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## The Prevalence of Dementia in Warsaw Centenarians: a Population – Based Study\*\*

### Ocena rozpowszechnienia otępienia wśród warszawskich stulatków – badanie populacyjne

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#### Summary

**Background.** Along with the centenarian population increases in recent years a number of centenarian studies have investigated the prevalence of dementia. These studies reported dementia prevalence rates to range from 30 to 100%.

**Aim.** To estimate the prevalence of dementia in individuals aged 100 years and older

**Material and methods.** Centenarians from Polish Centenarians Programme, who living in Warsaw and who did not refuse assessment of cognitive impairment were investigated from June 2002 to June 2004, 83 persons (71 women, 12 men; mean age 101.11). Dementia was clinically diagnosed using DSM-IV criteria, Alzheimer's disease using NINCS/ADRDA criteria and vascular dementia using ICD 10 criteria. The severity of dementia was classified using Global Deterioration Scale (GDS).

**Results.** 65 (78.3%) participants lived with their families, 4 (4.8%) were institutionalized. 45 (54.2%) centenarians had primary education (38 women), 11 (13.3%) participants had higher education (10 women).

Among 28 (33.7%) non-demented centenarians 8 were classified as cognitively normal, 20 with cognitive impairment without dementia. Dementia was diagnosed in 55 (66.3%) participants (49 women). Among them 60% of the demented patients were affected by mild or moderate dementia (GDS 4 or 5). Clinically diagnosed AD accounted for 74.5% of all dementia cases.

Higher education was present significantly more frequent among women with dementia in comparison to women without dementia (31.8% vs. 6.1%,  $p < 0.05$ ).

**Conclusions.** In this study dementia is common but not universal finding. The high early education tended to be associated with a lower risk of developing dementia among women.

Key words: centenarians, dementia, cognitive impairment

#### Streszczenie

**Wprowadzenie.** Wraz z odnotowywanym w ostatnich latach wzrostem populacji osób stuletnich wzrosła liczba badań oceniających rozpowszechnienie otępienia w tej grupie wiekowej. Jednak ich wyniki są niejednoznaczne (od około 30% do prawie 100%).

**Cel pracy.** Celem pracy była ocena rozpowszechnienia otępienia w populacji warszawskich stulatków.

**Materiał i metody.** W okresie od czerwca 2002 roku do czerwca 2004 roku przebadano 83 osoby (71 kobiet, 12 mężczyzn śr. wieku 101.11 lat) z Programu Badania Polskich Stulatków mieszkających w Warszawie. Rozpoznanie otępienia było stawiane przy użyciu ogólnie przyjętych kryteriów klinicznych.

**Wyniki.** 65 (78,3%) badanych osób mieszkało z rodzinami, 4 (4,8%) w domach pomocy społecznej. 45 (54,2%) stulatków miało wykształcenie podstawowe (38 kobiet), 11 (13,3%) wykształcenie wyższe (10 kobiet). Otępienie stwierdzono w 66,3% (55 osób w tym 49 kobiet). Wśród osób z otępieniem u 74,5% rozpoznano chorobę Alzheimera. Kobiety bez otępienia miały istotnie statystycznie częściej wyższe wykształcenie niż kobiety z otępieniem (31,8% vs. 6,1%  $P = 0.013$ ).

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**Wnioski.** W badanej grupie wiek pozostaje nadal czynnikiem ryzyka rozwinięcia się otępienia (otępienie nie dotyczyło wszystkich stulatków). U kobiet wyższe wykształcenie może stanowić czynnik protekcyjny.

Słowa kluczowe: stulatkí, otępienie, zaburzenia poznawcze

## INTRODUCTION

It is well known that age is the primary risk factor for developing all types of dementia. The prevalence of dementia increases proportionally with age and doubles every 5 years, starting from 1% between 60 and 64 years of age through 21% between 85 and 90 years, up to 40% in the group of 90-94 years old (1, 2). Consequently, it might be suspected, that almost all persons aged 100 and over should be endangered by dementia. However, the above studies did not cover persons over 95 as a separate group due to very small sample sizes. Moreover, not all results of studies on the prevalence of dementia in the oldest old support the assumption of linear increase in dementia prevalence with age. Some studies have shown that the prevalence of dementia in the age group of over 95 rises to 60-70% (3, 4). In other studies, it has been proved that the prevalence increases up to the age of 90 years, then it starts to decline in persons aged 90-94, and reaches a plateau of 40% beyond the age of 95 years (5, 6).

Due to the fact that, until recently, centenarians have been very rare, centenarian studies were infrequent in the past. Along with the increase of centenarian population in recent years, a number of centenarian studies have investigated the prevalence of dementia. These studies reported dementia prevalence rates ranging from 30 to 100% (7, 8).

