Late-Onset Depression in Elderly Subjects From the Vienna Transdanube Aging (VITA) Study

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Objectives: To assess whether prevalence of depression increases with age. To determine possible risk factors of late-onset depression.

Method: The Vienna Transdanube Aging (VITA) study is a community-based cohort study investigating every inhabitant of the area on the left shore of the river Danube, in Vienna, Austria, born between May 1925 and June 1926. It includes a thorough neurologic, psychiatric, and neuropsychological battery. Occurrence of a current depressive episode was diagnosed according to a DSM-IV–based questionnaire, the Hamilton Rating Scale for Depression, and the Short Geriatric Depression Scale. A gerontopsychiatric life events scale was used for the assessment of life events. 1505 subjects were contacted and 606 participated. At baseline, 406 nondemented and never-depressed individuals were included in the study. Follow-up after 30 months was possible in 331 of the 406 participants. Baseline data were collected from May 2000 to December 2002, and 30-month follow-up data were collected from November 2002 to September 2005.

Results: Of the 331 participants who were not depressed at baseline, 31.4% had developed a subsyndromal, minor, or major depressive episode at the 30-month follow-up; 14.2% were diagnosed with mild cognitive impairment at follow-up, 42.5% of whom were also diagnosed with new-onset depression. In the multiple analyses, "troubles with relatives" was a significant variable ($p = .018$, OR = 0.5, 95% CI = 0.28 to 0.89, $R^2 = 0.16$). Summative scores on the Fuld Object Memory Evaluation showed a significant influence ($p = .048$, OR = 0.9, 95% CI = 0.88 to 0.99, $R^2 = 0.01$) on the occurrence of newly onset depression. None of the other investigated possible risk factors had a significant influence on the new occurrence of depression.

Conclusion: Prevalence of late-onset depression increases with age. Having severe troubles with relatives and pre-existing cognitive impairments may enhance the probability of developing a late-onset depression.

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A portion of the data set was used for previous publication (Fischer P, Jungwirth S, Zehetmayer S, et al. Conversion from subtypes of mild cognitive impairment to Alzheimer dementia. Neurology 2007;68[4]:288–291). However, considering that the VITA study is a large cohort study investigating elderly individuals over several years with a large examination battery, different issues can be extracted from this very large data set. This does not constitute dual publication, because this article deals with the prevalence of late-onset depression in the VITA study, which has not been published before.

The VITA study is ongoing and takes place at the Ludwig Boltzmann Institute of Aging Research within the Danube Hospital in Vienna, Austria.

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Depression in the elderly is widely acknowledged as being a common problem and a great burden for patients and their relatives. Incidence and prevalence numbers are still controversial. In general, ranges of prevalence rates vary between 1% to 3% at the low end of the spectrum and 11% to 16% at the higher end.[1–7] Similarly, some investigations have shown decreasing[5] or increasing[8–10] incidence rates of late-onset depression, i.e., with first onset after age of 60 years. Skoog[10] reported first-onset depression between the ages of 70 and 85 years as being 30 of 1000 person-years in women and 12 of 1000 person-years in men, with a higher incidence between the ages of 79 and 85 years than between 70 and 79 years. The large deviation may be due to underdiagnosis and misdiagnosis according to the approach to diagnosis of depression in older patients. One issue contributing to this phenomenon derives from the number of somatic illnesses and the amount of drugs prescribed to elderly individuals; 1 of the DSM-IV exclusion criteria for the diagnosis of a major depressive episode states that symptoms should not be directly explainable by somatic effects of a drug or a

medical condition; clearly this refers to depressive symptoms directly induced by a somatic condition and should not be confounded with depression as an indirect consequence of a somatic illness. Further reasons may be that most diagnostic assessment instruments are not validated for use in the elderly. Previous studies have often used telephone interviews, a method that can leave much room for imprecision in diagnosis; many have had prescreening procedures, which might have excluded cases of subsyndromal or minor depression. Additionally, depressive symptoms following a stressful life event, such as a loss, are often underrecognized. The heterogeneity and atypicality of manifestations of depression in older age also support the controversy regarding incidence and prevalence. Thus, in order to evaluate depression in the elderly, an adequate cohort and specific assessments are necessary.

