ORIGINAL PAPERS

Influence of selected factors on the prevalence of cognitive disorders and depression among patients over 60 years of age

MAŁGORZATA KOZIARSKA-ROŚCISZEWSKA[1, A–G], PATRYCJA IWAN[2, A–F], GRZEGORZ KARDAS[3, A–F],
ORCID ID: 0000-0002-2809-7153   ORCID ID: 0000-0002-3279-6133

PAWEŁ KOZARZEWSKI[4, A–F], JACEK RYSZ[1, A, D, G], MATEUSZ MACIEJEWSKI[5, D, F]
ORCID ID: 0000-0002-2757-6443   ORCID ID: 0000-0001-5555-3559

[1] Nephrology, Hypertension and Family Medicine Department, Medical University of Lodz, Poland
[2] Internal Medicine Department, Main-Spessart Clinic, Marktheidenfeld/Lohr, Germany
[3] Department of Internal Medicine, Asthma and Allergy, Medical University of Lodz, Poland
[4] NZOZ Optima, Grodzisk Mazowiecki, Poland
[5] Department of Propaedeutics of Internal Medicine and Social Pharmacology, Medical University of Lodz, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Dementia is defined as a gradual loss of intellectual capabilities and cognitive functions that may impair daily functioning. Early diagnosis seems essential for proper treatment and slowdown of disease progression. Multimorbidity leading to polypharmacotherapy need a complex dosage regimen. In patients with dementia, this is a real challenge.
Objectives. To determine the incidence and the risk factors of cognitive disorders and depression among patients over 60 years of age.
Material and methods. A group of 115 patients over 60 years of age attending primary care and geriatric ward in Lodz were enrolled in this observational study (75 women – 65.2%; 40 men – 34.8%). The patients underwent MMSE, GDS and CDT tests and completed a questionnaire concerning age, place of residence, marital status, medical history and family history of dementia. The data collected was statistically analysed using STATISTICA 10.0 (StatSoft Inc, USA).
Results. Education level in the group: 20% basic, 51.3% secondary, 28.7% higher education. 45.2% were married, 54.6% were single. 61.7% had hypertension, 27.0% – diabetes, 9.6% – atherosclerosis, and 9.6% had a stroke in the past. Mean score of GDS was 9.2 points; MMSE 25.7; CDT 1.9. A higher score in GDS correlated with a worse result of MMSE ($p < 0.05$). Age was an important factor in the group with basic education; it affected: MMSE (lower) and CDT (higher) results. Male patients achieved a higher score in MMSE ($p = 0.0399$) and lower in CDT ($p = 0.0345$). The MMSE result was higher ($p = 0.0454$) and the CDT result was lower ($p = 0.0230$) in married individuals. The number of diseases correlated with the GDS score ($p < 0.05$).
Conclusions. Patients predisposed to dementia were: older females, patients with basic education, those who were single, mostly widowed. Family physicians should pay special attention to such patients and be aware of early symptoms of dementia. Cooperation with the patient's family or caregivers seems crucial to provide proper care and improve patient compliance.
Key words: depression, dementia, mental status and dementia tests.

Background

Dementia is described as a set of symptoms caused by a brain disease, usually chronic or progressive in nature. Clinically, it is characterised by impairment of higher cortex functions, such as memory, thinking, orientation, understanding, counting, learning and language abilities [1]. Statistics indicate that from 3.5% (in the general population) to 7% (large towns > 500,000 inhabitants) of the Polish society suffers from various kinds of dementia [2]. Worldwide, around 55 million people have dementia, mainly (60%) those living in low-middle-income countries. As the number of older people in the population is increasing in nearly each country, it is expected that dementia will affect up to 78 million by 2030 and 139–152 million by 2050 [1, 3].

Additionally, impairment of cognitive functions is an important risk factor of physical disability in the future, which may be problematic for an individual patient in basic activities of daily living (BADL) and instrumental activities of daily living (IADL). This may lead to increased healthcare and financial outlays for society as a whole and may cause new challenges for healthcare professionals [4].

