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Sex differences in late-life depression

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Objective: The primary aim of this study was to assess sex differences in depression in later life.

Method: In a random, age and sex-stratified community sample of 3056 older Dutch people (55–85 years) the prevalence, symptom-reporting and risk factors associated with depression in later life were studied. Depression was measured with the Center for Epidemiologic Studies Depression scale (CES-D). Bivariate, multivariate and factor analyses were used.

Results: Prevalence of depression in women was almost twice as high as in men. Controlling for age and competing risk factors reduced the relative risk for females with more than half. Symptom-patterns in men and women were very much alike. Sex differences in associations with risk factors were small, but exposure to these risk factors was considerably higher in females.

Conclusion: Very little evidence for a typical 'female depression' was found. Female preponderance in depression was related to a greater exposure to risk factors.

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Key words: depression; sex difference; elderly;
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Introduction

In most clinical and community studies the prevalence of depression is higher in women than in men. In 1977 Weissman and Klerman reviewed this evidence in various types of studies conducted in the previous 40 years, including community surveys. Differential prevalence rates of depression for men and women varied from 1:1.5 to 1:3 (1).

In the subsequent 20 years several clinical and epidemiological studies, both cross-sectional and longitudinal, were conducted on sex differences in depression (2–7). Generally, female preponderance in depression rates appears to be a consistent finding. The sex difference seems to be age-specific with little difference in childhood, a considerable difference in mid-life (due to a sharp rise of depression in females) and a slight decrease of the difference in older age (8, 9).

In the literature a large number of possible explanations has been suggested and investigated, such as biological factors (endocrine), social factors (social roles and status, life-events, social support), psychological factors (coping style), and the possibility of the difference being artefactual

(sex differences in help-seeking behaviour and/or symptom reporting, diagnostic bias) (10). In the elderly, chronic life strain (especially financial matters), increasing number of life events and low social contact and attachment, particularly in those living alone, seem to increase the risk of depression for women (9, 11).

Newman et al. found two different types of syndromes in depressive older women: a depressive syndrome (more classical form with negative affect, feelings of guilt), decreasing with age, and a so-called 'depletion' syndrome (marked by feelings of denervation and loss of interest), increasing with age (12). This changing of symptom pattern may impede correct diagnosis in women. Because this phenomenon has not been studied in older men it is unclear what role it plays in diagnosing depression in older men and women.

The principal aim of the present study was to investigate sex differences in depression across older age. Most community-based studies include low numbers of older males. Our sample is stratified for age and sex, which allows comparison of depression in men and women throughout later life. The following questions were addressed:

- (i) Are there sex differences in the prevalence of depression in the elderly?
- (ii) If so, can this be attributed to sex differences in symptom-reporting, thus pointing towards an artefactual sex difference in prevalence, or to different types of depressive syndromes?
- (iii) Are there sex differences in (a) the vulnerability and (b), the exposure to risk factors of depression, which may explain the sex difference in prevalence?

Material and methods

Sample and procedures

Data were derived from the Longitudinal Aging Study Amsterdam (LASA), a 10-year interdisciplinary study on the predictors and consequences of changes in autonomy and wellbeing in the ageing population (13). Sampling procedures and characteristics of the sample have been described in detail in previous publications (14). In short, the LASA cohort is based on a representative random sample of older adults between the ages of 55 and 85, stratified for age, sex and expected mortality 5 years into the study. It was drawn from the population registers of 11 municipalities in three regions of the Netherlands, and was also used in another study prior to LASA (NESTOR-LSN, $n=6108$, response rate 62.3%; non-response associated with age, sex and urbanicity). Of the 3805 LSN-participants, 3107 participated in LASA (response rate 81.7%; refusal rate 10.4%; deceased/too frail 6.8%; ineligible 1.2%). Non-response was related to age (partly due to illness or cognitive impairment), but not to sex. Due to item non-response (more than two missing items on the CES-D) 51 participants were lost, leaving a baseline sample of 3056.

