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Incidence of depression in octo- and nonagenerians: results of an epidemiological follow-up community study

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Abstract The incidence rate of depression in very old people was examined. In a two-wave community study of Munich, Germany a representative sample of 402 people older than 85 years was restudied 1 year later. In the first cross section a total of 358 (89%) subjects were interviewed. One year later 263 (73.6%) subjects could be reexamined. Only persons with two examinations were included for analysis of incidence. Several diagnostic systems were used. According to the project diagnosis of 203 persons at risk, 25 subjects suffered 1 year later from depression. The incidence rate amounted to 133.49 per 1000 person years at risk. According to the GMS-A computer AGECAT diagnosis the incidence rate amounted to 140.97 per 1000 person years at risk. The younger age cohort, persons with changing living situations and subjects suffering from dementia in the first cross section had a higher risk for depression. The results were not significant.

Key words Incidence of depression in general population · Octo- and nonagenerians · Psychiatric epidemiology

Introduction

With the increasing longevity of the population in western societies, in future years health problems will have an increasing impact on public health. Because treated psychiatric patients are not representative of the population in the community, general conclusions can be drawn only from results of studies conducted in the general population. There are many prevalence studies based on community samples which have reported that dementia and depression are the most prevalent mental disorders in the elderly. Most community studies reviewed in the literature are based, however, on a wider age range and contain only small samples of very old people (Essen-Möller 1956; Nielsen 1962; Akeson 1969; Kay et al. 1970; Magnusson and Helgason 1981; Cooper and Sosna 1983). Presently, such longitudinal studies on the incidence of depression are rare. Differences in diagnostic procedures and case identification and sampling are most likely responsible for considerable variations in the incidence rates obtained in these studies (Murphy 1988; Spicer 1973).

Unbiased data can only be achieved on the basis of longitudinal studies in representative community samples assessing incidence. Incidence studies on unselected samples of elderly populations can also be of importance in causal research and provide clues concerning the effects of risk exposure.

The aim of the present study was to assess the incidence of depression in a representative sample aged 85 years and above of an urban community longitudinally at two points of time 1 year apart with diagnoses based on reliable interviews performed by trained research physicians.

Methods

Samples

The sample was drawn from the community register of the city of Munich. On 5 June 1990, 20415 persons living in Munich were aged 85 years and above. The names and addresses of 2052 persons of this population could not be obtained because the data requested of subjects was not forwarded (for security reasons). The remaining population consisted of 18363 persons aged 85 years and above who were registered as residents of the city of Munich. This includes persons living in homes for the elderly. The sample of 402 persons was randomly drawn and approached for assessment. The drawn sample of 402 subjects correlated very well to the remaining population of 18363 persons according to gender, age, and living situation. Nevertheless, the problem exists that we have no information about 2052 persons (10%) of the population 85 years and older. Possible security reasons could include mental illness, biasing the representativity of our sample.