In Poland, available epidemiological data on the prevalence of dementia concern exclusively age groups between 65 and 84 years (9).

## AIM OF THE STUDY

The aim of the present study is to assess the occurrence and severity of dementia in individuals aged 100 years and older.

## METHODS

This study forms a part of the Polish Centenarians Program "Environmental and genetic factors of longevity of Polish centenarians". All centenarians were identified through the Polish General Electronic System of Population Registration. Age was verified based on birth certificates or other significant documentation or sometimes indirectly e.g. through the children's age or the time of military service. All participants were initially contacted by post and then by telephone. All centenarians who consented to participate in the Program were visited in their homes (including nursing homes) by geriatricians. The examination record included a very detailed interview on sociodemographic features, medical history, general physical examination, simple assessment of sight and hearing, and blood tests, including serum vitamin B12 and folic acid levels.

**The present study included centenarians who, apart from the abovementioned examination, consented to another medical visit, consisting of neurological examination and broadened assessment of cognitive impairment. The visits were conducted between June 2002 and June 2004.**

## PARTICIPANTS

One hundred and thirty five eligible centenarians residing in Warsaw area were contacted. Thirty three of them refused to participate in the study (non-response rate 24.4%). Of the remaining 102 subjects, five were found to be 'false' centenarians, eight died after giving their consent but prior to the second visit, and six centenarians or their caregivers did not agree to undergo a second medical visit. **The final study group consisted of 83 centenarians (71 women, 12 men) aged 100-107 (mean age 101.1, SD ± 2.1).**

Sixty five participants (78.3%) lived with their families, four (4.8%) in nursing homes and 14 (16.8%) lived on their own with assistance of visiting caregivers. Forty five (54.2%) centenarians had primary education ( $\leq 6$  years), including 38 women and 7 men, 27 (32.5%) had secondary education, including 23 women and four men, 11 (13.3%) participants had either complete or incomplete higher education, including 10 women and one man. 33 centenarians suffered from severe visual impairment, 18 from severe hearing impairment and six from both of the above disabilities.

## Assessment of dementia

Preliminary assessment of cognitive impairment included the Mini-Mental State Examination (MMSE) (10), and the Six Item Cognitive Impairment Test (6 CIT) (11) from the Blessed Dementia Scale. This test was chosen since, unlike the MMSE, it is entirely verbal and visual impairment does not affect performance. In screening tests, no cutoff point for the whole group was marked that would indicate cognitive impairment, and each case was analyzed individually. The reasons for that included primarily the fact, that there are no cognitive norms available for this age group, and, secondly, that there are no education norms in Poland. Furthermore, a number of factors in centenarians (sight or hearing impairment or motor handicap) may have impact on the number of points scored. The severity of cognitive impairment was classified using the Global Deterioration Scale (GDS) (12), where a score GDS 1 and 2 equals no dementia, GDS 3 – mild cognitive impairment without dementia, and GDS 4, 5, 6, 7 indicate mild, moderate, severe and terminal stage of dementia, respectively. Along with the GDS, the Brief Cognitive Rating Scale (BCRS) (13) was administered to help

assess stages of cognitive function. The BCRS tests concentration, recent memory, past memory, orientation, functioning and self-care. The final interpretation of the individual's cognitive status was based not only on testing data but also included information obtained from caregivers, nursing home records and clinical observation. The Geriatric Depression Scale (14) was used to assess depression. Dementia was clinically diagnosed according to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (15).

Clinical diagnosis of Alzheimer's disease was determined according to National Institute of Neurological and Communicative Disorders and Stroke – Alzheimer's disease and Related Disorders Association (NINCS/ADDA) criteria (16), and diagnosis of vascular dementia according to the 10th Edition of the International Classification of Diseases (ICD 10) criteria (17). The Hachinski scale (18) was applied for calculating an ischemic score to evaluate the risk of vascular dementia. Since for ethical and practical reasons (i.e. transportation problems) the CT examination was not feasible, all diagnoses were considered possible.

**Statistical analysis**

The Fisher exact test was used to test differences between the demented and non-demented group with reference to the parameters under examination. P-value < 0.05 was considered to be statistically significant.

**RESULTS**

Dementia was diagnosed in 55 (66.3%) participants. Among 28 (33.7%) non-demented centenarians, eight participants were classified as cognitively normal, and 20 as subjects with mild cognitive impairment without dementia. Dementia occurred more frequently in women than men; however the differences were not significant (tab. 1).

Table1. Prevalence of Dementia in Centenarians.

