 1; 80–84 years: OR 1.4; 85–89 years: OR 2.3; 90+ years: OR 3.2, \(P<0.001\)), and living in sheltered/residential accommodation (OR 2.0, \(P<0.001\)). Being female was not a significant factor (OR 1.0, \(P=0.99\)).
The MMSE was reviewed by subsection to see if non-completion was random or related to the difficulty of the items. The sections had a range of missing data: time 2.6%, place 3.0%, registration 2.1%, attention/calculation 9.3%, recall 4.8% and language/performance 9.1%. The attention and language sections are rated as difficult and the registration section as easy.

**Prevalence of cognitive impairment**

The median MMSE score was 27 (interquartile range (IQR) 25–29). Table 2 shows the increasing prevalence of cognitive impairment by age and sex at the cut-off at 23/24 (MMSE23/24) or 17/18 (MMSE17/18). Women were significantly more likely to be cognitively impaired (P < 0.001) and impairment increased significantly with age (P < 0.001). The adjusted Wald test for interaction between age and sex was significant at the 23/24 (P = 158.9, P < 0.001) and 17/18 cut-off points (F = 62.7, P < 0.001), with a steeper gradient for women than men. The overall prevalence of cognitive impairment at MMSE23/24 was 18.3% (95% confidence intervals (CI) = 16.0–20.9), and at MMSE17/18 was 3.3% (95% CI = 2.8–4.0).

To estimate the effect of the missing data assumptions, we re-calculated the prevalence of cognitive impairment (23/24) assuming that the excluded 430 subjects scored 23 or under. The prevalence at 23/24 would have been 20.7% (n = 3,112/15,051).

**Physical and social associations with cognitive impairment**

Physical and social associations with the MMSE23/24 were examined. Over one-quarter of all subjects lived in rented accommodation (27.7%). Of these, 22.7% had impairment. Few subjects were in sheltered/residential accommodation (8.4%), but over one-third were impaired (35.9%). Subjects with impairment were significantly more likely to live in sheltered/residential (OR 2.5) and rented accommodation (OR 1.8) and slightly more likely to be classified as ‘single’ (single, widowed, divorced/separated; OR 1.2).

Impairment was associated with unmet need in terms of activities of daily living (ADL; OR 1.4). Unmet need was when an ADL could not be performed and not enough help was available. Those with impairment were more likely to have hearing (OR 1.7), vision (OR 1.9) and urinary incontinence problems (OR 1.7), and self-reported poor health (OR 2.3). Those with impairment were also more likely to have had two or more falls in the previous 6 months (OR 1.8). The results were adjusted for age, sex and other variables (Table 3). Place of residence, poor self-reported health, hearing, sight and falls remained highly statistically significant (P < 0.001).

Just fewer than half the participants ticked that they lived alone (7,073; 47.0%). Of these, almost one-fifth were impaired (MMSE 23/24; 19.4%). Of those with impairment, 186 (14.4%) had recurrent falls, 106 people reported incontinence (8.2%), over one-third failed the whisper test (n = 502; 39.2%), 85 had vision problems (7.1%) and 178 had unmet need (13.7%). These were all significantly higher than those without impairment living on their own (P < 0.001).
Prevalence of cognitive impairment

This is the largest study to provide estimates of the prevalence of cognitive impairment in older people in the UK. In common with other studies, the prevalence of cognitive impairment in this study increased with age and was higher in women, with the highest prevalence in women aged 90 years and above. The overall prevalence of moderate/severe impairment (3.3%) is consistent with other UK studies and the prevalence of any impairment (18.3%) is slightly higher than many other UK studies, but is dependent on the cut-off used. The MRC CFAS study [23] looked at cognitive impairment in an age-stratified sample of 13,004 people in six UK sites. Their estimates of cognitive impairment at a cut-off of 17/18 showed higher rates than this study, but the sample included institutionalised subjects who are more likely to be impaired. If all people scoring less than 24 on the MMSE in this study were to be investigated, then this would have a significant effect on the workload in primary care.