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Fig. 1

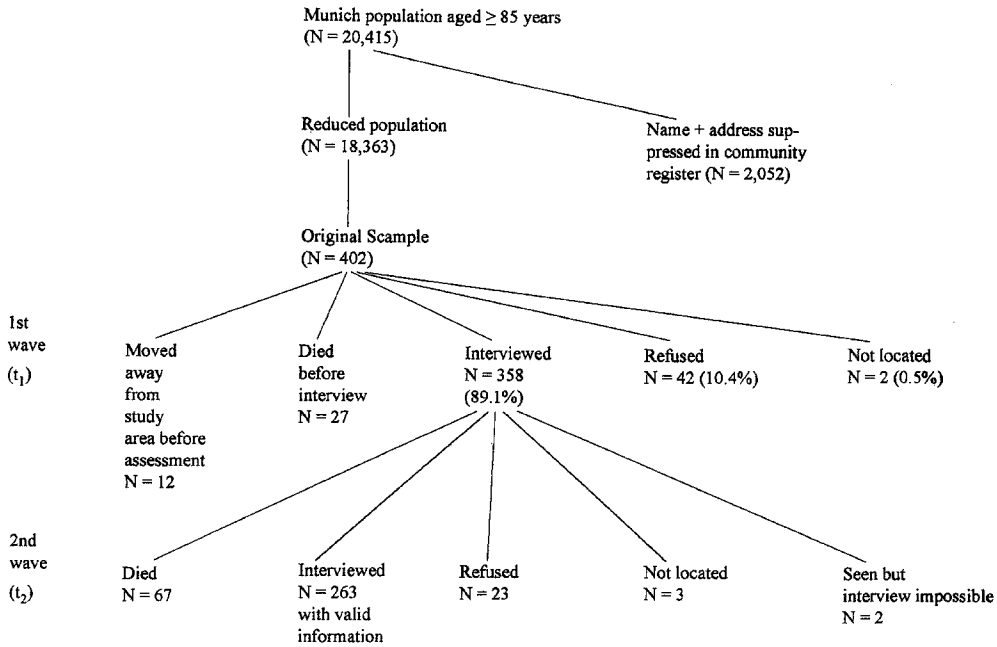

Table 1 Sociodemographic characteristics of the sample assessed in both cross sections (t_1, t_2)

	t_1 *n*	(*n* = 358) %	t_2 *n*	(*n* = 263) %
Sex				
Female	276	77.1	203	77.2
Male	82	22.9	60	22.8
Age				
Year of birth				
1891–1899	91	25.4	45	17.2
1900–1905	267	74.6	218	82.8
Living situation				
Private household	257	71.8	188	71.5
Home	61	17.0	47	17.9
Nursing ward	40	11.2	28	10.6

Of the 402 persons, 358 (89%) were assessed in the first cross section in an examination conducted by physicians trained in psychiatry. Two persons (0.5%) could not be traced, and 42 persons (10.5%) refused to participate. Of 358 persons examined in the first cross section, 263 (73.6%) were reexamined 1 year later. Sixty-seven persons (18.7%) died before the second interview, and 25 persons (7.3%) refused or could not be traced. Two persons (0.6%) could not be interviewed because of bad health (Fig. 1).

Table 1 shows the sociodemographic characteristics of the persons assessed in both cross sections.

Instruments

The main instrument used to assess psychopathology was the Geriatric Mental State Interview (GMS-A; Copeland et al. 1976, 1986, 1987). This semistructured psychiatric interview covering the whole of psychopathology was designed for the assessment of the elderly. The high sensitivity and specificity for organic as well as depressive disorders in the elderly has been reported. Results were analyzed using the AGECAT (Automated Geriatric Examination for Computer-Assisted Taxonomy) computer program developed by Copeland et al. (1986). The following diagnoses can be derived (with severity scores ranging from 1 to 5) on the basis of the AGECAT computer program: organic mental illness (dementia), depression (undifferentiated), depressive neuroses, depressive psychoses, hypochondriasis, anxiety neuroses, obsessive-compulsive neuroses, phobia, and schizophrenia. The GMS offers only one main diagnosis at the end, however, on the syndrome level the possibility of several syndroms. In addition, the structured interview of the diagnosis of dementia of Alzheimer type, multi-infarct dementia and dementias of other etiology according to DSM-III-R and ICD-10 (SIDAM by Zaudig et al. 1989 and 1990), was assessed. In addition to the GMS-A the Hamilton Depression Scale (HAMD; Hamilton 1967) was used for the assessment of depressive symptoms. Siegfried et al. (1984) decided the following classification referring to the 21-item Hamilton Scale: Hamilton Score ≥ 18 = depression; ≤ 7 = no depression.

In our study the Hamilton scale was reduced: three items were omitted (work capacity, loss of libido, insight into illness, items of limited validity because of high age). The Hamilton scale was assessed for the whole sample. We expected cognitive impairment and dementia of high prevalence. Because of this hypothesis we assumed that insight into illness, especially in demented people, is sometimes of low validity and consequently we omitted this item. Therefore, the scale points were reduced from 63 to 55 points. The cutoffs of Siegfried et al. (1984) were modified: Hamilton score ≥ 16 = depression; ≤ 6 = no depression; between 7 and 15 = no assessment.