Impairment	Total group n; (%) n = 83	Men n; (%) n = 12	Women n; (%) n = 71
No dementia	28 (33.7)	6 (50)	22 (31.0)
No cognitive impairment	8	3	5
Cognitive impairment without dementia	20	3	17
Dementia	55 (66.)	6 (50)	49 (69)

In the demented group, the range of points scored in screening tests was 0-21 (mean 11.6, SD 8) for the MMSE and 7-28 (mean 19.6, SD 7.9) for the 6CIT. In the non-demented group, MMSE scores ranged from 17 to 29 (mean 23, SD 3.3) and 6CIT scores were between 0 and 12 (mean 5.8, SD 3.9).

According to the GDS, 60% of the demented patients were affected by mild or moderate dementia. A similar proportion occurred in women and men (tab. 2).

Table 2. Severity of Dementia According to GDS and Gender.

GDS*	Total group n; (%) n = 55	Men n; (%) n = 6	Women n; (%) n = 49
4	17 (30.9)	3 (50)	14 (28.6.)
5	16 (29.1)	0	16 (32.7)
6	13 (23.6)	2 (33.3)	11 (22.4)
7	9 (16.4)	1 (16.6)	8 (16.3)

\*Global Deterioration Scale  
GDS 4, 5, 6, 7 indicate mild, moderate, severe and terminal stage of dementia, respectively.

The mean age at onset of dementia in centenarians was 96.7 years (± 4.1 years), range 83 – 107 years.

Non-demented centenarians more frequently lived on their own than demented ones (32.1% versus 9.1%; P = 0.03). Additionally, the non-demented centenarians less frequently suffered from considerable hearing impairment (P = .018).

**Significant correlation between education and prevalence of dementia was found in the group of women.** Higher education was significantly more frequent in women with no dementia than in women with dementia (31.8% vs. 6.1%; P = .013). Such tendency was also noted in the whole group, however it was not significant (fig. 1).

Forty one participants (74.5%) were diagnosed with AD, 10 with vascular dementia and one person with another type of dementia. In three centenarians vitamin B12 and folic acid deficiency might have contributed to dementia.

**DISCUSSION**

This was the first study held in Poland aiming at assessment of the prevalence of dementia in persons aged 100 and over.

Due to difficulties in assessing dementia, centenarians form a specific group. It is mainly related to lack of accepted normal values for this age group and more frequent occurrence of sensimotor impairment. The lack of age norms causes that there is no certainty whether the observed cognitive impairment is to be associated with age or whether it is already pathology. Visual and hearing impairment, arthritic changes and frailty affect test scores, and may also cause functional impairment not related to cognitive disturbances. Moreover, the assistance provided to centenarians in a number of instrumental activities (e.g. shopping or washing) might be a result of caregiver's overprotectiveness rather than a real need. For these reasons the test scores constituted only one part of the our assessment in identifying dementia.

From the sociodemographic perspective, this cohort of centenarians did not demonstrate significant differences from those reported in other centenarian studies, except one characteristic. In our group, almost 80% of the participants lived with close or distant relatives and only 5% in nursing homes, while in other studies,

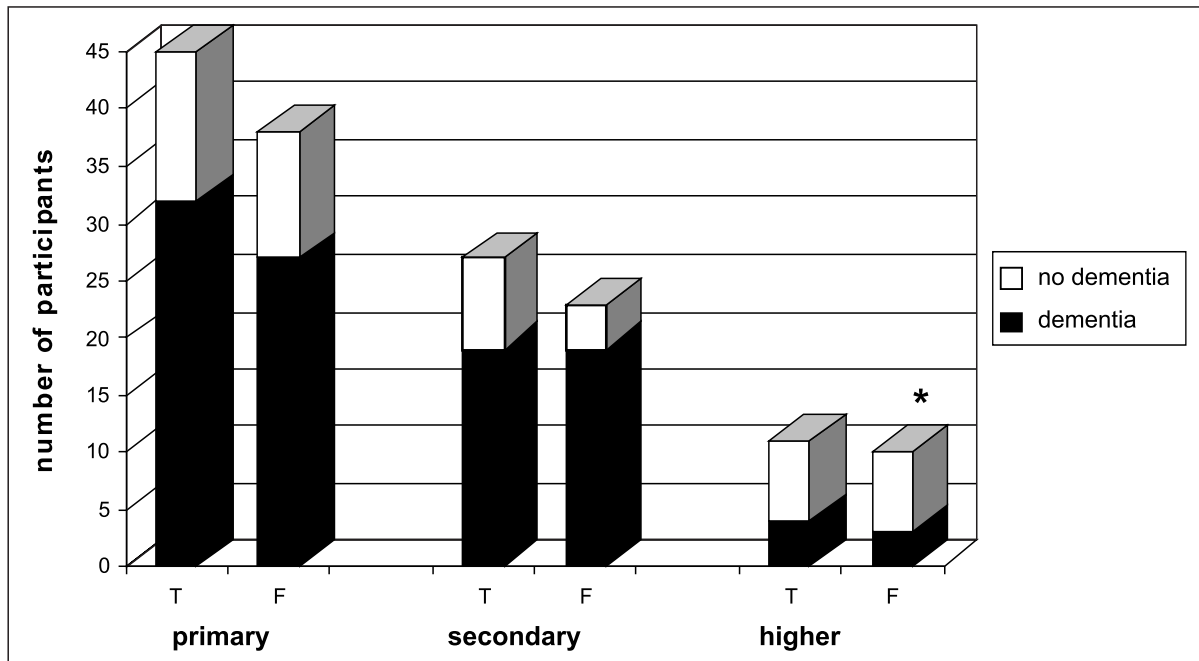


Fig. 1. Prevalence of Dementia in Relation to Education Level.

