Prevalence of depression among older adults with dementia living in low- and middle-income countries: a cross-sectional study

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Background: The prevalence of depression has been evaluated in populations of low- and middle-income (LMI) countries but the risk of depression has not been specified among persons with dementia. This cross-sectional analysis aimed to assess the prevalence and risk of depression among older people with dementia living in LMI countries. Methods: The study analysed data from a population-based survey conducted by 10/66 Dementia Research Group in 2004. Altogether, 17 031 participants from eight different countries aged 65 years and above were assessed. Logistic regression was used to calculate prevalence and odds ratio (OR) of depression on persons with dementia. Adjustments by age and education were included in the analysis. ORs of depression on different types of dementia were determined. Results: Depression was identified in 5.8% (4.4% of men, 6.6% of women) of all the 17 031 participants and in 12.4% (18.9% of men, 10.1% of women) of the 1612 persons with dementia. Persons with dementia had an increased risk of depression compared with persons without dementia, the age- and education-adjusted OR was 2.38 [95% confidence interval (CI) 1.99–2.84]) for men and 1.88 (95% CI 1.51–2.35) for women. Compared with Alzheimer’s disease, Lewy body [OR 2.75 (95% CI 1.40–3.72)] and vascular dementia [OR 2.35, (95% CI 1.49–3.72)] were associated with a higher risk of depression. Conclusions: Persons with dementia were twice as likely to have depression as persons without dementia. Among persons with dementia, the prevalence of depression was higher for men than women, and the risk of depression varied by the type of dementia.

Introduction

Depression is known to be linked to dementia among older adults.1–3 As the number of memory disorders and dementia increases globally,4,5 relevant information about the characteristics of dementia and depression is of increasing importance. Depression together with cognitive impairment such as dementia causes increased disability and burdens the caregivers and society around persons with this type of co-morbidity.6–10

Depressive disorders among persons with dementia have been described in research literature before, but have been limitedly investigated in low- and middle-income (LMI) countries.3,5 In high-income countries, depression is a common occurrence in all types of dementias and at all disease stages, including mild cognitive impairment (MCI).11,12 Concomitant depression and cognitive impairment are of particular interest due to their behavioural and functional consequences and risk of several adverse outcomes.13 The exhibited symptoms of concomitant depression and dementia are often perceived as misbehaviour by caregivers or relatives when lacking the relevant information of these two conditions. Research into this specific health burden has important public health aspects in LMI countries with aging populations.4,5 Moreover, information about the association between dementia and depression may be useful for clinicians and caregivers of persons with dementia.

The Dementia Research Group conducted a cross-sectional, population-based study in 10 LMI countries in 2003–07.14 The present analysis utilized cross-sectional data of 17 031 older adults living in eight LMI countries in 2004. The aim of this study was first, to assess the prevalence of depression among persons with dementia in LMI countries and second, to estimate the risk of depression associated with dementia.

Methods

Setting and participants

This study analysed data from Dementia Research Group’s population survey of older adults aged 65 years and above. Basic characteristics of the study population (n = 17 031) are presented in Table 1. Participants were living in rural and urban areas in Peru, Mexico, Venezuela, Puerto Rico, Cuba, India, China and Dominican Republic.

Data collection

Data were collected in 2004. In-depth information of the data collection has been published previously.26 Baseline assessments were made during the first meeting lasting ~2 h. The core set for the diagnosis of dementia consisted of separate assessments of the older adult and the informant. The interview was carried out in a household setting with assistance of an employed researcher. Recordings were documented and run through a software program, in order to ascertain the diagnoses for each participant.

The assessments for the older adult participant were as follows: clinical mental state interview; the Geriatric Mental State (GMS),23 cognitive tests, including the Community Screening Instrument for Dementia (CSI-D),24 the CERAD 10; word list learning test,25 the NEUROEX; neurological assessment and questionnaire about background, socio-demographic information and risk factors.26
The participants’ educational level was determined as ‘high’ when he or she had education beyond primary school and ‘low’ when completed primary school or less.