Depression in the elderly population has been shown to have various risk factors; heritability was observed as being a risk factor in some studies[11,12] but not in others.[13–16] There is some evidence of an effect of personality traits as a risk factor[17]; however, this is controversial.[18] Poor financial status has been shown to increase the risk for elderly depression[19] in addition to female gender, limited activities due to health problems, chronic health conditions, dementia,[20] and reduced social networks.[21] Few studies have proceeded in the analysis of potential social, biological, and cognitive factors that may enhance the risk of developing late-onset depression.

The main objective of our study was to assess whether prevalence of depression increased with advancing age. We hypothesized that prevalence of late-onset depression was higher than previously shown and that depression increases with age. We investigated incidence rates and possible risk factors for late-onset depression in a prospective community-based cohort study of all 75-year-old inhabitants of 2 Viennese districts (the Vienna Transdanube Aging [VITA] study), taking into account all new cases of subsyndromal, minor, and major depressive episodes. In order to overcome the limitations in previous studies on prevalence and incidence rates of late-onset depression and to fill this existing gap, no prescreening procedures were applied; all participants were rated in face-to-face interviews by expertly trained specialists; a dimensional approach of depression was adopted; and social, biological, and cognitive factors were analyzed as potential risk factors.

METHOD

Sample Selection

The data originate from a community-based cohort study of all 75-year-old inhabitants of Vienna's 21st (Floridsdorf) and 22nd (Donaustadt) districts (Austria). The VITA study was approved by the local ethics committee and all participants gave written informed consent.[22] Subjects were contacted by means of information from the districts' official voting registry, where all inhabitants are registered. According to the voting registry of our study area, 1920 people born between May 1925 and June 1926 were alive on May 1, 2000. Due to certain errors of residency (N = 69) and lack of response to 3 consecutive invitation letters and/or having a secret telephone number (N = 346), only 1505 people could be contacted. Six hundred six of the contacted individuals (40%) participated in the complete baseline investigation. Because refusals were often due to severe somatic morbidity, Kaplan-Meier survival curves were calculated between participants and nonparticipants of the whole age cohort (N = 1920), which showed the expected significantly higher mortality of nonparticipants ($p < .0001$).