Questions were used to assess sociodemographic and biographic data. Subjects received a physical examination. The research physician filled out a checklist concerning somatic health problems within the past 7 days and the past 12 months. Somatic illness was classified according to ICD-9.

Case definition of mental illness

In addition to the GMS-AGECAT, computer diagnosis cases of depression were syndromatically classified according to the following criteria defined as project diagnosis. The hierarchical proceeding for project diagnosis of depression is as follows:

1. GMS-A diagnosis with the exceptions of:

a. A false-negative diagnosis according to the GMS-A syndrome level is assumed if the Hamilton score shows less than 7 points, excluding an anxiety disorder.

Table 2 Incidence rate of depression in the community

	Population at risk at t_1	Person years	Number of new cases	Incidence rate per 1000 person years ± (SE)
a) Private households only				
"Projectdiagnosis"	150	141.18	17	120.41 ± (27.4)
GMS-A-AGECAT diagnosis	142	133.41	17	127.43 ± (28.9)
GMS-A-Syndrom diagnosis	137	127.48	20	156.89 ± (32.2)
b) Private households + institution				
"Projectdiagnosis"	203	187.28	25	133.49 ± (24.8)
GMS-A-AGECAT diagnosis	193	177.35	25	140.97 ± (26.1)
GMS-A-Syndrom diagnosis	185	166.90	33	197.72 ± (30.8)

b. A false-positive diagnosis according to the GMS-A syndrome level is assumed if the Hamilton score does not amount to 16 points.

2. If there exists no GMS-syndrome diagnosis because of missing data: Hamilton score.

3. If there exists neither GMS-syndrome diagnosis nor Hamilton score: medical judgment according to ICD-10 and DSM-III-R.

4. By missing data of GMS-syndrome diagnosis, Hamilton score and medical judgment: no assessment.

Definition and analysis of incidence

For estimating the incidence rate of depression we counted the numbers of new illness of depression in the second cross section (t2) among the nondepressed of the first interview (t1). The population at risk consisted of persons not diagnosed as depressed in the first cross section. This group at risk includes mentally healthy persons, demented persons or subjects suffering from mental illness other than depression. Persons who had died during the 1-year interval or refused to participate at wave 2, i.e. without second examination, were excluded from the analysis of incidence. The time at risk is defined as the time without depressive illness of the population at risk. For the incidence group the time at risk has to be estimated because we do not know the exact beginning of the depressive illness. For the estimation we assumed that the onset of the illness is possible at any time during the follow-up interval and the best estimation for the time without illness for ill people is half the distance between first and second interview. By interpreting the incidence rates we have to consider that we have two cross-sectional points of examination, but no data about the 1-year interval. It is therefore quite likely that the incidence for depression constitutes an underestimation because an episode of depression might have occurred during the interval. Our analyses of incidence were based on the concept of incidence density of Miettinen (1976, in Kleinbaum et al. 1982). ID (t1, t2) = I/PT (I = number of new illnesses in second cross section, PT = population time at risk). Incidence was expressed as annual incidence rates per 1000 person years at risk. Because the population at risk does not exclude persons suffering sometimes in their life from a depressive illness, we are not allowed to speak of the first incidence.

In the present paper the following topics are discussed:

1. The incidence rate of depression for the elderly
2. Are there sociodemographic differences in the incidence rates?
3. The influence of dementia on the incidence of depression.

Results

Prevalence rates of depression of first cross section were the following: According to the project diagnosis, 24.3% (n = 87) suffered from depression, 74.3% (n = 266) from no depression, and 1.4% (n = 5) could not be classified.

According to the GMS-AGECAT diagnosis, of 358 subjects interviewed, 11 (3.1%) could not fulfill the criteria for the AGECAT computer program because of missing data. The data on the AGECAT computer diagnosis refer to 347 subjects. Of the sample assessed, 23.6% fulfilled criteria for depression. Of the 23.6% depressed persons, 54.9% suffered from depressive neuroses, and 45.1% from depressive psychoses (Meller et al. 1993). The AGECAT computer program does not offer a possible mixed group (depression and dementia) or a second diagnosis as main diagnosis. For data concerning comorbidity with dementia see Fichter et al. (1995).

