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# CHRISTIAN SPIRITUALITY AND PREVALENCE OF MEMORY DECLINE
# A PROSPECTIVE STUDY IN A ROMANIAN MONASTERY

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## Abstract

The paper is the first prospective 5-years study conducted in a Romanian monastery in order to examine a longitudinal relationship between Orthodox Christian spirituality and the prevalence of cognitive impairment in the elderly. We studied a group of 103 nuns, aged 65-90 years that were evaluated through medical history taking, physical examination, laboratory tests. MMSE (mini mental state examination), clock drawing test, verbal fluency, SIB (Severe impairment battery) were used for the cognitive evaluation; ADL (activities of daily living), BADL (Basic ADL), IADL (Instrumental ADL) were used to measure the functional capacities. The severity of global deterioration was evaluated with Reisberg GDS (Global Deterioration Scale) with a cut-off for dementia at stage 4. CT-scan was additionally performed. Diagnostic was made according to the DSM IV criteria (1994). The results were compared with those from a group of 260 lay women that lived near the monastery. All statistical procedures were performed using EpiInfo version 3.5.3.

*Keywords:* memory disorders age-related, dementia, Alzheimer, elderly, Orthodox spirituality

## 1. Introduction

Spirituality and religiousness are closely related to health and quality of life. *Spirituality* appears to mean different things to different people. For many, spirituality is related to an individual's attempt to find meaning in life, which can include a sense of involvement with the transcendent outside institutional

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boundaries [1]. *Religion* is related to religious belief and behaviour, including spirituality transmitted by a religious community or tradition. Most of the research in these areas has been based on measurements of religiosity rather than spirituality [2]. Nevertheless, spirituality could reveal its value in helping people live together in better health, greater satisfaction and meaning in life [3] and achieving healthy aging.

A 2001 publication [4] identified over 1200 studies that had examined the relationship between religious belief or behaviour and health, and it concluded that most studies had found a positive association between religious belief and behavior, on one side, and physical and mental health, on the other [2, 5, 6].

There is mounting scientific evidence of a positive correlation between religious involvement and multiple indicators of health. Health practices and social ties are important pathways by which religion can affect health. Other potential pathways include the provision of systems of meaning and feelings of strength to cope with stress and adversity [2]. Strong evidence exists that a link between religious attendance and mortality is present, with higher levels of attendance being predictive of a pronounced, consistent and often graded reduction in mortality risk [2].

Several articles in the medical literature report positive connections between spirituality and diverse conditions such as Chronic Obstructive Pulmonary disease (COPD), cancer, cirrhosis, rheumatoid arthritis, leukaemia, AIDS, depression, adolescent risk behaviours, anxiety and pain. Other studies demonstrate a correlation between increasing levels of spirituality and decreasing levels of medical utilization, healthcare costs and death.

Despite the fact that there are numerous studies that analyze the relationship between spiritual practices (like meditation, contemplation and prayer) and health, there are just a few studies that look at the correlation between Judeo-Christian religious practices and health. In those studies that reference the Judeo-Christian religious practices, research showed that spirituality/religiosity influences blood pressure, lipid profiles and immune functions [7]. Religious involvement in these various studies was measured in terms of church attendance [8-13] or reported religious commitment [9, 11, 14, 15]. These studies compared nuns from a secluded order in six convents in Umbria (Italy) and a group of lay Italian women who volunteered for the study [16].

It can be concluded that healthy aging is vital for preventing Alzheimer Disease [17].

Memory impairment or memory loss may be defined as a lack of a person's ability to continuously recollect information to such an extent that it impairs the daily activities of the person. Progressive and chronic type of memory impairment related to aging causes permanent damage to the brain, is difficult to be reversed [18] and is considered a risk factor for age related dementia and Alzheimer's disease [19].

In these conditions, in reference to the role of the Orthodox spirituality, the present study aims to clarify the relationship between Orthodox spirituality and the onset of memory decline in the old age (i.e. over 65) by analyzing the emergence of cognitive decline and dementia in nuns living a monastic life starting from the age of 13 to 17.