The strengths of this study include the large sample size, which was representative of the total population, and the large proportion of people over the age of 85 years included.

Discussion

Discussion

Prevalence of cognitive impairment

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The strengths of this study include the large sample size, which was representative of the total population, and the large proportion of people over the age of 85 years included.

There were differences between MMSE completers and non-completers—non-completers being more likely to have a sensory impairment, be older and living in sheltered or residential homes.

Review of missing data on the MMSE subsections demonstrated overall low levels of missing data. Only the attention and language sections had high levels of missing data and these are the more difficult sections. The usefulness of the MMSE for people who are unable to answer the language section is questionable. For physical and educational reasons some subjects did not complete the language section of the MMSE and they were excluded from the analysis. This was a small percentage of the overall total. However it is likely that these excluded subjects were more likely to be impaired, as many of the factors associated with non-completion are associated with cognitive impairment. Our study may be a conservative estimation of the prevalence of cognitive impairment.

The data in this study were collected by self-report. There may be some ascertainment bias as the data may be less reliable in people with cognitive impairment. The results provide us with information about cognitive impairment, but we were not able to comment on the proportion that had dementia, as there were no diagnostic or informant interviews. Other neuropsychological tools are available to assess cognitive impairment.

<table>
<thead>
<tr>
<th>Residence</th>
<th># scoring &lt;24</th>
<th>% scoring &lt;24</th>
<th>Age-/sex-adjusted OR (95% CI)</th>
<th>P value</th>
<th>Fully adjusted OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own</td>
<td>1,316/9,316</td>
<td>14.1 (12.2–16.4)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
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<tr>
<td>Rented</td>
<td>923/4,072</td>
<td>22.7 (19.1–26.7)</td>
<td>1.8 (1.5–2.1)</td>
<td>1.6 (1.4–1.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheltered/residential</td>
<td>443/1,233</td>
<td>35.9 (31.1–41.0)</td>
<td>2.5 (2.1–3.0)</td>
<td>&lt;0.001*</td>
<td>2.3 (1.8–2.8)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or co-habiting</td>
<td>809/6,034</td>
<td>13.4 (11.4–15.8)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Single/seperated/divorced/widowed</td>
<td>1,825/8,297</td>
<td>22.0 (19.4–24.8)</td>
<td>1.2 (1.1–1.4)</td>
<td>&lt;0.001</td>
<td>1.1 (1.0–1.2)</td>
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<tr>
<td>Self-reported health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor/fair</td>
<td>633/2,274</td>
<td>27.8 (24.2–31.8)</td>
<td>2.3 (2.0–2.7)</td>
<td>1.9 (1.5–2.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>1,059/5,361</td>
<td>19.8 (17.0–22.9)</td>
<td>1.5 (1.3–1.6)</td>
<td>1.3 (1.1–1.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very good</td>
<td>968/6,903</td>
<td>14.0 (12.2–16.1)</td>
<td>1</td>
<td>&lt;0.001*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Unmet needs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>2,403/13,610</td>
<td>17.7 (15.3–20.3)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Some/many</td>
<td>279/1,011</td>
<td>27.6 (23.9–31.7)</td>
<td>1.4 (1.2–1.8)</td>
<td>&lt;0.001</td>
<td>1.2 (0.9–1.4)</td>
<td>0.19</td>
</tr>
<tr>
<td>Hearing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passed</td>
<td>1,627/10,860</td>
<td>15.0 (13.0–17.2)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Failed whisper test</td>
<td>1,005/3,604</td>
<td>27.9 (24.6–31.5)</td>
<td>1.7 (1.5–2.0)</td>
<td>&lt;0.001</td>
<td>1.7 (1.5–2.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>2,465/13,927</td>
<td>17.7 (15.4–20.2)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>217/694</td>
<td>31.3 (27.5–35.4)</td>
<td>1.7 (1.4–2.1)</td>
<td>&lt;0.001</td>
<td>1.3 (1.0–1.1)</td>
<td>0.03</td>
</tr>
<tr>
<td>Sight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>2,310/13,122</td>
<td>17.6 (15.2–20.3)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Partial sighted/blind</td>
<td>174/481</td>
<td>36.2 (30.7–42.1)</td>
<td>1.9 (1.5–2.4)</td>
<td>&lt;0.001</td>
<td>1.7 (1.4–2.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Number meds &lt;3</td>
<td>1,524/8,926</td>
<td>17.1 (14.6–19.9)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>4+</td>
<td>1,002/4,918</td>
<td>20.4 (18.1–22.8)</td>
<td>1.2 (1.1–1.3)</td>
<td>0.001</td>
<td>0.9 (0.8–1.1)</td>
<td>0.43</td>
</tr>
<tr>
<td>Falls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1,903/13,952</td>
<td>16.4 (14.1–19.1)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>One</td>
<td>413/1,808</td>
<td>22.8 (20.0–26.0)</td>
<td>1.2 (1.0–1.5)</td>
<td>1.2 (1.0–1.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two+</td>
<td>351/1,190</td>
<td>29.5 (25.7–33.6)</td>
<td>1.7 (1.5–2.0)</td>
<td>&lt;0.001*</td>
<td>1.4 (1.2–1.7)</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