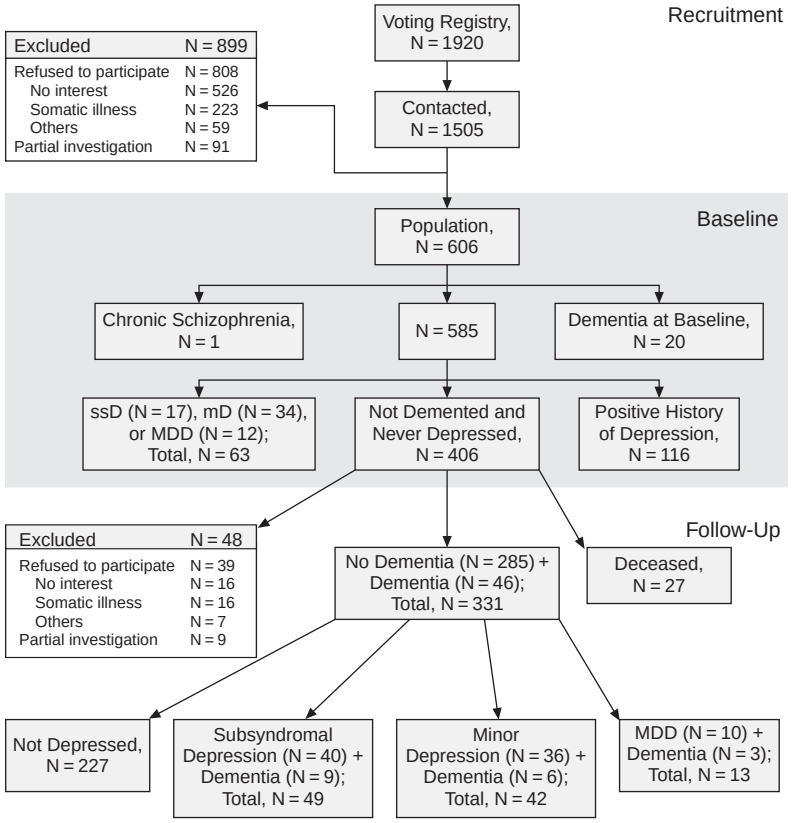
Mean age of participants from the birth cohort was 75.77 years, with an SD of only 0.45 years. At baseline, 20 subjects from this cohort of 606 individuals were diagnosed with dementia according to DSM-IV; 1 had chronic schizophrenia. Thus, 585 subjects formed the nondemented cohort at baseline (344 female, 241 male). Of these, 116 subjects had a positive history of depression, and 63 were diagnosed as currently suffering from a subsyndromal, minor, or major depressive episode according to DSM-IV criteria. Hence, the nondemented and never-depressed cohort at baseline consisted of 406 individuals. At the 30-month follow-up, 27 of the 406 individuals were deceased and 48 were excluded (39 due to refusal of participation and 9 because only partial investigation was possible). The remaining 331 participants were not depressed and not demented at baseline and constitute the population for the current analysis. Of these, 46 were diagnosed with a dementia at follow-up and included in the analysis (Figure 1). Collection of baseline data was performed between May 4, 2000, and December 17, 2002. Collection of 30-month follow-up data was performed between November 11, 2002, and September 29, 2005.

Clinical Evaluation

The VITA study includes a thorough neurologic, psychiatric, and neuropsychological battery administered in face-to-face interviews by experienced specialist raters, lasting about 9 hours total per subject over 2 days, both at baseline and at the 30-month follow-up. Reasons for refusal were investigated per telephone, and data on current medication of refusers at baseline were compared with those of participants in a consecutive series of refusers; no significant differences between rates of treatment with 20 different medications could be found.

All investigations were performed at the General Hospital of the 2 concerned districts (Danube Hospital). Complete medical, demographic, and psychosocial history including family history of dementia, history of depressive episodes (actual episode not included), education,

Figure 1. Flowchart of Recruitment and Participation in the Vienna Transdanube Aging Study of Elderly Subjects



Abbreviations: ssD = subsyndromal depression, mD = minor depression, MDD = major depressive disorder.

nicotine and alcohol consumption, head traumas, hypertension, diabetes mellitus type II, lifetime medications, and medications during the last 2 weeks was collected using a structured interview. Occurrence of a current depressive episode was diagnosed by the same experienced geriatric psychologist at baseline and at the 30-month follow-up according to a questionnaire based on DSM-IV criteria[23] for depressive episode (Table 1) as well as the Hamilton Rating Scale for Depression[24] and the Short Geriatric Depression Scale,[25] a self-rating scale for the evaluation of depression in old age. Data on occurrence of depressive symptoms during follow-up and consequential treatment were assessed and taken into account in the analysis. A gerontopsychiatric life events scale (modified from the Life Event and Difficulties Schedule, by Brown and Harris[26]) was used for the operationalized assessment of life events. Close relatives were interviewed whenever possible. Neuropsychological investigations, such as the Fuld Object Memory Evaluation[27] at baseline, leading to diagnoses or exclusion of mild cognitive impairment in nondemented cases were carried out as described previously.[22] Furthermore, frontal-executive functions were assessed using the Trail Making Test Part B.[28] Routine laboratory measures were carried out. A cerebral magnetic resonance imaging (MRI) could be done in 532 participants. The MRI investigation was performed using a 1.0 Tesla unit (Siemens Impact Expert, Siemens Corp., Munich, Germany) with a circular polarized skull coil. The following sequences were obtained: transverse proton density, T2-weighted turbo spin echo, coronary T1-weighted gradient echo sequence, and a thin-section inversion recovery sequence in the olfactory region.[29] Occurrence of 5-HTTLPR (serotonin transporter gene promoter-linked polymorphic region) polymorphism was assessed through genotyping of genomic DNA extracted from participants' blood, as previously described.[30]