The informant’s assessment consisted of: Informant Section of Community Screening Instrument for Dementia to assess cognitive and functional decline,24 caregiver questionnaire, when informant was a caregiver of participant, History and Aetiology Schedule—Dementia Diagnosis and Subtype in case of cognitive or functional decline,25 Neuropsychiatric Inventory (NPI) test to screen behavioural and psychological symptoms of dementia26 and background, socio-demographic and risk factor information about informant.

### Assessment of dementia

Dementia was defined through two diagnostics ways using: (i) direct application of Diagnostics and Statistical Manual (DSM-IV) criteria for dementia launched by the American Psychiatric Association29 and (ii) the 10/66 algorithm. This algorithm involves those scoring above cutoff point of predicted probability of DSM-IV dementia syndrome from the logistic regression equation that was developed and piloted in earlier studies by 10/66 Dementia Research Group.14

The 10/66 algorithm requires the following:

1. CSI-D test
2. GMS
3. CERAD10 word list learning test
4. HAS-DDS, the History and Aetiology Schedule—Dementia Diagnosis and Subtype
5. NEUROEX
6. NPI
7. DSM-IV dementia cutpoint value based on an earlier pilot study.14

Coefficients of GSM, CSI-D and CERAD 10 word list learning task were used for the algorithm.30 The type of dementia was diagnosed using NINCDS-ADRDA criteria for Alzheimer’s disease (AD),30 NINCDS-AIREN criteria for vascular dementia (VD)31 and Operational criteria for senile Lewy body type for Lewy body dementia (LBD).32

The reason for choosing two parallel diagnostic methods for this study is the criticism concerning sensitivity presented towards the DSM-IV criteria for dementia.33 The DSM-IV criterion is acknowledged as a highly specific but narrow definition for dementia. When comparing the two diagnostic methods with each other, DSM-IV leaves out less severe cases of dementia. Those cases left out were, however, clearly cognitively impaired and fulfilled the criteria of 10/66 dementia.33

### Assessment of depression

The detection of depression was based on the GMS interview and Automated Geriatric Examination for Computer Assisted Taxonomy (AGECAT) diagnostic algorithm.25 According to the AGECAT procedure, symptoms from the GMS questionnaire are specified into five clusters in the first stage. Depression is one of these five clusters. The other four are Complete, Organic, Anxiety and Schizophrenia clusters. Depression accordant to diagnostic criteria of ICD-10 and DSM-IV is differentiated at the second stage by the AGECAT computerized algorithm. ICD-10 criteria apply to mild, moderate and severe depressive disorders (F23, F33) and DSM-IV criteria for major depressive disorder.

The depression variable used in the analysis was converted using the DSM-IV29 and International Classification of Diseases, 10th revision (ICD-10)34 criteria for depression. In this study, the definition of depression included those with major depression by DSM-IV criteria and mild, moderate and severe depressive disorders (F32, F33) by ICD-10 criteria.34

### Ethics

All the participants remain anonymous in this research. As they were recruited to the population survey, the participants signed a consent themselves or through their informant. In cases of illiteracy, the participants expressed their agreement verbally. The data collection procedure was approved by the local ethics committees and by the ethical committee of the Institute of Psychiatry, King’s College, London.

### Statistical analyses

Logistic regression was used to determine the relationship between dementia and depression. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated, and statistical significance was set at \( P < 0.05 \). The logistic regression models were adjusted for age and education level. Analyses were performed using SPSS (version 20.0).

### Results

#### Depression and dementia in the study population

Depression was identified in 5.8% of all the 17 031 participants (Table 2). Among women, the prevalence of depression (6.6%) was higher than among men (4.4%). The prevalence of dementia was 9.5% in the whole study population; 5.6% for men and 11.8% for women. 2.5% of persons had AD, 1.4% had VD, 0.3% had LBD and 5.2% had unspecified dementia. Concomitant depression and dementia was identified in 1.2% of the all the participants; in 1.1% of men and in 1.2% of women.

#### Depression among persons with dementia

Among the 1612 persons with dementia, the prevalence of depression was 12.4%; 18.9% for men and 10.1% for women. Between the different types of dementia, the highest prevalence of depression was observed among persons with LBD (22.0%),
followed by VD (19.3%), unspecified dementia (11.5%) and AD (9.2%).