An important distinction between dementia and mild cognitive impairment (MCI) is crucial in medical treatment. MCI is defined as cognitive disorders with normal general functioning in everyday activities. It is considered as an intermediate state between healthy aging and dementia [5].

Depression, according to the definition of the World Health Organization (WHO), is "a common mental disorder, characterized by persistent sadness and a loss of interest in activities that you normally enjoy, accompanied by an inability to carry out daily activities, for at least two weeks. In addition, people with depression normally have several of the following: a loss of energy; a change in appetite; sleeping more or less; anxiety; reduced concentration; indecisiveness; restlessness; feelings of worthlessness, guilt, or hopelessness; and thoughts of self-harm or suicide". As estimated by the WHO, depression affects about 5–6% of the world's population [6]. Over 300 million people around the world suffer from this condition, with an increase of 18% during the last 10 years (2005–2015) in the number of

individuals affected [6, 7]. Within the European population, disease prevalence rate varies from 5.1% (Poland, Austria, Italy), 5.2% (Germany) to 6.3% (Ukraine) [8, 9]. The WHO pays special attention to the three risk groups that are particularly vulnerable to the occurrence of depression: adolescents and young adults, women of childbearing age (especially after childbirth) and people over 60 years of age [10].

In the family doctor practice, as well as in every other specialty, a significant percentage of patients are particularly prone to the occurrence of cognitive and depressive disorders, i.e. elderly patients. It is important to recognise early symptoms of these disorders, as their presence may negatively affect patients' compliance and decrease the effectiveness of therapy. In general medicine, useful tests determining the risk of these diseases in a simple and convenient way include the Mini-Mental State Examination (MMSE) and the Clock Drawing Test (CDT).

The MMSE is a frequently used test in the diagnosis of dementia. It is a short screening tool, useful for assessing dementia [11]. The important features of this test are short duration of testing and its availability. Using simple questions and tasks to be solved by patients, it allows one to assess a number of functions: time and place orientation, memory, attention and counting, remembrance, language functions, repetition, making complex verbal or written commands, visual and spatial abilities. The maximum result possible to obtain in this test is 30 points (correct result) (Table 1).

Table 1. Interpretation of MMSE results	
Result	**Interpretation**
27–30	correct result
24–26	cognitive disorders without dementia
19–23	mild dementia
11–18	moderate dementia
0–10	severe dementia

A shorter and possibly simpler screening test for dementia is the Clock Drawing Test (CDT). It is used to assess visual and spatial functions depending on the frontal lobe and temporoparietal cortex. There are several variants of evaluation and analysis of the test results, but the most popular is the system developed by Schulman (1986). Drawn by the patient (a clock face with appropriate hands), according to the instructions of the physician, the clock is assessed on a five-point scale, where 1 is no deviation from the norm, while the result of 2–5 suggests the occurrence of symptoms of dementia (Figure 1).
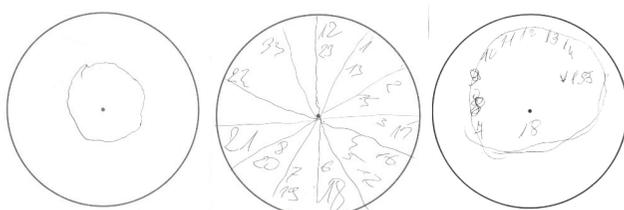

Figure 1. Examples of CDT results

Another widely used tool for evaluation of depressive disorders is the Geriatric Depression Scale (GDS). It consists of 30 questions to which the patient answers "yes" or "no" (Table 2). Among other tests for diagnosing depression, this one was especially designed for older patients.

Table 2. Interpretation of GDS results	
Result	**Interpretation**
0–10	correct result
11–20	mild depression
21–30	severe depression

Objectives

The aim of this study was to obtain information on the prevalence of cognitive disorders and depression among patients over 60 years of age (in a family practice in Lodz, Poland) and to analyse selected factors influencing the risk of these disorders. Additionally, we aimed to highlight the problem of coexisting cognitive disorders and other chronic diseases which require a daily intake of many drugs, often with complicated dosage regimens, thus demanding sufficient intellectual capabilities from the patient.