Statistical Analyses

Prevalence of depression between the ages of 77 and 78 years was calculated for all cases of depression and for cases of minor and major depressive episode. Univariate ordinal logistic regression analyses were calculated in order to investigate the influence of several risk factors on the 3 classes of depression (no depression, subsyndromal depression, or minor/major depressive episode). The probability of being in a higher category was modeled,

Table 1. DSM-IV–Based Questionnaire for Diagnosis of Depression Applied in the Vienna Transdanube Aging (VITA) Study[a]

Criteria for Major Depressive Episode According to DSM-IV		
A1	Is mood being described as feeling depressed or sad?	❑ Yes ❑ No
	Are there feelings of hopelessness, discouragement, or dejection?	❑ Yes ❑ No
	Are there feelings of lassitude or anxiousness?	❑ Yes ❑ No
	Can the feelings be felt?	❑ Yes ❑ No
	Does the facial expression reveal depressive mood?	❑ Yes ❑ No
	Are somatic concerns being emphasized?	❑ Yes ❑ No
	Is there a higher irritability?	❑ Yes ❑ No
	A1: Is depressive mood present nearly every day, during most of the day, reported subjectively, or observed by others?	❑ Yes ❑ No
A2	Is there a general loss of interest?	❑ Yes ❑ No
	Is there a loss of interest regarding hobbies or a lack of pleasure for activities that used to be pleasant?	❑ Yes ❑ No
	Do relatives observe social withdrawal or neglect of recreational activities?	❑ Yes ❑ No
	Is there a clear diminishment of sexual interest or desire?	❑ Yes ❑ No
	A2: Markedly diminished interest or pleasure in all or almost all activities on nearly every day, during most of the day (either by subjective account or observed by others)	❑ Yes ❑ No
A3	Is the appetite diminished or increased?	❑ Yes ❑ No
	Is there an increased appetite or ravenousness for certain foods, eg, sweets or other carbohydrates?	❑ Yes ❑ No
	Is there a significant weight loss or weight gain?	❑ Yes ❑ No
	A3: Significant weight loss when not dieting or weight gain (a change of more than 5% of body weight in 1 month) or reduced or increased appetite nearly every day	❑ Yes ❑ No
A4	Are there problems sleeping through the night, ie, waking up during the night and difficulties falling back to sleep?	❑ Yes ❑ No
	Are there difficulties falling asleep?	❑ Yes ❑ No
	Is there a presence of early morning awakening, ie, waking up earlier than usual and inability to fall back asleep?	❑ Yes ❑ No
	Is the duration of sleep at nighttime prolonged or is there increased sleeping at daytime?	❑ Yes ❑ No
	A4: Insomnia or hypersomnia nearly every day	❑ Yes ❑ No
A5	*Restlessness and agitation:*	❑ Yes ❑ No
	Is the person unable to sit still?	❑ Yes ❑ No
	Does the person constantly walk up and down?	❑ Yes ❑ No
	Is there hand wringing or rubbing or plucking of the skin, clothes, or other things?	❑ Yes ❑ No
	Psychomotor retardation:	❑ Yes ❑ No
	Does speech seem slowed down?	❑ Yes ❑ No
	Is there a slowing down of thinking?	❑ Yes ❑ No
	Do movements appear slowed down?	❑ Yes ❑ No
	Is there a prolonged latency of response?	❑ Yes ❑ No
	Is language low and monotonous?	❑ Yes ❑ No
	Are extent and expression of language diminished?	❑ Yes ❑ No
	A5: Psychomotor agitation or retardation nearly every day (observed by others, not just feelings of restlessness or slowing down) ***NB:*** Symptoms have to be severe enough as to be observable by others; subjective feeling does not suffice.	❑ Yes ❑ No
A6	Is there a loss of energy?	❑ Yes ❑ No
	Are fatigue and floppiness apparent?	❑ Yes ❑ No
	Are little tasks, eg, showering in the morning and getting dressed, only possible with great effort, taking longer to perform, and only accomplished insufficiently?	❑ Yes ❑ No
	A6: Fatigue or loss of energy nearly every day	❑ Yes ❑ No
A7	Is self-appraisal unrealistically negative?	❑ Yes ❑ No
	Are there excessive feelings of self-reproach and brooding on little mistakes in the past?	❑ Yes ❑ No
	Is there an excessive and inappropriate feeling of guilt for errors and unpleasant events?	❑ Yes ❑ No
	Are neutral or insignificant everyday occurrences being drawn on to prove own incompetence?	❑ Yes ❑ No
	Do feelings of worthlessness or guilt appear delusional?	❑ Yes ❑ No
	A7: Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick) ***NB:*** Self-reproach about being sick and inability to fulfill occupational or interpersonal requirements do not suffice for this diagnostic criterion if delusional features are absent.	❑ Yes ❑ No