Persons with dementia had over two times higher risk of depression than persons without dementia; the unadjusted OR was 2.61 (95% CI 2.21–3.08) (Table 3). Men with dementia had a four times increased risk of depression compared with men without dementia (unadjusted OR 4.13, 95% CI 3.09–5.52). Among women with dementia, depression was twice as likely as among women without dementia (unadjusted OR 2.05, 95% CI 1.67–2.52). Adjusting the analyses for age and/or education level did not significantly change the results.

When AD was used as the reference, LBD was associated with a nearly 3-fold risk of depression (OR 2.75, 95% CI 1.40–5.72) and VD with a 2-fold risk (OR 2.35, 95% CI 1.49–3.72). The risk of depression related to unspecified dementia was not significantly higher than that related to AD (OR 1.28, 95% CI 0.87–1.89).

### Discussion

#### Main findings

The findings of this study suggest that depression was more likely to hit persons with dementia than persons without. The gender-specific risk of depression associated with dementia was higher for men than women. Among different types of dementia, persons with LBD were at the highest risk of depression. In this study, we ascertained the association between dementia and depression in the population of older adults living in LMI countries.

#### Interpretation

Evidence from several previous neurological research documents correlates with the main findings of this study. Persons with dementia are likely to become depressed1,2,15–18 and among the dementing disorders, LBD carries the highest risk for depression.12,19,20 Only a few studies on depression and dementia have been conducted in LMI countries3,21,22 and an evaluation of the risk of depression in different types of dementia has not been done earlier. Ferri et al.3 reported that depressive symptoms were found in 43.8% of the persons with dementia in LMI countries, which is higher than the prevalence rate (12.4%) found in this study. However, study populations and definition of dementia vary between these two studies and the results are not fully comparable. The 10/66 algorithm has not been used for diagnostics of dementia in the study of Ferri et al. nor does the population sample (n = 555) correspond to our study.

We found that the prevalence of depression was higher among older women than men living in LMI countries. This is in accordant to the evidence based on a review of several studies on depression in older adults.15 In an epidemiological study from rural China,16 female gender was also found as a risk factor for depression in older age. We found, however, that among persons with dementia the prevalence of depression was higher for men than women. Furthermore, the gender-specific relative risk of depression associated with dementia was also higher for men. In accordance with evidence of earlier studies,15,16 we may speculate that compared with women, men with dementia may cope worse with the impairment due to dementia and are more vulnerable to depression.

We found that the risk of depression varied by the type of dementia. In previous community surveys from rural China and India, the social support had proved to be a protective factor from depression among older adults in low-income societies.6 In the present findings, men with dementia and persons with LBD or VD might especially be in need of such support. For the future investigations about different background characteristics and their influence on depression among people with dementia, a longitudinal study setting is suggested.

In the diagnostics of depression, the acknowledgement of cultural context has shown to be inevitable.6 In this study, a considerable cultural diversity between the participating countries was recognized. Regional variation of depression prevalence between the countries and continents aligned with earlier scientific evidence of neuropsychological disorders.3 In order to improve the quality of data material about mental health disorders in LMI countries, local perceptions and commonly used biomedical screening instruments should be well matched.6 The ongoing work for the establishment of applicable practices across cultures plays an important role in prevention and treatment of mental disorders.