Material and methods

The study group consisted of 115 consecutive patients over 60 years of age attending one of the Family Medicine Clinics in Lodz, Poland, and the Geriatric Ward of the University Clinical Hospital Military Memorial Medical Academy in Lodz, Poland, without previously diagnosed cognitive disorders and depression. 75 patients enrolled in this observational study were women (65.2%), aged 60–95 (mean 78.4 years), and 40 were men (34.8%), aged 60–94 (mean 74.2 years). More socio-epidemiological data is shown in Table 3.

Each patient completed a questionnaire regarding socio-epidemiological information, chronic diseases, medications and family history. MMSE, CDT and GDS tests were then carried out in order to assess any symptoms of depression and dementia.

Ethical considerations

The study was approved by the Medical University of Lodz Bioethics Commission (RNN/123/16/KE).

Statistics

The data collected was statistically analysed using STATISTICA 10.0 (StatSoft Inc, USA). The compatibility of the distribution of quantitative variables with normal distribution was checked using the Shapiro-Wilk W test. To analyse the interrelations of variables, the Mann-Whitney U test, Kruskal-Wallis test and Spearman's rank correlation were used, $p < 0.05$ was assumed as significant in all tests conducted.

Results

The socio-demographic data of the study group is presented in the Table 3.

Table 3. Socio-demographic data of the examined group			
		n = 115	%
Gender	female	75	65,2
	male	40	34.8
Education	primary	23	20.0
	high school	59	51.3
	university	33	28.7
Marital status	bachelor	11	9.6
	relationship	52	45.2
	widowed	52	45.2
Place of residence	countryside	2	1.7
	small town (< 500,000 inhabitants)	7	6.1
	large town (> 500,000 inhabitants)	106	92.2

The main results are presented in Table 4.

Table 4. Results of GDS, MMSE, CDT tests in the group

	n	Average	Median	Minimum	Maximum	IQR	SD	CV
Age	115	77.0	78.0	60.0	95.0	16.0	9.6	12.4
GDS	115	9.2	8.0	0.0	27.0	7.0	5.7	61.6
MMSE	115	25.7	27.0	9.0	30.0	4.0	4.3	16.8
CDT	114	1.9	1.0	1.0	5.0	2.0	1.3	68.0

IQR – interquartile range, SD – standard deviation, CV – coefficient of variation.

In the examined group of patients, 42% presented signs of cognitive impairment or dementia; 32% had features of depression.

Based on the MMSE test, 66 patients (57%) (37F – 49.3%, 9M – 2.5%) had no cognitive impairment.

22 patients (19%) (16F – 21.3%, 7M – 17.5%) showed signs of cognitive dysfunction.

Furthermore, 26 patients (23%) (22F – 31.4%, 4M – 10%) had dementia-indicating features, including 16 subjects (14%) with light severity (15F – 20%, 1M – 2.5%), 9 patients (8%) average (6F – 8%, 3M – 7.5%) and 1 person (1%) with deep dementia (1F – 1%, 0M).

Similar results were obtained by analysing the outcomes of the CDT test. 65 people (56%) obtained the highest scores (no deviations from the normal state). In addition, 90% of people with a CDT result of 5 also received an MMSE score indicating the occurrence of dementia. At the same time, comparing the relationship between the MMSE and CDT results, it was found that the higher the MMSE test score, the lower the CDT test score (Figure 2).
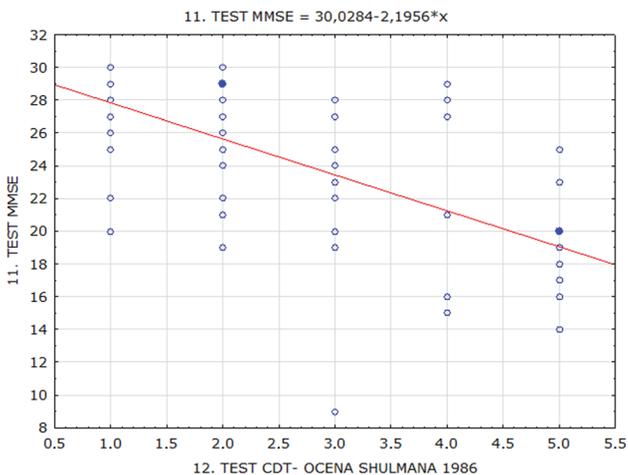
Figure 2. Correlation between CDT and MMSE