Measurements

Depression was measured with the Center for Epidemiologic Studies Depression scale (CES-D), a 20-item self-report scale developed for use in the community (15, 16). Respondents scoring 16 or higher on this scale are considered to have a clinically relevant depressive syndrome. The CES-D has also proved to have good psychometric properties in elderly community samples in the Dutch translation (17), with a minimal overlap with physical illness (18) and very good criterion validity for major depression (19).

Within the CES-D four valid factors or subscales are distinguished (15), also in the Dutch version (20): depressed affect (having the blues, feeling depressed, life a failure, feeling fearful, feeling lonely, crying, feeling sad), positive

affect (feeling as good as others, hopeful about the future, being happy, enjoying life), somatic complaints and inhibition (being bothered, low appetite, trouble with concentration, everything an effort, restless sleep, talking less, cannot get going) and interpersonal problems (people unfriendly, people dislike me).

Building on previous findings (14, 19) the following risk factors of depression were studied: age, marital status, socioeconomic status (level of education attained and income), urbanicity, physical health (chronical illness (21) and functional limitations (22)), social and interpersonal support (size of personal network; exchange of instrumental and emotional support with network members (23)), personality (locus of control (24)) and cognitive functioning (MMSE (25)).

Data analyses

Prevalence of depression in males and females in six age groups was calculated. Associations with sex were assessed in bivariate analyses, using odds ratios with 95% confidence intervals. Association between sex ratio and age was assessed by testing their interaction using logistic regression. To examine sensitivity of the sex difference to the threshold of the cut-off score of 16 used in the CES-D, analyses were repeated with thresholds of 12 and 20. Multivariate analysis was assessed to control for confounding, using logistic regression with depression as the dependent variable and sex, age and risk factors as independent variables.

Sex differences in symptom reporting were assessed in four ways. Mokken's scale analysis was used to assess sex differences in item response functioning or item difficulty (i.e. differences in the way men and women answer the questions of the CES-D). Sex differences in symptom patterns were assessed in factor analysis of the CES-D item scores in the full sample and in the depressive subsample, with separate analyses in men and women in each. We used principal components analysis with varimax rotation. Mean scores of the four subscales of the CES-D in men and women were compared using *t*-tests. To investigate sex differences in the separate item scores chi-square tests were used.

Sex differences in the vulnerability to risk factors were tested in bivariate associations by calculating odds ratios and 95% confidence intervals, in both sexes, for the separate risk factors. All odds ratios were calculated relative to the non-depressed group. Logistic regression was used with depression as the dependent variable, and age and the risk factors as independent variables.

Finally, sex differences in the exposure to these risk factors were examined. Differences in exposure

Table 1. Characteristics of the sample

	<i>n</i>	(%)
Age (years)		
55–59	458	(15.0)
60–64	506	(16.6)
65–69	494	(16.2)
70–74	460	(15.1)
75–80	570	(18.7)
80–85	568	(18.6)
Sex		
Male	1478	(48.4)
Female	1578	(51.6)
Marital status		
Married	1920	(62.8)
Not married	1136	(37.2)
Level of education		
Low	1340	(43.8)
Middle/high	1711	(56.0)
Income in Dutch fl.		
< 2000 p.month	1155	(44.7)
2000 pm or more	1427	(55.3)
Living in a big city		
Yes	847	(27.7)
No	2209	(72.3)
Living arrangement		
Independent	2946	(96.4)
Old age residence	93	(3.0)
Nursing home/hospital	17	(0.6)
Depressive symptoms		
CES-D < 16	2602	(85.1)
CES-D > 15	454	(14.9)
Cognitive functioning		
MMSE > 23	2567	(84.0)
MMSE < 24	473	(15.5)
Chronic physical illness		
None	1026	(33.6)
One or more	2030	(66.2)
Physical limitations		
None	1787	(58.5)
One or more	1239	(40.5)

to the risk factors in males and females, in the full sample as well as in the depressed subsample, were assessed by chi-square tests.