(continued)

Table 1 (continued). DSM-IV–Based Questionnaire for Diagnosis of Depression Applied in the Vienna Transdanube Aging (VITA) Study[a]

Criteria for Major Depressive Episode According to DSM-IV

A8	Is the ability to concentrate diminished?	❑ Yes	❑ No
	Is the ability to think diminished?	❑ Yes	❑ No
	Is the ability for decision making diminished?	❑ Yes	❑ No
	Does the person appear absent-minded and easily distractable?	❑ Yes	❑ No
	Does the person complain about memory problems?	❑ Yes	❑ No
	A8: Diminished ability to think or concentrate or indecisiveness nearly every day (either by subjective account or observed by others)	❑ Yes	❑ No
A9	Are there thoughts that own death would be a relief to others?	❑ Yes	❑ No
	Do recurrent suicidal thoughts (without a specific plan) appear?	❑ Yes	❑ No
	Are there specific plans for committing suicide?	❑ Yes	❑ No
	Has there been a suicide attempt in the past?	❑ Yes	❑ No
	A9: Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide	❑ Yes	❑ No
A	**At least 5 of the above-mentioned symptoms persist during the same 2-week period and represent a change of previous functioning; at least 1 of the symptoms is either (A1) depressive mood or (A2) loss of interest or pleasure** ***NB:*** Symptoms that are clearly due to a general medical condition or are due to mood-incongruent delusions or hallucinations are to be excluded. ***Scoring:*** Criterion A is met if 5 of the 9 above-mentioned symptoms are marked as "yes"; among those, A1 and A2 are compulsory.	❑ **Yes**	❑ **No**

B1	Except for the time criterion, criteria for a manic episode as well as a major depressive episode are met nearly every day during at least 1 week	❑ Yes	❑ No
B2	Change in mood is severe enough to lead to a marked impairment in occupational functioning, social functioning, or interpersonal relationships or to lead to hospitalization due to suicidality, danger of harm to others, or presence of psychotic symptoms	❑ Yes	❑ No
B3	Symptoms are not due to the direct physiological effects of a substance (eg, drug of abuse, medication) or other general medical conditions	❑ Yes	❑ No
B	**The symptoms meet criteria for a mixed episode** ***Scoring:*** Criteria for a mixed episode are met if B1 and B2 and B3 are marked as "yes."	❑ **Yes**	❑ **No**

C	**The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning**	❑ **Yes**	❑ **No**

D1	Is there a direct physiological effect of a drug, eg, alcohol intoxication or cocaine withdrawal syndrome?	❑ Yes	❑ No
D2	Are the symptoms side effects of medications or of treatments, eg, with steroids?	❑ Yes	❑ No
D3	Do the symptoms appear to be caused by intoxication?	❑ Yes	❑ No
D4	Can the symptoms be ascribed to the direct physiological effect of a medical condition, eg, hypothyreosis?	❑ Yes	❑ No
D	**The symptoms are due to the direct physiological effect of a substance or a general medical condition**	❑ **Yes**	❑ **No**