### Table 2

Distribution of depression and dementia within the study population in 2004

<table>
<thead>
<tr>
<th>No.</th>
<th>% (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total depression</td>
<td>992 5.82 (5.48–6.19)</td>
</tr>
<tr>
<td>Men</td>
<td>280 4.39 (3.91–4.92)</td>
</tr>
<tr>
<td>Women</td>
<td>703 6.64 (6.18–7.13)</td>
</tr>
<tr>
<td>Total dementia</td>
<td>1612 9.47 (9.03–9.91)</td>
</tr>
<tr>
<td>Men</td>
<td>359 5.63 (5.09–6.22)</td>
</tr>
<tr>
<td>Women</td>
<td>1251 11.81 (11.21–12.44)</td>
</tr>
<tr>
<td>Type of dementia</td>
<td></td>
</tr>
<tr>
<td>Alzheimer’s disease</td>
<td>424 2.49 (2.27–2.73)</td>
</tr>
<tr>
<td>Vascular dementia</td>
<td>244 1.43 (1.26–1.62)</td>
</tr>
<tr>
<td>Lewy Body dementia</td>
<td>55 0.32 (0.25–0.42)</td>
</tr>
<tr>
<td>Unspecified</td>
<td>889 5.22 (4.90–5.56)</td>
</tr>
<tr>
<td>Prevalence of depression among persons with dementia</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>200 12.41 (10.88–14.11)</td>
</tr>
<tr>
<td>Men</td>
<td>68 18.94 (15.23–23.32)</td>
</tr>
<tr>
<td>Women</td>
<td>126 10.07 (8.53–11.87)</td>
</tr>
<tr>
<td>Within type of dementia:</td>
<td></td>
</tr>
<tr>
<td>Alzheimer’s disease</td>
<td>39 9.20 (6.81–12.33)</td>
</tr>
<tr>
<td>Vascular dementia</td>
<td>47 19.34 (14.88–24.78)</td>
</tr>
<tr>
<td>Lewy Body dementia</td>
<td>12 21.82 (12.98–34.44)</td>
</tr>
<tr>
<td>Unspecified</td>
<td>102 11.46 (9.53–13.72)</td>
</tr>
</tbody>
</table>

*Number of men and women do not add up to the total due to missing information on gender.

### Table 3

Risk of depression associated with dementia, 2004

<table>
<thead>
<tr>
<th>Depression</th>
<th>No depression</th>
<th>OR (95% CI)</th>
<th>P-value</th>
<th>Age-adjusted OR (95% CI)</th>
<th>P-value</th>
<th>Education-adjusted OR (95% CI)</th>
<th>P-value</th>
<th>Age- and education-adjusted OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>No dementia</td>
<td>792 14616 1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Dementia</td>
<td>200 1412 2.61 (2.22–3.08)</td>
<td>2.55 (2.13–3.04)</td>
<td>2.37 (2.01–2.80)</td>
<td>2.38 (1.99–2.84)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>No dementia</td>
<td>212 5658 1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Dementia</td>
<td>68 439 4.13 (3.09–5.52)</td>
<td>4.07 (2.99–5.55)</td>
<td>3.80 (2.84–5.10)</td>
<td>3.86 (2.83–5.26)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>No dementia</td>
<td>577 8934 1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
<td>1.00</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Dementia</td>
<td>126 951 2.05 (1.67–2.52)</td>
<td>1.99 (1.60–2.48)</td>
<td>1.89 (1.54–2.32)</td>
<td>1.88 (1.51–2.35)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The results of the current investigation are in accordance with recent research findings from the high-income countries, where the prevalence of depression or depressive symptoms among persons with dementia varies from 15% to 63%.\textsuperscript{11,12} In their review article, Enache et al. reported that depression occurs in 20–30% of patients with Alzheimer’s disease and is even higher in patients with VD and LBD.\textsuperscript{12} In European countries, the age-standardized prevalence of dementia (all causes) was 6.4%. This was slightly lower than the prevalence of dementia (9.5%) in our study where age standardization between different populations was not done. The prevalence rates of depression in high-income countries were comparable, though slightly higher, with our figure (5.8%). In the USA, the prevalence of major depressive episodes was 8.3% during a 12-month period,\textsuperscript{57} and in Finland, the annual prevalence of depression was 9.3%.\textsuperscript{38}

Thus, the differences between LMI and high-income countries in the prevalence of dementia, depression or concomitant dementia and depression were not remarkable and may not be as tightly culturally determined as might have been thought.\textsuperscript{39} The number of people with memory disorders is expected to grow with population aging,\textsuperscript{4,5} and LMI countries have less resources for the implementation of requisite interventions, compared with high-income societies. The first step to improve care of persons with dementia living in LMI countries is to achieve further knowledge, acceptance and understanding among public health professionals and policy makers. Raised awareness of the nature of dementia as well as concomitant depression will assist relatives and caregivers to understand the behaviour of a demented person and seek for relief in their daily life settings.

Limitations

The purpose of this cross-sectional study was not to examine the causality of different factors contributing to dementia or depression. Neither are causal inferences between depression and dementia allowed due to the cross-sectional nature of the study. Although the results showed that certain dementing disorders were more significantly linked to depression, further studies of an analytical type are warranted.