*Test for heterogeneity.

Adjusted for age, sex, residence, marital status, health, needs, hearing, incontinence, vision, medication and falls.
Prevalence of cognitive impairment

The MMSE was selected in this study as it was a well-validated and widely used tool; however, other instruments may also be suitable for screening older people.

As non-completers were significantly likely to have visual or hearing impairment, there are training issues around how best to administer the MMSE to those with physical or educational limitations.

A number of factors have been consistently reported as being associated with dementia. These include age, female gender, low levels of education, smoking and vascular factors [24–30]. Study designs used have not been uniform and have been conducted with different populations producing different results [30]. Decreasing independence in function is related to increasing cognitive impairment [31, 32]. Studies have shown associations with hearing impairment [26]. This study demonstrates a strong relationship between cognitive impairment and sensory impairment (hearing and vision), falls and urinary incontinence, and supports the need for a broader assessment of functioning in people with cognitive impairment. There are concerns about the needs of significant numbers of older people who live on their own and have cognitive impairment.

Conclusions

There was a high prevalence of cognitive impairment in those aged 75 years and over living in the community. Impairment was significantly associated with poor health, sensory impairments, incontinence and falls. These findings will assist policy-makers in estimating the potential burden of disease and service demands, and will have consequences for the assessment and management of people with cognitive impairment. The study supports the need for a broader assessment of functioning as recommended by the National Service Framework for Older People [33].

Key points

- Cognitive impairment is common in the community.
- It is significantly associated with sensory impairment, falls and self-reported poor health.
- The results support the need for a broader assessment of functioning as recommended by the National Service Framework for Older People.

Funding

The MRC Study of the Assessment and Management of Elderly People in the Community was funded by the UK Medical Research Council, the Department of Health and the Scottish Office. G.R. was funded by an MRC Health Services Research Training Fellowship.

Acknowledgements

We would like to thank the following people. The nurses, GPs, the other staff and the patients in the participating practices. Everyone at the MRC General Practice Research Framework coordinating centre, particularly Jeannett Martin and Nicky Fasey. Clerical staff at London School of Hygiene and Tropical Medicine (Janbib Mazar and Rakhi Kabawala) and Hammersmith Hospital (Ruth Peters) for all their work on the study. Judith Nickson (cognitive function) and Jennifer Evans and Richard Wormald (vision) for advice and help with training researchers. The Trial Steering Committee: Professor J. Grimley Evans (chair), Professor A. Haines (previous chair), Professor K. Luker, Dr M. Vickers and Professor M. Drummond.

Conflicts of interest

There is no conflict of interest.

References


Received 3 September 2004; accepted in revised form 6 December 2004