Incidence of depression according to different instruments (Table 2)

According to the project diagnosis, the population at risk of the first cross section – the population without depression – amounted to 203 persons. In the second cross section 25 persons suffered from depression. The incidence rate amounted to 133.49 per 1000 person years at risk (py).

According to the *GMS-A computer AGECAT diagnosis*, the population at risk of the first cross section consisted of 193 subjects. Twenty-five persons suffered 1 year later from depression; the incidence rate amounted to 140.97 per 1000 py.

Referring to the *GMS-A syndrome diagnosis*, the incidence rate amounted to 197.72 per 1000 py. From a population at risk of 185 persons, 33 subjects showed a depressive syndrome in the second cross section.

The incidence rates for the community sample – persons living only in private households – are minor in comparison with the whole sample. Exact data are shown in Table 3.

Incidence rate and sociodemographic factors (Table 3)

The incidence rate according to the project diagnosis and sociodemographic factors was as follows: For the whole sample the incidence rate for depression amounted to 133.49 per 1000 py. Women had a higher incidence rate in comparison with men (140.39 per 1000 py vs 111.5 per 1000 py; n.s.). The younger age cohort suffered more of-

Table 3 Incidence rate for depression (according project diagnosis) and sociodemographic data – total sample

	Population at risk at t_1	Person years	Number of new cases	Incidence rate per 1000 person years ± (SE)	*P*
Total	203	187.28	25	133.49 ± (24.8)	
Sex					
Women	155	142.46	20	140.39 ± (29.1)	n.s.
Men	48	44.82	5	111.56 ± (47.0)	n.s.
Age					
85–89	156	143.39	20	139.48 ± (28.9)	n.s.
90+	47	43.88	5	113.94 ± (47.8)	n.s.
Living situation					
Private household	150	141.18	17	120.41 ± (27.4)	n.s.
Institution	46	40.21	6	149.22 ± (56.2)	n.s.
Moving from private to institution	7	5.89	2	339.69 ± (195.2)	n.s.

Table 4 Incidence rate for depression (GSM-A-AGECAT diagnosis) and sociodemographic data – total sample

	Population at risk at t_1	Person years	Number of new cases	Incidence rate per 1000 person years ± (SE)
Total	193	177.35	25	140.97 ± (26.1)
Sex				
Women	152	140.18	18	128.41 ± (28.3)
Men	41	37.17	7	188.32 ± (64.1)
Age				
85–89	153	139.55	21	150.48 ± (30.3)
90+	40	37.79	4	105.84 ± (50.0)
Living situation				
Private household	142	133.41	17	127.43 ± (28.9)
Institution	46	40.06	6	149.77 ± (56.4)
Moving from private to institution	5	3.88	2	515.90 ± (253.8)

ten from a new depression than the older age cohort (139.48 per 1000 py vs 113.94 per 1000 py; n.s.). Differences in the incidence rates for depression were found according to the living situation. Considering only the community sample – persons living in institutions were excluded – the population at risk consisted of 150 persons. Of these persons, 17 subjects suffered at the second cross section from depression, and the incidence rate was 120.41 per 1000 py. Persons living in institutions (incidence rate 149.22 py) and persons who had moved from private households to an institution (incidence rate 339.69 py) had a higher risk to develop a depression (n.s.).

Incidence rate according to the GMS-A AGECAT computer diagnosis and sociodemographic factors (Table 4)

According to the GMS-A computer diagnosis the incidence rate for depression amounted to 140.97 py for the whole sample. Men had a higher incidence for depression than women (188.32 py vs 128.41 py; n.s.). The younger cohort suffered more often from depression in the second cross section in comparison with the older age cohort (150.48 py vs 105.84 py; n.s.).