Results

Description of the sample

In Table 1, demographic and health-related characteristics of the sample are shown. The relatively high number of subjects unmarried, with cognitive impairment or physical health problems, is due to oversampling among the older old. Due to higher non-response among the older old and the very frail, subjects in institutions are under-represented.

Sex differences in the prevalence of depression

Table 2 shows prevalence rates in the six age groups in the full sample, in males and in females and the sex ratio. Prevalence rates in the full sample and in females were found to be lowest in the youngest age group, rising gradually with age. In males, rates appeared to fall until the age of 70, after which they increased, but not to the same extent as in females. Prevalence of depression was previously described by Beekman et al. (14). Considering the sex ratio, in the full sample the odds ratio for females compared to males was 1.78. In the youngest age-group there was no significant sex difference. In the other age-groups prevalence in women was significantly higher than in men. Testing for interaction effects between sex ratio and age showed a non-linear, third power association ($B=0.02$; $SE=0.0048$; $P<0.001$). Repeated analyses with CES-D thresholds of 12 and 20 yielded similar results (analyses not shown).

In the multivariate analyses the relative risk for females was reduced from $RR=1.78$ ($CI=1.58-1.99$) to $RR=1.33$ ($CI=1.04-1.61$) but remained significant. Therefore, confounding by age and competing risk factors existed, but only partially explained the effect of sex on depression.

Table 2. Prevalence of depression by age and sex, odds ratios (sex ratio) and confidence intervals

Age	% Depressed	% Depressed males	% Depressed females	Odds ratio (relative risk for females)	95% CI
Full sample					
55–85	14.9	11.2	18.3	1.78	1.45–2.19*
Age-groups					
55–59	10.7	12.1	9.1	0.71	0.39–1.28 NS
60–64	11.5	7.3	15.5	2.34	1.30–4.21*
65–69	13.2	7.0	17.9	2.91	1.59–5.34*
70–74	14.3	10.6	18.0	1.86	1.08–3.19*
75–79	18.6	14.6	22.9	1.74	1.13–2.67*
80–85	19.4	13.8	24.7	2.05	1.33–3.16*

* = 95% confidence interval > 1 = significant.

Table 3. Factorloading of the CES-D itemscores

CES-D item	CES-D subscale							
	Negative affect		Positive affect		Inhibition		Interpersonal	
	Male	Female	Male	Female	Male	Female	Male	Female
Having the blues	0.64	0.67						
Feeling depressed	0.64	0.57						
Life a failure	(0.32)	(0.29)			(0.35)			(0.36)
Feeling fearful	(0.38)	0.55						
Feeling lonely	0.60	0.50						
Crying	0.74	0.80						
Feeling sad	0.76	0.79						
Feeling good			(0.39)	0.45	0.54			
Hopeful about future			0.68	0.72				
Being happy			0.76	0.75				
Enjoying life			0.76	0.72				
Being bothered	0.49	0.54			(0.18)	(0.30)		
Low appetite					0.51	0.61		
Trouble with concentration					(0.38)	0.47		
Everything an effort					0.63	0.72		
Restless sleep	(0.31)				(0.29)	(0.38)		
Talking less					0.53	(0.36)		
Cannot get going					0.66	0.67		
People unfriendly							0.80	0.80
People dislike me							0.73	0.81

Sex differences in symptom patterns

Mokken's scale analysis of the CES-D scale showed almost similar item response functioning for men and women in the complete CES-D scale, and in three of the four subscales (depressed affect, positive affect and interpersonal problems) with reliable scalability coefficients (Loevinger's H weighted >0.30). Small sex differences were found in the somatic complaints/inhibition subscale: three items were similarly scaled for men and women, two items (being bothered and talking less) were not scalable for men and low for women ($H=0.30$), and two items (low appetite and restless sleep) were not scalable for both sexes ($H<0.30$). In general, item difficulty appeared to be similar for men and women.