Primary – primary education, secondary – secondary education, higher – higher education.

T – total group, F – female, \*P = .013.

In the whole group, higher education was reported by four (7.3%) persons with dementia and seven (25%) participants without dementia P = .09.

In the group of women, higher education was reported by three (6.1%) females with dementia and seven (31.8%) females without dementia P = .013.

except the Hungarian one (19), the majority of participants were institutionalized (20-22). This phenomenon may have the following reasons: extended family model frequently found in Poland and institutional incapacity to provide appropriate care for the elderly in Poland. Additionally, the fact that in Poland people aged 100 and over receive high guardianship benefit from the National Insurance Fund, facilitating home-care for the centenarians, might be considered in some cases.

The prevalence of dementia in this population-based group of centenarians was 66.3%. Our findings are close to the results obtained in the majority of centenarian studies conducted up to date. Although the results range from 27% in a Swedish study to as much as 88% in a Dutch study (7, 8), reports from New England (20), northern Italy (22), Japan (23) as well as Denmark (24), Finland (25) and Germany (26) indicate that the prevalence of dementia is 60-70%. Contrary to others studies, we did not note significantly higher prevalence of dementia in women vs. men. It needs to be stressed, however, that the number of centenarian men in this study was low.

In the demented, group 60% of centenarians were diagnosed with moderate or mild dementia according to the GDS. It may result from a relatively short history of disease (mean morbidity age was 96.7). It also may be of importance that approximately 80% of the participants resided in their own environment, which, unlike nursing home, facilitates good cognitive functional status.

An inverse correlation found in our study between incidence of dementia and higher education seems interesting. This relationship was marked in the whole group although it reached statistical significance only in the group of women. Again, non-significant results for the male group might be due to the small size of this subgroup. Numerous epidemiological studies indicate that there exists relationship between previous formal education and dementia. One of the most popular theories accounting for this phenomenon is brain reserve hypothesis (27). It postulates that cognitive impairment occurs only when the brain pathology goes beyond certain threshold. Education, while increasing cognitive reserve e.g. through elevated synaptic density, causes that a greater intensity of pathological changes is required to reach this critical threshold. However, little is known whether the protective effect of previous formal education holds steady in the oldest old, although the results of neuropathological studies on non-demented persons diagnosed with advanced neuropathological AD changes (28, 29) allow for the positive answer. It is also supported by the clinical data from the Heidelberg Centenarian Study (30).

In the demented group, 74% of the participants, similarly to Finnish (25) and Italian (22) studies, were diagnosed with AD, whereas 18% with vascular dementia. However, these results should be approached with caution. Since CT examination was not conducted, according to NINCDS/ADRDA criteria only possible but no probable AD can be diagnosed. No neuroradiologi-

cal assessment increases the risk of failure to diagnose vascular dementia or mixed dementia. The results noted by Itoh (31) indicate the possibility of frequent occurrence of vascular changes. In a neuropathological study of 13 Japanese centenarians at different stages of cognitive impairment he noted an occurrence of vascular changes with concentration of AD changes insufficient for definitive AD diagnosis. Secondly, it seems that the phenomenon of 'demographic selection' should lead to lower proportion of Alzheimer's disease among dementia disorders in centenarians as compared to younger age groups.

Thirty percent of centenarians in this study were nondemented, which stands in accordance with the majority of other centenarian studies. This finding seems also to be supported by the results of neuropathological studies by Silver (28). In her study, 14 centenarians underwent neuropsychological as well as post mortem

neuropathological assessment, and six of them with no clinically diagnosed dementia did not present pathological markers indicative of AD or other forms of dementia.

Unfortunately, epidemiological population-based studies on the prevalence of dementia in persons aged 85 and over have not been conducted in Poland. We have access only to the data on the Warsaw area population-based study, which indicated that the prevalence of dementia in the oldest examined age group (80-84 years) stood at 17% (9). Therefore, we cannot estimate whether the Polish population demonstrates the plateauing of dementia prevalence rates described by Ritchie (6). However, we can assume, based on the results of our study, that the supposition made by some scientists that dementia is inevitable in a sufficiently long life (8) is unjustified, at least in today's average life span.

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