Persons who had moved from private households to institutions had a higher incidence rate for depression (515.90 py) in comparison with persons without changing living situation (living in institutions in both cross sections 149.77 py; in private households 127.43 py). The sociodemographic differences are not significant, whereby the date referring to the living situation barely misses the significance of 10%.

Role of dementia in the incidence of depression

Project diagnosis

In Table 5 the role of dementia in the incidence of depression is shown. Of 25 persons developing a depression between the first and second cross section, 13 persons developed only depression without dementia (incidence rate for only depression 69.42 py; total incidence rate for depression 140.97 py).

In 5 persons we diagnosed a double incidence of depression and dementia according to the project diagnosis (double incidence rate 26.70 py). One person diagnosed as demented in the first cross section changed in the sec-

Table 5 The role of dementia in the incidence of depression according to "project diagnosis"

	Population at risk	Person years	Number of new cases	Incidence rate per 1000 person years ± (SE)
Total	203	187.26	25	133.49 ± (24.8)
Single incidence of depression			13	69.42
Incidence of depression as well as dementia			5	26.70
Change in diagnosis from dementia to depression			1	5.34
Additional incidence of depression in dementia			6	32.04

Table 6 The role of dementia in the incidence of depression according to GSM-A-AGE-CAT diagnosis

	Population at risk	Person years	Number of new cases	Incidence rate per 1000 person years ± (SE)
Total	193	177.35	25	140.97 ± (26.1)
Single incidence of depression			18	101.50
Incidence of depression as well as dementia			3	16.92
Change in diagnosis from dementia to depression			3	16.92
Additional incidence of depression in dementia			1	5.64

ond cross section into the diagnosis of depression (changing incidence rate 5.34 py). Six persons got an additional incidence of depression in already consisting dementia (additional incidence rate 32.04 py).

Are we differentiating the population at risk in persons without and with dementia at first cross section the incidence rate for depression is slightly, but not significantly, higher in subjects with dementia (151.29 py vs 127.65 py).

GMS-A diagnosis

In Table 6 the role of dementia in the incidence of depression according to the GMS-A computer syndrome level diagnosis is shown. The only incidence of depression (101.5 py) is higher in comparison with the project diagnosis.

The double incidence (incidence rate 16.92 py) and additional incidence rates (5.64 py) are lower, and the changing incidence (16.92 py) higher, in comparison with the project diagnosis.

Discussion

The distribution of patients undergoing psychiatric treatment does not enable conclusions to be drawn as far as the distribution of the mentally ill among the general population is concerned. Epidemiological follow-up studies of representative community samples are necessary to detect the true incidence. The comparison of different epidemiological studies is complicated by the use of different diagnostic instruments and different case identification. In addition, sociocultural differences and different attitudes toward mental illness limit direct comparison. Longitudinal epidemiological studies in the oldest olds are rare. Most of the few existing studies on the incidence of depression have based their calculations on samples aged 60 or 65 years and older, and because of mortality, very old people have been underrepresented.

Comparisons are complicated by the fact that some published studies report the incidence risk, whereas others report incidence rates. In some studies the whole sample, rather than the cases at risk, has been the denominator. For our data we choose to calculate average annual incidence per 1000 person years at risk, because this approach has been recommended for the testing of etiological hypotheses for chronic diseases with long latent periods especially when risk periods are extended and the actual period of disease susceptibility extends beyond the observed follow-up period (Kleinbaum et al. 1982).

Differing from many psychiatric epidemiological studies, in our present study the interview and examination were conducted only by medical doctors trained in psychiatry. The rate of participation was high; nevertheless, the methodological problems of unincluded people because of security reasons and refusal remains. Maybe those not investigated suffer more often from mental illness. Therefore, our results can only be considered as representative for the population assessed. The incidence rates of our study represent no lifetime incidence. Incidence rate considers new cases by comparison of two points of time 1 year apart. It is therefore quite likely that the incidence constitutes an underestimation because an episode of depression might have occurred during the interval. Another reason for underestimation could be the

death before the second cross section. Maybe depressed people have a higher mortality risk in comparison with the mentally healthy.