E1	Do the symptoms persist longer than 2 months after the loss of a loved one?	❑ Yes	❑ No
E2	Are the symptoms within the duration of 2 months after the loss of a loved one characterized by marked impairment of functioning, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, and psychomotor retardation?	❑ Yes	❑ No
E	**The symptoms are better accounted for by bereavement**	❑ **Yes**	❑ **No**

Scoring: Criteria for a major depressive episode are met if **A** is marked as "yes," and **B** is marked as "no," and **C** is marked as "yes," and **D** is marked as "no," and **E** is marked as "no."

Do symptoms meet diagnostic criteria (DSM-IV) for a major depressive episode? ❑ Certainly ❑ Probable ❑ Possible ❑ Impossible

[a]Reprinted with permission from the *Diagnostic and Statistical Manual of Mental Disorders*, Text Revision, Fourth Edition (Copyright 2000). American Psychiatric Association.[23]

Abbreviations: DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition; NB = note well.

Table 2. Classification of Participants at Baseline and 30-Months' Follow-Up According to Cognition and Depression

	Baseline (N = 606)			30-Months' Follow-Up (N = 331)		
Depression Subtype	Subjects With Dementia, N = 21[a]	Subjects With MCI, N = 145	Cognitively Healthy Subjects, N = 440	Subjects With Dementia, N = 46	Subjects With MCI, N = 48	Cognitively Healthy Subjects, N = 237
Not depressed	12	92	368	28	28	171
Subsyndromal	3	15	16	9	9	31
Minor	2	23	30	6	6	30
Major	4	15	26	3	5	5

[a]1 subject with chronic schizophrenia was included.
Abbreviation: MCI = mild cognitive impairment.

e.g., the odds ratio of the not depressed versus the sub syndromal, minor, or major depressive episode groups. p Values, odds ratios, and 95% confidence intervals are reported. Risk factors with a univariate p value < .05 were further applied in a stepwise multiple ordinal logistic regression. The probability to enter or to stay in the model was set to 0.05. These analyses were computed twice. First, the 46 people with dementia at 30 months were excluded and then included. Furthermore, the same analyses were performed for the binary outcome occurrence of depression. The analysis was performed with SAS 9.1 (SAS Institute Inc., Cary, N.C.). All p values < .05 were considered as statistically significant.

RESULTS

Gender Distribution

Of the 331 participants, 56.5% (N = 187) were female. Of those female participants, 34.2% (N = 64) suffered from newly diagnosed subsyndromal (N = 31), minor (N = 26), or major (N = 7) depressive episode. When taking into account only those with a minor or major depressive episode, the percentage was 17.6%. Within the male participants, 27.8% (N = 40) had late-onset subsyndromal (N = 18), minor (N = 16), or major (N = 6) depressive episode, decreasing to 15.3% when excluding those with subsyndromal depression.

First-Onset Depression

At the 30-month follow-up, 31.4% (N = 104) of the 331 participants who were not depressed at baseline had developed subsyndromal (N = 49), minor (N = 42), or major depressive episode (N = 13). The percentage of newly diagnosed depression was 16.6% when taking into account only those with minor (12.7%) or major depressive episode (3.9%). When excluding those with dementia at follow-up (N = 46), the newly diagnosed cases of depression at follow-up (N = 86) account for 30.2%.

First-Onset Depression and Mild Cognitive Impairment or Dementia

Of the 46 participants with dementia at the 30-month follow-up, 60.9% (N = 28) were not depressed, 19.6% (N = 9) had a subsyndromal, 13.0% (N = 6) had a minor, and 6.5% (N = 3) had a major depressive episode at the 30-month follow-up (Table 2). Forty-seven participants (14.2%) were diagnosed with a mild cognitive impairment (amnestic single or multiple, nonamnestic single or multiple) at follow-up, 42.6% (N = 20) of whom were also diagnosed with a new-onset subsyndromal, minor, or major depressive episode (23.4% [N = 11] when taking into account only cases of minor or major depressive episodes).

