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

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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%).

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

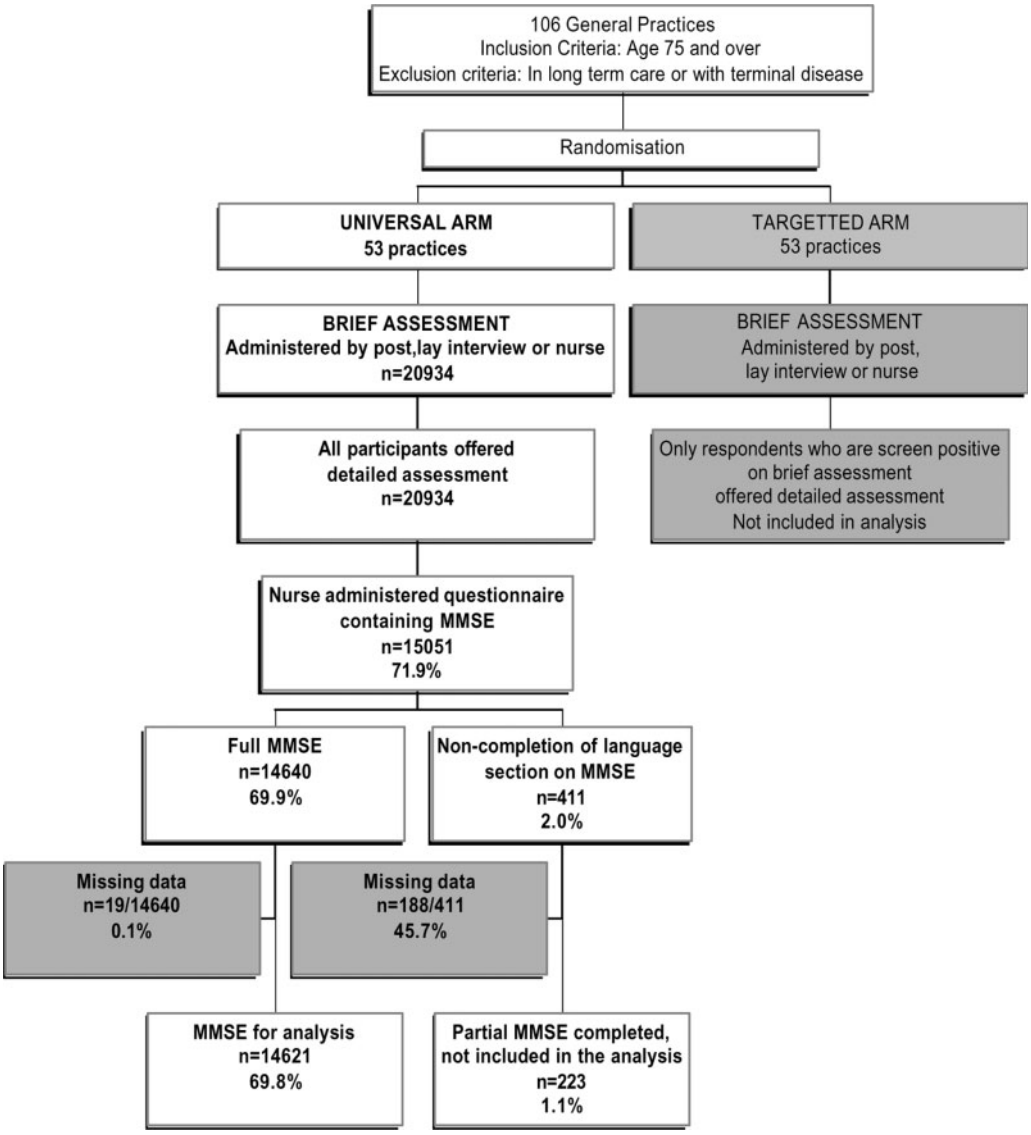

Figure 1. Study outline.

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).

Table 1. Characteristics of a sample of 15,051 subjects in the detailed arm of the trial

	n	%
Sex		
Male	5,787	38.5
Female	9,264	61.5
Age group (years)		
75–79	7,077	47.0
80–84	4,727	31.4
85–89	2,412	16.0
90+	835	5.6
Housing		
Owner occupier	9,536	63.4
Rented	4,175	27.7
Sheltered/residential home	1,340	8.9
Lives alone	7,073	47.0
Unmet need	1,059	7.0
Depression[a]	1,151	7.9
Self-reported health[b]		
Poor	319	2.1
Fair	2,085	14.0
Good	12,524	83.9

[a]Based on 14,520 subjects; GDS score of 6+.
[b]Based on 14,928 subjects.

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 ($MMSE^{23/24}$) or 17/18 ($MMSE^{17/18}$). 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 ($F=158.9$, $P<0.001$) 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 $MMSE^{23/24}$ was 18.3% (95% confidence intervals (CI) = 16.0–20.9), and at $MMSE^{17/18}$ 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 $MMSE^{23/24}$ 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).