In our study the incidence rate of depression was analyzed according to different diagnostic instruments. The results were very similar. The syndrome diagnosis according to the GMS-A instrument amounts to a higher incidence rate for depression than the GMS-A computer AGECAT diagnosis. This difference can be explained by the fact that the syndrome diagnosis is the first level, demonstrating a depressive syndrome without diagnosing a depression. If several syndromes exist, e.g., a depressive and a demential syndrome, a decision has to be made for the main diagnosis according to the computer AGECAT diagnosis.

Presently, incidence studies for depression in the general population in older age are rare. Incidence studies for depression concerning only psychiatric inpatients (Adelstein 1968; Spicer 1973; Bland 1977; Eagles 1985) are not comparable to our study. The degree of severity of illness and factors of illness behavior and help seeking behavior influence the treatment, and general conclusions cannot be drawn.

Some epidemiological studies (Copeland 1992; Eaton 1989; Fichter 1993; Murphy 1988) are not comparable, because they include a wider age range, the incidence rates are analyzed for persons aged 50 years (Murphy 1988), 65 years and above, and the intervals of examinations, the samples, the instruments and case definitions are different.

In the study of Copeland the subjects are selected by the general practitioner; in the study by Eaton persons living in institutions are excluded. Helgason and Magnusson (1989) examined the incidence rates for depression for the population aged 80 years and above in Island. They found an incidence rate of 6 per 1000 persons per year. The time examination amounted to 20 years. Hagnell (1981, 1982, 1990) gave an incidence rate per 1000 persons per year of 6.6 for males, and of zero for females in the population of Lundby (Sweden) aged 80 years and older. The total incidence rate amounted to 3.3. The time range was 1947–1957 and included depressions of different grades of severity. Between the years 1957–1972 the incidence rate of the persons aged 80 years and older was zero. This finding was most likely due to low sample size in the very old, rather than reflecting a true decline in the incidence in very old age.

Considering the different diagnostic instruments there were no significant differences in the incidence rates according to gender and age in our study. For persons who moved between both cross sections from private households to institutions the incidence rate for depression was higher, but not significantly higher because of small case numbers, in comparison with persons who had no change in living situation.

In several studies the risk for developing depression in older age was proved to be higher in the time before and just after moving into an institution. Even the anticipation of moving and the first time in the institution is accompanied by depressive reactions. In our study the number of persons who had moved between the two cross sections is too small to make a definite statement. Persons classified as demented in the first cross section without additional depressive syndrome showed no reduced incidence rate for depression in comparison with not demented people of first examination according to project diagnoses. Some tendency is visible that persons with dementia according to the GMS-A AGECAT diagnostic system are less depressive in the second cross section than subjects without dementia. According to the GMS-A AGECAT computer diagnosis the main diagnosis of dementia is more likely to be decided in persons suffering as well from demential and depressive syndromes.

By comparing the incidence rates of depressive syndromes on the syndrome level persons with and without demential syndrome showed almost similar incidence rates (193.51 per 1000 py for persons without demential syndrome, and 212.16 per 1000 py for persons with demential syndrome).

The question of whether dementia includes palliative effects arises, i.e. persons diagnosed as demented to a higher degree do not recognize their impairment and suffer less. Therefore, we could expect a reduced incidence of depression for demented persons. Such an effect could not be demonstrated in our study; maybe such an effect depends on the severity of dementia.

There are several limitations in our present study. Although we focused on a very selected (high) age group, the sample was not large enough for a detailed break down of the data. Some of the data presented is exploratory and needs to be confirmed by future studies. Especially when data is broken down into several subgroups type II error may easily occur (rejecting a hypothesis which is true).

Another shortcoming of our study is that presently we do not know how many of those who died may have been cases of depression. If such cases exist, our estimates would be too low.

Several studies of the incidence of depression are presently conducted in Europe within the EURODEP concerted action in the epidemiology of depression. The possibility of pooling data will increase our knowledge on the incidence and etiology of depression and may solve the problem of small sample sizes in particular age groups, which most incidence studies presently have in common.

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