Factor analyses of the twenty CES-D item scores also showed very few sex differences. Results are shown in Table 3. For convenience of comparison the CES-D items are arranged according to the four original subscales of the CES-D. Factor loadings >0.40 were considered meaningful; lower loadings are in brackets. In the full sample factor loading according to the four original subscales of the CES-D was found for most items, with the pattern for women and men very much alike. Exceptions were the items 'feeling as good as other people', 'thinking life is a failure' and 'restless sleep', which had fairly weak loadings and loaded on different factors in males and females. In the depressed subsample similar patterns were found (results not shown).

Mean scores on the four subscales in the full sample showed small but statistically significant sex differences for negative affect, positive affect and inhibition/somatic complaints: on the negative affect subscale and the inhibition subscale women scored only one point higher (range 0–21); on the

Table 4. Odds ratios and 95% confidence intervals in males and females for risk factors of depression

Independent variable	Males	Females
Marital status		
not/no longer married	3.09 (2.22–4.32)	2.10 (1.61–2.74)*
Level of education		
low level	1.68 (1.21–2.33)	1.49 (1.15–1.94)
Income		
low (< dfl 2000/m)	2.20 (1.52–3.19)	1.47 (1.09–1.98)*
Urbanicity		
living in a big city	1.87 (1.34–2.62)	1.90 (1.46–2.49)
Chronic physical illness		
one or more	2.31 (1.57–3.41)	2.12 (1.54–2.90)
Functional limitations		
one or more	4.19 (2.98–5.91)	3.34 (2.53–4.42)
Cognitive impairment		
MMSE <24	2.56 (1.76–3.71)	1.93 (1.41–2.66)
Network size		
small (<50%)	1.97 (1.38–2.84)	1.74 (1.33–2.29)
Instrumental support received		
low (<50%)	1.10 (0.77–1.57)	0.90 (0.69–1.19)
Emotional support received		
low (<50%)	1.96 (1.34–2.86)	1.21 (0.92–1.59)*
External locus of control		
high (<50%)	6.07 (4.29–8.59)	6.31 (4.76–8.37)

Printed in bold with * = significant difference between males and females (odds ratio outside confidence interval).

Table 5. Sex differences in exposure to the risk factors

Risk factor	% Males	% Females
Marital status		
not/no longer married	24.4	49.2*
Level of education		
low level	32.9	54.2*
Income		
low (<2000 dfl)	32.1	57.3*
Living in a big city		
yes	28.3	27.2
Chronic physical illness		
one or more	63.3	69.2*
Functional limitations		
one or more	34.5	47.0*
Cognitive impairment		
MMSE <24	15.6	15.5
Network size		
small (<50%)	47.2	45.7
Instr. support received		
low (<50%)	47.5	47.4
Emotional support received		
low (<50%)	55.2	44.7*
External locus of control		
high (>50%)	59.6	64.0

Printed in bold with * = significant difference in exposure between males and females.

positive affect subscale (range 0–12) 0.5 point higher. In the depressed subsample the same sex difference was found for negative affect and inhibition, but no difference for positive affect. No significant sex differences were found for the subscale ‘interpersonal problems’.

At the symptom level, women scored significantly higher on almost every CES-D item, except for the the interpersonal items and one inhibition item (talking less) on which scores were similar. In the depressed subsample this sex difference disappeared, except for the items ‘crying’ and ‘feeling sad’ ($P < 0.001$) and ‘disturbed sleep’ ($P < 0.01$), on which women scored significantly higher.

Sex differences in associations with and exposure to risk factors

Table 4 shows the results of the bivariate analyses. Significant sex differences are marked. Higher odds ratios for men than for women were found for not or no longer being married, low income and low emotional support received, indicating a stronger association between these risk factors and depression in men.

In the multivariate models independent sex differences in the associations with depression were found for not or no longer being married (males: OR = 2.51, CI = 1.69–3.91; females: OR 1.57, CI = 1.07–2.29) and low emotional support received (males: OR = 1.18, CI = 0.73–1.90; females: OR = 0.68, CI = 0.47–0.99).