Table 2. Prevalence of cognitive impairment by age and sex

		n	Prevalence (95% CI)	*P* value
$MMSE^{23/24}$	Female	1,872/8,964	20.8 (18.3–23.8)	
	Male	810/5,657	14.3 (12.4–16.5)	<0.001
	All	2,682/14,621	18.3 (16.0–20.9)	
Age (years)	75–79	784/6,989	11.2 (9.5–13.2)	
	80–84	874/4,600	19.0 (16.2–22.2)	
	85–89	674/2,280	29.6 (25.8–33.6)	
	90+	350/752	46.5 (42.6–50.6)	<0.001[a]
Female	75–79	495/3,982	12.4 (10.3–14.9)	
	80–84	607/2,897	21.0 (17.8–24.5)	
	85–89	487/1,508	32.3 (28.2–36.7)	
	90+	283/577	49.1 (44.5–53.6)	<0.001*
Male	75–79	289/3,007	9.6 (8.1–11.3)	
	80–84	267/1,703	15.7 (13.0–18.8)	
	85–89	187/772	24.2 (20.1–28.9)	
	90+	67/175	38.3 (31.9, 45.1)	<0.001[a]
$MMSE^{17/18}$	Female	351/8,964	3.9 (3.3–4.7)	
	Male	136/5,657	2.4 (1.9–3.0)	<0.001
	All	487/14,621	3.3 (2.8–4.0)	
Age (years)	75–79	101/6,989	1.5 (1.1–1.9)	
	80–84	153/4,600	3.3 (2.6–4.3)	
	85–89	133/2,280	5.8 (4.5–7.5)	
	90+	100/752	13.3 (10.7–16.5)	<0.001[a]
Female	75–79	60/3,982	1.5 (1.1–2.0)	
	80–84	110/2,897	3.8 (2.8–5.1)	
	85–89	99/1,508	6.6 (4.9–8.7)	
	90+	82/577	14.2 (11.2–17.9)	<0.001[a]
Male	75–79	41/3,007	1.4 (1.0–2.0)	
	80–84	43/1,703	2.5 (1.8–3.6)	
	85–89	34/772	4.4 (3.0–6.4)	
	90+	18/175	10.3 (6.4–16.2)	<0.001[a]

[a]Test for heterogeneity.
Confidence intervals account for clustering.

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 1.7). 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 ($P<0.001$).

Table 3. Age- and sex-adjusted physical and social associations with cognitive impairment ($MMSE^{23/24}$)

	n scoring <24	% scoring <24	Age-/sex-adjusted OR (95% CI)	*P* value	Fully adjusted OR = (95% CI)	*P* value
Residence						
Own	1,316/9,316	14.1 (12.2–16.4)	1		1	
Rented	923/4,072	22.7 (19.1–26.7)	1.8 (1.5–2.1)		1.6 (1.4–1.9)	
Sheltered/residential	443/1,233	35.9 (31.1–41.0)	2.5 (2.1–3.0)	<0.001[a]	2.3 (1.8–2.8)	<0.001[a]
Marital status						
Married or co-habiting	809/6,034	13.4 (11.4–15.8)	1		1	
Single/seperated/divorced/widowed	1,825/8,297	22.0 (19.4–24.8)	1.2 (1.1–1.4)	<0.001	1.1 (1.0–1.2)	0.12
Self-reported health						
Poor/fair	633/2,274	27.8 (24.2–31.8)	2.3 (2.0–2.7)		1.9 (1.5–2.3)	
Good	1,059/5,361	19.8 (17.0–22.9)	1.5 (1.3–1.6)		1.3 (1.1–1.5)	
Very good	968/6,903	14.0 (12.2–16.1)	1	<0.001[a]	1	<0.001[a]
Unmet needs						
None	2,403/13,610	17.7 (15.3–20.3)	1		1	
Some/many	279/1,011	27.6 (23.9–31.7)	1.4 (1.2–1.8)	<0.001	1.2 (0.9–1.4)	0.19
Hearing						
Passed	1,627/10,860	15.0 (13.0–17.2)	1		1	
Failed whisper test	1,005/3,604	27.9 (24.6–31.5)	1.7 (1.5–2.0)	<0.001	1.7 (1.5–2.0)	<0.001
Urinary incontinence						
No	2,465/13,927	17.7 (15.4–20.2)	1		1	
Yes	217/694	31.3 (27.5–35.4)	1.7 (1.4–2.1)	<0.001	1.3 (1.0–1.1)	0.03
Sight						
Normal	2,310/13,122	17.6 (15.2–20.3)	1		1	
Partial sighted/blind	174/481	36.2 (30.7–42.1)	1.9 (1.5–2.4)	<0.001	1.7 (1.4–2.2)	<0.001
Number meds						
<3	1,524/8,926	17.1 (14.6–19.9)	1		1	
4+	1,002/4,918	20.4 (18.1–22.8)	1.2 (1.1–1.3)	0.001	0.9 (0.8–1.1)	0.43
Falls						
None	1,903/13,952	16.4 (14.1–19.1)	1		1	
One	413/1,808	22.8 (20.0–26.0)	1.2 (1.0–1.5)		1.2 (1.0–1.5)	
Two+	351/1,190	29.5 (25.7–33.6)	1.7 (1.5–2.0)	<0.001[a]	1.4 (1.2–1.7)	<0.001[a]

[a]Test for heterogeneity.

Adjusted for age, sex, residence, martial status, health, needs, hearing, incontinence, vision, medication and falls.

Discussion

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. 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.

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.

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Conflicts of interest

There is no conflict of interest.

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