

The predictive value of MMSE, ADAS-cog, IADL and PSMS as instruments for the diagnosis of pre-clinical phase of dementia of Alzheimer type

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The aim of the present study was to describe factors that allow for the estimation of the degree of risk in the development of dementia (Alzheimer type). A five-year observation was performed on 204 individuals. Among the examined population, during the five-year observation, Alzheimer type dementia was recognised in 19 individuals. Based on the examination conducted after five years, the examined population was eventually divided into two groups: without dementia syndrome (control group, n = 185) and individuals in which Alzheimer type dementia was recognised during the five-year observation period (DAT group, n = 19). A statistic analysis of the results indicates that it is possible, on the basis of the examination by means of proper clinical scales, to predict the danger of dementia, however it is necessary to take into account various elements of psychic state and social functioning. This is discussed in detail.

Key words: clinical scales, prediction, Alzheimer type dementia

Introduction

Alzheimer's disease is a long-standing illness with a progressive course depending on the disposition of biochemical and histopathological changes. A chronic course of Alzheimer disease assumes the presence of long-lasting pre-clinical phase in which biological processes, leading to brain damage have already initiated [1]. It results from Jacobs et al's [2], study which was based on conducting neuropsychological tests, that demonstrated that very early (pre-clinical) stages of Alzheimer disease is characterised by trace amnesic aphasia, deterioration of higher executive thinking and memory function. People who are in the pre-clinical phase of Alzheimer disease often complain about having trouble with memory [3]. It must be stressed that thus far, no specific symptoms have been found that would clearly indicate the threat of Alzheimer's disease. Moreover, disturbances in cognitive functioning are common

among the elderly and they may present a full symptomatic clinical syndrome (dementia) including depression, neurotic disturbances or memory weakness associated with age [4]. Neuropsychological tests exist that may simplify the differentiation of preliminary forms of the dementia process from physiological states (Locascio et al [5], Masur et al [6], Jacobs et al [2]), however there is little access to such instruments (particularly in Poland), which limits its use.

In the pre-clinical phase other symptoms of a non-cognitive sphere also appear, including behavioural symptoms [7]. Any changes in professional and social function of an individual may be of significant importance. Stern et al [8] emphasised withdrawal from social function as a precursor to dementia. Very often depression is prodromal to the dementia process, despite existing disturbances of cognitive functions [9]. Some researchers point at so called neurasthenic onset of dementia, where apathy, irritability and anxiety dominate the preclinical phase.

In the professional literature there is very little information describing the pre-clinical phase of Alzheimer type dementia, based on longitudinal examinations. There is a lack of examinations devoted to the assessment of psychic state preceding the development of dementia, based on methodology, which makes the quantification of psychopathological symptoms possible. In the present research, one of the aims is to describe factors that allow for the estimation of the degree of risk of the development of Alzheimer type dementia. Elderly inhabitants of a Nursing Home, who at the onset of examinations did not display any signs of dementia, had undergone a five-year observation.

Method

The initial population for the study (N = 345) involved subjects residing at the two Nursing Homes in Gdynia, Poland. The qualifications for the examinations involved the following criteria:

- Consent to participating in the examination;
- Age of 55 or older;
- No psychical diseases at time of the interview;
- Absence of dementia according to DSM III R criteria [10];
- A somatic state enabling a complete examination, especially the lack of any illnesses involving the organs of movement, vision and hearing that would hinder performing orders and procedures enclosed in the applied clinical scales;
- The first (no cognitive decline) or second (very mild cognitive decline) degree of dementia, according to Global Dementia Scale (GDS) [11];
- Exclusion of other psychiatric diseases such as schizophrenia and other psychotic disorders, depression, mental retardation, and substance-related disorders.

291 subjects complied with the primary criteria and have undergone the entire examination process, which consisted of the following elements:

- Estimation of the intensification of cognitive functions impairment, according to the following scales: Mini Mental Scale Examination (MMSE) [12] and Alzheimer's

- Disease Assessment Scale (ADAS)– cognitive (ADAS-cog) part [13];
- Estimation of the functioning of a patient, based on Instrumental Activity of Daily Living (IADL) [14] and Physical Self Maintenance Scale (PSMS) ([15].