As the definition of dementia used in this study consisted of applications from both DSM-IV criteria and 10/66 algorithm for dementia, the number of dementia cases was higher than that determined by DSM-IV criterion alone (n = 619). Thus, the study sample (n = 1612) includes a range from less severe cases of dementia to advanced dementia. Although the sensitivity of this research approach is well guaranteed by a wide spectrum of cases, specificity—on the other hand—might be less complete.\textsuperscript{35} Neuroimaging (magnetic resonance imaging (MRI), positron emission tomography (PET), single-photon-emission computed tomography (SPECT)) and biomarker studies hold potential to improve diagnostic accuracy of dementing disorders, but their incremental value to clinical assessment is not yet fully established.\textsuperscript{35}

Furthermore, no specific screening or diagnostic tools or neuropsychological evaluations were used to distinguish between depression and dementia in this study. The attempt was to identify the persons who fulfilled the criteria of depression or dementia in order to evaluate the risk of depression among persons with dementia and the association between dementia and depression. Depression may cause reversible cognitive decline up to a condition called pseudodementia. Many studies have also explored whether depression in MCI increased the conversion rate to dementia, but findings are inconsistent [12]. Nevertheless, depression can be a risk factor for developing dementia and may present with cognitive symptoms [13], and this study may have included cases with cognitive impairment caused by depression alone.

In this study, depression diagnostics were made using the GMS/AGECAT algorithm. This diagnostic tool has been criticized for leaving out some cases of behavioural and psychological disorders.\textsuperscript{3,35} This is due to its tendency to overestimate the organic cluster and simultaneously lack some cases in the depression cluster.\textsuperscript{56} In addition, participants and/or their relatives or caregivers might have been unwilling to report mental health problems.\textsuperscript{3} For this reason, the amount of depression cases in this study (n = 992) is likely to be an underestimate.

In conclusion, persons with dementia were 2.4 times more likely to have depression compared with people without dementia. Among persons with dementia, the prevalence of depression was higher for men than women and varied by the type of dementia, the highest being LBD. The findings of this study indicate that some persons with dementia are more likely to become depressed than others. This may have an impact on treatment guidelines or policies for the growing amount of people with neuropsychiatric disorders and their caregivers globally. In order to increase the knowledge of the characteristics of concomitant depression and dementia, further research regarding the different types of dementia, factors behind depressive syndromes on persons with dementia as well as causal inferences between the two diseases are suggested.

Acknowledgements

We thank 10/66 Dementia Research Group committee for providing the data for this analysis and for general supervision of the study. This is a secondary analysis of data collected by the 10/66 Dementia Research Group (www.alz.co.uk/1066). The 10/66 DRG is led by Martin Prince and co-ordinated by Cleusa Ferri from Institute of Psychiatry, King’s College London. The other principal investigators responsible for research governance in each site are Juan Llibre Rodriguez (Cuba), Daisy Acosta (Dominican Republic), Mariella Guerra (Peru), Aquiles Salas (Venezuela), Ana Luisa Sosa (Mexico), KS Jacob (Vellore, India), Joseph D Williams (Chennai, India) and Yueqin Huang (China). The 10/66 Dementia Research Group’s research has been funded by the Wellcome Trust Health Consequences of Population Change Programme (GR066133—Prevalence phase in Cuba and Brazil, GR08002—Incidence phase in Peru, Mexico, Argentina, Cuba, Dominican Republic, Venezuela and China); the World Health Organisation (India, Dominican Republic and China); the US Alzheimer’s Association (IIRG – 04 – 1286—Peru, Mexico and Argentina); FONACIT/CDCH/UCV (Venezuela); the Rockefeller Foundation supported a dissemination meeting at their Bellagio Centre; Alzheimer’s Disease International has provided support for networking and infrastructure.

Conflicts of interest: None declared.

Key points

- Among persons with dementia living in LMI countries, risk of depression has been measured earlier but not specified between the different types of dementia.
- The findings of this study showed that persons with dementia were twice as likely to have depression as persons without dementia. From the different types of dementia, persons with LBD were the most vulnerable to depression.
- Female gender might protect from depression when a person becomes disabled due to dementia.
- Age and education level had only a minor impact on the risk of depression associated with dementia.

References