The dependence of the results of the above tests on the socio-demographic data of the examined patients was also studied.

It was found that the older the examined patient, the lower the score in the MMSE test (Spearman's correlation coefficient = 0.47) and the higher the CDT score (rS = 0.51).

Additionally, the results in the MMSE test were significantly higher in the group of men than women.

A similar result was achieved by analysing the correlation of the CDT score with a patient's gender: the CDT test was significantly higher in the group of women than men (p = 0.0345).

A statistically significant dependence was found between the level of education and the MMSE test (p = 0.0096). Comparing subgroups of subjects with different levels of education by pairs, a significant difference was found in the MMSE test between subgroups of subjects with primary and higher education (p = 0.0075). For people with higher education, the average MMSE score was 27.55, while for people with basic education, it was 23.26.

There was also a statistically significant dependence between marital status and the MMSE test score (p = 0.0389). Comparing subgroups of respondents with different marital status, there was a higher average MMSE score in patients in relationships compared to widows, but this result was not statistically significant (p = 0.0533). The result of the MMSE test was significantly higher in the subgroup of those in relationships in comparison to single persons (bachelors, widows) (p = 0.0454). A similar result was found by analysing the correlation between marital status and the result of the CDT test: A statistically significant relation was found between these factors (p = 0.0007). Comparing subgroups of respondents with different marital status, a significantly higher CDT test result was obtained in the widows subgroup in comparison to those in a relationship (p = 0.0101) and bachelors (p = 0.0303). The result of the CDT test was significantly lower in the subgroup of those in relationships in comparison to single persons (bachelors, widows) (p = 0.0230).

The relationship between MMSE scores and age and education was also examined. A significant negative correlation between age and MMSE test result was observed in the subgroup of patients with primary education (rS = -0.87). The older the person being tested, the lower the test result. On the other hand, among subjects with secondary (high school) and higher (university) education, no significant correlation was found between age and MMSE test score.

When comparing the results in the GDS and MMSE studies, it was found that the higher the GDS rating, the lower the MMSE score.

Discussion

The study group consisted of patients who had not yet been diagnosed with depression or cognitive disorders. The group was diverse in terms of age, gender and education. The most vulnerable to occurrence of dementia were elderly females and those single or widowed with primary education. The beneficial influence of education on the reduction of the risk of cognitive impairment is commonly postulated [12–14]. There are some contradictory reports on the impact of the number of years of education completed on the probability of being diagnosed with dementia. A study by Gross et al. showed that with a higher number of years of education, there were much better results in all measurements of cognitive functions [15]. However, Iracleous et al. postulated that the level of education is important, not just the number of completed years of education [16, 17]. Our study included people who were not illiterate and had completed at least primary school.

The incidence of dementia in the world in the population above 60 years of age is diverse, e.g. in the United Kingdom (UK), in the 65+ group, it is 7.1% [18], in the South Korean population, it is assessed as 6.3% in the same age group [19], while in the Chinese population, it is 3.0% in the 60+ population [20–22], and in Canada 1.5% [23]. In Poland, the percentage of people with dementia is estimated at 3.5–7% [2].