Every examination was preceded by a short (15 minutes) history of the subjects' life, the aim of which was to reduce the patient's emotional tension. A psychiatrist or a clinical psychologist performed an examination with the use of GDS and ADAS in each case. Since many social workers and nursing personnel were employed by the Nursing Home, they also, performed MMSE, IADL and PSMS as well. Before beginning the proper program, a training program for application of clinical scales was organised for the individuals taking part in the examinations. A piloting examination was subsequently conducted with a group of 20 subjects, both demented and those without dementia. Having conducted the piloting examination, the difficulties connected with the accepted research procedure had been discussed as well as attention given to the mistakes committed during the examination.

The initial examination was conducted between July and September of 1993.

Individuals included in the program were examined every year by means of the MMSE. Individuals who obtained less than 24 points on the MMSE examination underwent a psychiatric examination with the aim of identifying and excluding dementia. If dementia was identified according to DSM IV criteria– further examinations were conducted. This assessment included haematology, blood biochemistry, CAT scan or MIR. This was performed in order to determine the aetiology of the process. Final recognition was made on the basis of DSM IV criteria [16]. Apart from annual examination by the MMSE scale, repeated psychiatric examination was conducted at the end of the observation, i.e. five years after initial qualification.

Group characteristics were employed using parametric and non–parametric techniques. Categorical variables were measured using the chi-square test. A “T” test was used to analyse normally distributed parametric variables. All statistical tests were two-sided and conducted at the 0,05 level of significance.

Results

A five-year observation was performed on 204 subjects from a pool of 291 who qualified for the examination in 1993. A full period of observation had not been completed by 87 of the examined due to the following reasons:

- 63 subjects died;
- 11 of the examined a dementia syndrome of aetiology different than Alzheimer type was recognised (8 – vascular, 2 – mixed, 1 – aetiology unknown);
- 7 subjects had increasing symptoms of other illnesses, which hindered conduction of the entire examination;
- 2 of the subjects examined did not agree to the following examinations;
- 4 people were relocated.

Among the examined population, during the five-year observation, dementia of the Alzheimer type (DAT) was recognised in 19 subjects, and 5 of the demented did

not display any signs of cognitive decline at the beginning of the observation period in 1993. They were qualified to the first group according to Reisberg et al's scale, whereas 14 subjects qualified as "very mild cognitive decline". Because of the death of two patients with the dementia of Alzheimer type (in 1996 – a person with DAT recognised in 1994 and in 1997 – DAT recognised in 1995) – an examination in 1998 was not conducted. In both cases the cause of death was circular-respiratory insufficiency resulting from pneumonia. Considering the fact that the entire diagnostic process had been completed previously, the above subjects were qualified to the DAT group, regarding the last examination as the final one, to the rest of the examined it was completed in the fifth year of the observation.

The population that underwent the entire five-year observation (N = 204) was divided into two groups: those subjects without dementia syndrome (CONTROL GROUP, N = 185) and those subjects with whom Alzheimer type dementia had been recognised during the five-year observation (DAT GROUP, N = 19).

Table 1 represents the average age and results obtained in the examinations by means of MMSE, IADL, PSMS and ADAS cognitive part, obtained in 1993. Statistic analysis of the results (test for two independent averages) display significant differences, in comparison with subjects who during the following five years decline with dementia (DAT group), were noted for the control group regarding MMSE, ADAS cognitive part and IADL. Whereas PSMS scale did not part differentiate in the examination carried out at the beginning of the observation.

Table 1

Baseline results obtained in the examinations
by means of MMSE, IADL, PSMS and ADAS cognitive part

Variable	CONTROL N = 185		DAT N = 19		t value or test for independent samples	Significance level
	Mean	SD	Mean	SD		
AGE	75.15	9.75	75.26	9.51	1.1537	n.s.
MMSE	27.00	1.76	26.00	2.05	4.006	0.001
ADAS-COG	5.00	2.00	6.00	1.76	5.295	0.001
IADL	10.56	2.75	12.53	2.20	3.016	0.01
PSMS	6.00	1.75	7.00	1.81	1.600	n.s.

n.s. – No statistical differences

The comparison of the frequencies of the obtained results regarding elements of the MMSE, IADL and ADAS scales were conducted by means of the chi square test. The obtained results indicate that between the DAT group and the rest of the examined subjects, differences in particular scales exist. Therefore subjects from the DAT group, in comparison with control group, had significantly more difficulties with attention, calculation and constructional praxis (30 item)(MMSE), following commands, naming objects and fingers, constructional praxis, ideational praxis, spoken language ability, comprehension of spoken language and word-finding in spontaneous speech was worse (ADAS– cog.). Also there were worse results in mode of transportation, responsibility

for own medications, ability to handle finances (IADL), and smaller care about the appearance (PSMS).