Risk Factors for First-Onset Depression

The univariate ordinal logistic regression analyses for the effect on the onset of a subsyndromal, minor, or major depressive episode show that a significant influence can be found for the variable "troubles with relatives" (p = .02). The sum of life events shows a borderline statistical significance (p = .04). When the variable "sum of life events" does not include the life event "troubles with relatives," this new variable no longer shows statistical significance (p = .25, OR = 1.2, 95% CI = 0.9 to 1.5). Bereavement at the 30-month follow-up also shows a trend toward significance (p = .08). There was a tendency for people whose partner died in the last 30 months to have fewer depressive episodes (23%) than others (33%). Only 1 participant experienced the loss of a partner within the 3 months preceding the 30-month follow-up assessment; however, bereavement could not be diagnosed in this individual. None of the other subjects had experienced the loss of a partner within the 4 months preceding the 30-month follow-up assessment, i.e., bereavement was not diagnosed in any of the participants.

Including the 46 individuals with dementia at the 30-month follow-up, similar univariate results can be found. Again, troubles with relatives (p = .02) and the sum of life events (p = .01) had a univariate significant influence on depression. Additionally, bereavement at the 30-month follow-up had a significant influence (p = .03). When the variable "troubles with relatives" was not considered in the sum of life events, this variable was no longer significant (p = .1). Thus, the sum of life events was not considered in the multiple analyses, but only the variables "bereavement" and "troubles with relatives," resulting

in "troubles with relatives" being the only significant variable (p = .018, OR = 0.5, 95% CI = 0.28 to 0.89, R^2 = 0.16). Regarding the occurrence of newly onset depression regardless of subtypes, the summative baseline score on the Fuld Object Memory Evaluation (mean = 43.96, SD = 3.95, minimum = 29, maximum = 50) showed a significant influence (p = .048, OR = 0.9, 95% CI = 0.88 to 0.99, R^2 = 0.01). Baseline performance on the Trail Making Test B (N = 326 due to 5 missing values, mean score = 154.6, SD = 105.65, minimum = 43, maximum = 600) was only slightly lower in newly depressed subjects; the relationship with occurrence of depression was not statistically significant (p = .16).

None of the other investigated factors, such as gender, education, positive family history of depression, newly diagnosed cancer since baseline, coronary heart disease, myocardial infarction or stroke within the last 30 months, emergent pain, handicap, change of living situation, own severe illness, illness of relatives, as well as sum of vascular risk factors, occurrence of the 5-HTTLPR short allele, progression of white matter or periventricular hyperintensities in MRI, cella media index, or atrophy of the medial temporal lobe, had a significant influence on the new occurrence of depression.

DISCUSSION

The main finding of this prospective cohort study is an increase in the prevalence of depression between the ages of 75 and 78 years; at baseline, 10.8% of the 585 individuals assessed were diagnosed with a subsyndromal, minor, or major depressive episode. At follow-up after 30 months, 31.4% of the investigated population had a first-onset depression of any of the 3 above-mentioned kinds. Data on the incidence of late-onset depression are still controversial, with some studies showing an increase[8–10] and others showing a decrease[5] with age. However, our findings of increasing occurrence of depression with age are consistent with data from the methodologically precise H70 study.[10] None of the patients with newly occurring cases of depression had had a history of depression nor were they suffering from depression (not even on a subsyndromal level) at baseline; they can thus be seen as having cases of real late-onset depressive episodes. In our study, we have used several diagnostic instruments, including the Short Geriatric Depression Scale and a thorough DSM-IV–based interview (see Table 1) assessed by the same experienced rater at baseline and at the 30-month follow-up in order to take into account the heterogeneity of depression in old age and to recognize all cases of subsyndromal, minor, and major depressive episode. Lack of age-adequate diagnostic instruments leading to underrecognition of depression in the elderly might be the reason for lower late-onset incidence and depression prevalence rates in some studies of older populations; such factors have been postulated for studies like the Epidemiological Catchment Area study that used a diagnostic instrument often controversially discussed as being unable to differentiate between somatic symptoms of depression induced by a psychiatric or somatic condition.[5]