The MMSE test is widely used to assess cognitive functions by many clinicians. For example, in the UK, it is estimated that up to 79% of physicians use this test as the first, basic tool for assessing cognitive functions [24]. Another study shows that up

to 91% of UK neurologists use the MMSE test in clinical practice [25]. According to the International Psychogeriatric Association (IPA), the MMSE is the most popular test used in brief cognitive screening by members of the IPA and the American and Canadian Associations of Geriatric Psychiatry [26]. There are also other tests used for assessment of cognitive functions that were not used in this study – for example, the Montreal Cognitive Assessment (MoCA) test, which serves as a screening tool for detecting mild cognitive impairment [27]. It has been reported that the MoCA test better meets the screening criteria for the detection of MCI in people over 60 years of age in comparison to the MMSE used in this study [5]. The MoCA test, however, is not as widely used as the MMSE test, and therefore, there may be some difficulties in comparing the outcomes of patient results worldwide. In addition, there is a need for further clinical trials that would allow one to establish cut-off points for MCI and dementia in the new Polish version of the MoCA 7.2 scale [27]. In spite of the increasing popularity of the MoCA test, there is insufficient data to determine its actual usage in everyday clinical practice among physicians.

The Mini-Cog test is also used in the assessment of cognitive functions – it is even suggested that it has a lower specificity than MMSE but is more sensitive in detecting dementia [28]. Similarly to the MoCA test, its use is not so widespread. Many psychometric tools are strongly dependent on the socio-cultural and educational background, and the use of such tests in people without higher education (university) may result in their misjudgement and wrong interpretation of the results [29]. Therefore, in our study, we used the MMSE test, which is simple and allows for an objective assessment of the level of functioning, regardless of the patient's characteristics. An additional positive feature of the MMSE test is its credibility and experience resulting from its lengthy use, which allows the obtained data to be compared with other studies. For example, our results concerning the percentage of elderly patients with cognitive disorders and dementia (42%) seem similar to the results of Chorążyczewska and Sapilak from 2015, who revealed 46% of patients over 65 years of age with cognitive disorders 46% [30].

The severity of mood disorders and the occurrence of depression in elderly patients were also determined in this study. The GDS was used for this purpose. Almost 1/3 of the examined patients (32% in the examined group above 60 years of age) obtained a result suggesting the occurrence of depression, which significantly differs from the population average in Poland [9]. The incidence of depression may be underestimated. According to WHO data, the global prevalence of depression among patients above 60 years of age is more than 7% for females and more than 5% for males [9]. In a study conducted among the Indian population, the incidence of depression is estimated at about 9% in the examined age group over 60 years of age, and older age is a significant risk factor. It is also believed that people with cognitive impairment are three times more likely to suffer from depression [31]. This was also corroborated by our study – the lower the MMSE score, the higher the GDS score of the patient. The authors of this study also reported that marital status and educational status had no significant effect on depression in multivariate analysis [31].

This Indian study, however, does not explain the causes of this disease. They may be sought, among other things, in comorbidity with other, multiple chronic diseases (including degenerative diseases and cancer). According to Kujawska et al., the severity of symptoms of depressive disorders positively correlates with the number and severity of somatic complaints [32]. In addition, it is suggested that chronic pain is associated with depression not only in the patients themselves, but also in their families, mainly their spouses. Pain among patients over 65 years of age is very common. For example, more than half of elderly patients in the US population complain of nuisance pain, which may be a factor in the occurrence of depressive symptoms. Therefore, it is important to provide proper diagnosis and medical care for these patients [33].

Conclusions

Patients predisposed to dementia were: older females, patients with basic education, those who were single, mostly widowed. Family physicians should pay special attention to such patients and be aware of early symptoms of dementia. Doctors taking care of patients over 60 years of age should routinely perform tests for dementia and depression, especially in the risk groups. Cooperation with the patient's family or caregivers seems crucial to provide proper care and improve patient compliance.

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Address for correspondence:
Małgorzata Koziarska-Rościszewska, MD, PhD
Klinika Nefrologii, Nadciśnienia Tętniczego i Medycyny Rodzinnej
Uniwersytet Medyczny w Łodzi
Szpital im. WAM
ul. Żeromskiego 113
90-549 Łódź
Polska
Tel.: +48 502 590-890
E-mail: malgorzata.koziarska-rosciszewska@umed.lodz.pl