Table 2

Comparison of particular elements of MMSE, IADL and ADAS scales in Control group and DAT group (Chi square test results)

Scale item	Chi square value	significance level
M M S E		
ORIENTATION	1,677	n.s.
REGISTRATION	1,970	n.s.
ATTENTION AND CALCULATION	29,851	***
RECALL	2,673	n.s.
LANGUAGE	1,818	n.s.
CONSTRUCTIONAL PRAXIS	8,209	***
A D A S		
1. WORLD RECALL TASK	6,779	n.s.
2. FOLLOWING COMMANDS	6,207	***
3. NAMING OBJECTS AND FINGERS	5,064	***
4. CONSTRUCTIONAL PRAXIS	83,854	***
5. IDEATIONAL PRAXIS	20,032	***
6. ORIENTATION	2,003	n.s.
7. RECALL OF TEST INSTRUCTIONS	2,118	n.s.
9. WORD-RECOGNITION TASK	6,779	n.s.
8. SPOKEN LANGUAGE ABILITY	11,018	***
10. COMPREHENSION OF SPOKEN LANGUAGE	17,587	***
11. WORD-FINDING DIFFICULTY IN SPONTANEOUS SPEECH	28,947	***
I A D L		
A. ABILITY TO USE TELEPHONE	0,776	n.s.
B. SHOPPING	4,236	n.s.
C. FOOD PREPARATION	0,463	n.s.
D. HOUSEKEEPING	0,281	n.s.
E. LAUNDRY	0,144	n.s.
F. MODE OF TRANSPORTATION	10,191	***
G. RESPONSIBILITY FOR OWN MEDICATIONS	40,803	***
H. ABILITY TO HANDLE FINANCES	34,059	***

n.s. – no statistically significant differences

Discussion

The undertaken studies are the first of this type to be conducted in Poland. The primary concern of the research involved the periods preceding the fully symptomatic clinical syndrome of dementia of Alzheimer type. The subjects under observation were those inhabitants of the Nursing Home. This ensured the minimal influence of uncontrolled environmental variables. It must be kept in mind that in DAT pathogenesis many factors play probable role, including environmental factors [17]. Uncontrolled environmental factors accelerating the occurrence of dementia syndrome could distort the obtained results.

The results obtained from the conducted examinations indicate that pre-clinical symptoms appear a few years prior to the development of fully symptomatic dementia syndrome. They concern not only cognitive function but also social function and finally other behavioural and psychopathological symptoms, such as depressive symptoms. The qualification of subjects as “very mild cognitive decline” is clearly connected with a higher risk on the DAT. Among “very mild cognitive decline” subjects’ DAT was recognised in 14 individuals (N = 93), whereas in GDS 1 group only in 5 individuals (N = 111). Further observation will show whether these people have already started to suffer from dementia.

In clinical practice estimation of the results obtained in the applied clinical scales is an important issue. Therefore the quality analysis of the items of particular clinical scales indicate usefulness of the estimation of such functions as attention, calculation and constructional praxis (30 item) (MMSE), following commands, naming objects and fingers, constructional praxis, ideational praxis, spoken language ability, comprehension of spoken language and word-finding in spontaneous speech was worse (ADAS– cog.). Mode of transportation, responsibility for own medications, ability to handle finances (IADL) were also worse.

The obtained results are consistent with earlier observations in which the importance of the IADL scale has been stressed, especially some of its items including managing one’s own finances, in the early recognition of DAT.

It must be stressed that all of the prognostic conclusions are of relative nature and they refer to a certain period of time (five years in this case). There is no doubt that in all the groups there are people in whom DAT will develop in the future. Hitherto existing results seem to indicate that the perspective for the development of DAT is the most remote for those who qualified, according to GDS scale, as “no cognitive decline”, whereas the “very mild cognitive decline” may at some people indicate a prompt beginning of dementia.

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