With regard to exposure to risk factors substantial sex differences were found. Results are shown in Table 5. Women were exposed significantly more often to: not or no longer being married, having completed a lower level of education, having a lower income, having one or more chronic physical illnesses and having one or more functional limitations. Men received less emotional support.

Discussion

The results confirmed the existence of sex differences in the prevalence of depression in the elderly, with older women appearing to be at a higher risk. The mean sex ratio in our study was 1.78, which corresponds to those found in studies of younger adults. Unlike in other studies (8, 9) the gender gap did not decrease or disappear with increasing age, but appeared to shift around the mean with an increase of the gap in the 60–70-year-olds, caused by a decrease of the prevalence in males in these age groups. Controlling for age and competing risk factors still showed female sex to be an independent, statistically significant risk factor for depression in the elderly.

Investigation of symptom reporting showed only minor sex differences in item difficulty. In the three levels of analyses, symptom patterns were very much alike, with women scoring slightly higher on almost every dimension and on almost every item of the CES-D. In the depressed subsample the same pattern was found. Significantly higher scores for women remained for three items, one of them being ‘crying’. This may be a confirmation of the widely held assumption that men admit to crying less readily than women, also in the elderly. It can be concluded that, in general, women did not report different symptoms or symptom clusters than men. They reported more symptoms on the full range of the CES-D, which corresponds with the higher prevalence of depression in females.

The association of depression with risk factors was similar in men and women. Noteable exceptions were: not or no longer being married, low income and low emotional support received, the data suggesting that men are more prone to depression in particular socioeconomic circumstances. This fits with the findings of Krause (9), that older women were not more vulnerable than men to the effect of network crises, and with the results of another study in LASA, with males being more vulnerable to depression following widowhood (26). A possible explanation can be found in the theory of Gutman (27), who hypothesized that there may be a reversal of emotional roles in late midlife: women tend to be

more assertive, and men tend to be more concerned with the emotional and nurturing aspects of life than they used to be earlier in life.

So far, little evidence has been found to explain the female preponderance in the prevalence of depression. On the contrary, males appeared to be slightly more vulnerable to some of the risk factors.

However, the effect of the risk factors changed when sex differences in exposure to these risk factors were taken into account. This absolute risk appeared to be of much more importance than the relative risk (or vulnerability), and explained part of the female preponderance in depression.

An important limitation of the present study is the use of self-report scales. Sex differences in reporting depressive symptoms may lead to report bias and/or diagnostic bias. Angst et al. (2) and Ernst et al. (28) found that men reported fewer depressive symptoms than women at the same degree of impairment of psychosocial functioning, thereby possibly causing an artefactual female preponderance in depression. However, other studies failed to confirm this observation (10). A second problem of the CES-D is that no information is given on depressive episodes and life events in the past; they are known to be important for developing depression later in life.

Another possible source of report bias is that depressed subjects may report more negatively about their mental and physical health status and about their social support and network. If the degree to which this occurs is different for men and women, this could influence the sex differences in the associations with the risk factors. A fourth potential source of bias is non-response, with non-responders being older, more often female and more often in poor health. Because the sample is stratified for age and sex, and risk factors for depression were well represented in men and women throughout the age strata, the sample is suitable for comparing prevalence data, symptoms and relative risks, which was the purpose of the present paper. However, bias due to non-response cannot be ruled out, limiting the generalizability of the results, especially to the older-old and very frail.

The fifth limitation is the data being cross-sectional, which makes it impossible to draw definite conclusions about causal relationships between variables, such as partner loss, losing income or changing level of emotional support.

Conclusions

The present study confirms the existence of female preponderance in depression, also in the older old.

Controlling for age and other risk factors reduces the relative risk for depression for females considerably, but it remains significantly higher than for males. This female preponderance is not caused by sex differences in symptom reporting. Considering risk factors for depression, sex differences in exposure to several risk factors appear to be more important than the slight and reverse sex differences in vulnerability to some of these factors.

Thus, typical 'female depression' with a specific symptom profile or specific risk factor profile has not been found, at least not in the elderly. What is different in men and women, is their level of exposure to negative socioeconomic circumstances.

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