The reasons underlying the finding of an increased incidence of late-onset depression in our study could not be related to family history of depression, gender, or education or to vascular or neuropathologic factors shown by others.[31,32] Burdensome life events, whether they are somatic illnesses, loss of a loved one, or other changes of socioeconomic or living situation, accumulate with age and thus could be a decisive factor in the occurrence of late-onset depression. Indeed, we found that having had severe troubles with relatives within the last 30 months significantly increased the risk for a newly diagnosed depressive episode. Clearly, troubles with relatives are a great affliction in old age, because relatives often constitute the main attachment figures and an important focus of interest for the elderly. Additionally, there was a tendency for the death of a partner to have a positive effect with respect to risk for depression, i.e., individuals whose partner had died within the last 2.5 years were less likely to suffer from a new-onset depressive episode. What might seem paradoxical at first sight probably is not when taking a closer look; it can be assumed that in many cases, the lost partner had suffered from a chronic or acute illness that constituted a great burden and distress for the people concerned. Thus, the "alleviation of death" seemed to outweigh the bereavement.[33] It should be noted that none but 1 of the subjects had experienced the loss of a partner within the 4 months preceding the 30-month follow-up assessment, and the subject who experienced a loss could not be diagnosed with bereavement according to DSM-IV-TR, i.e., the possibility that diagnoses of bereavement—depressive symptoms under 2 months' duration following a loss—may have led to a subsequently lower rate of diagnosing depression in our subjects can be excluded.

Our data regarding the total score on the Fuld Object Memory Evaluation, an instrument for the measurement of late selective reminding, point toward cognitive functioning being yet another element influencing the occurrence of depression. Presence of impairments in the capacity of memory at the time of assessment seems to increase the probability for a new-onset depression. This finding is emphasized by our results regarding the correlation of presence of mild cognitive impairment and first occurrence of depression at the 30-month follow-up. Studies investigating the temporal relationship between depression and mild cognitive impairment are still sparse. Some studies postulate that depression is a risk factor for the development of mild cognitive impairment.[34,35] However, Vinkers and colleagues[36] have shown that cognitive and depressive symptoms co-occur and, specifically, that

depressive symptoms increase with the presence of cognitive deficits at baseline. In fact, not only antecedent memory dysfunctions but also impairments in executive functioning, as a state factor, if not also a trait marker, seem to be related to late-onset depression.[37] Our findings are in line with the latter and with other studies that have found a similar association[38] and thus might signal some sort of change in underlying biological substrates such as cingulate cortex and frontal gyrus dysfunction not thoroughly accessible to differential analysis yet.[39,40]

Within the VITA study, participants undergo very thorough examinations. However, not having expected such a marked increase in late-onset depression, we have not extensively assessed personality traits, which have often been postulated as affecting occurrence of depressive episodes[17] and could have given more insight to underlying causes of late-life depression. Another limitation of our study is the potential bias caused by the number of individuals that refused participation at baseline and especially at the 30-month follow-up, which might have been due to the occurrence of depression among other reasons. Because our data reflect the prevalence and risk factors of late-onset depression in 75-year-old individuals, they cannot be generalized to all elderly age groups. The VITA study is ongoing, and longer follow-up data will yield further information on prevalence and influencing factors of late-onset depression.

CONCLUSION

We found that the prevalence of late-onset depression increases with age. Having severe troubles with relatives was found to be a significant risk factor. However, preexisting cognitive impairments may also enhance the probability of developing a late-onset depressive episode in elderly individuals.

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