## 2. Methods

### *2.1. Participants*

The data for the present study was collected from the personal files of the participants registered in the general practice (concerning the demographic characteristics). Additional source was the Romanian National Program for Evaluation of Health State (PNESSP) through which supplementary tests were performed (blood tests, interviews). A group of 363 subjects, all female, age 65 or older, (criteria for inclusion) agreed to undergo supplementary neuropsychological examination: 103 of the subjects were nuns from the same monastery in the Moldova region of Romania and 260 subjects were lay Romanian women living in the villages near the monastery. The participants were divided in groups in accordance to their age.

The characteristics of the women in group A and their environment were the following:

1) Nuns, following a monastic life more than 30 years, up to 69 years; with an average of 55.41±8.162 years; (monastic life is characterized by following: -physical activity with a duration and an intensity variation with age, but averages between 6-8 hours per day (like: painting, sculpture, embroidery, sewing, knitting, sacristan, nursing, accounting activities, gardening, work in the kitchen, taking care of animals (cattle, pigs, poultry), housekeeping, guest serving and monastery guiding); -a diet rich in fruits and vegetables, the majority of the food grown locally within the monastery, mostly organic (limited pesticides), no meat except fish, and half of the year only vegan food; limited alcohol intake (none or just wine in average less then one glass/week) and of course no smoking; - religious activities including prayer and lecture of holy books for 6-8 hours and rest time of about 6-8 hours;
2) The age of joining the monastery mostly between 13 and 17 years of age;
3) 57 out of 103 nuns were imprisoned between 1956 and 1964 for political reasons, for duration between 1 to 6 years, the rest of 46 nuns were under house arrest within the same period. For 35 years, after the monastery was closed, up to the reopening of the monastery in 1990, the nuns were under close surveillance by Romanian communist security. They were often interrogated and they had to report their daily activities.

The mean age of monastic life entry was 21.36±7.051 years, starting with 11 years. The average education level was 6$^{th}$ grade. The average age at the beginning of the study was 76.68±4.83 years.

The control group B included lay women living in the village near the monastery alone or with their family. They were usually retired and now taking care of their grandchildren. Before they retired they were involved with farm work, including gardening and raising animals. None of them was imprisoned during the past regime. The average education level in the controls was lower (4 to 5$^{th}$ grade), as well as the average age at the beginning of the study (74.59±7.03 years).

All the subjects underwent a complete baseline medical examination in 2006 and they were followed-up for the next 5 years (until 2011).

### *2.2. Measurements of cognition and functionality*

Since the diagnosis of dementia requires impairments in multiple cognitive domains [18], a neuropsychological test battery was assembled for the subjects that included neuropsychological tests for cognitive evaluation, functional scales for the functional competence; Computed Tomography (CT-scan) was additionally performed. Other possible causes of cognitive impairment and dementia were excluded. Finally the severity of global deterioration was evaluated with Reisberg GDS (Global Deterioration Scale) [20] with a cut-off for dementia at stage 4 (see Table 1).

For the evaluation of memory impairment there were used: MMSE (mini mental state examination) of Folstein [21], clock drawing test of Brodaty [22] and verbal fluency; SIB test (Severe impairment battery) was used in the case when MMSE was <9. All the participants who completed the MMSE test at baseline were included in the research. After 5 years of follow up, two of the nuns and three of the women in the village lost their hearing capacity and since they couldn't answer all the questions any longer, they needed to be excluded from the study. Monitoring was made at specific time intervals, with follow-ups at 1 month, 3 months, 6 months and 1 year until the end of the study, 2011.

In group A the lowest MMSE score was 17 points at baseline and 15 points at the end. There were no subjects with severe impairment in the monastery in this group (i.e., <9). The mean MMSE was 24.51±3.16 in compare to 22.57±4.59 in the control group and at the clock test 8.76±1.41 in compare to 7.53±1.5.

The verbal fluency test was based on letter (R) and semantic (animal) category. The test was performed to distinguish between early Alzheimer's disease and no dementia.

The functional capacity, expressing the allowance of independent living of older people, is regarded as a critical component of ability and was evaluated through its two major components: basic activities of daily living (BADL), and activities of higher-level competence [23]. BADL includes activities such as walking, eating, bathing, dressing, toileting, and continence. Higher-level functional capacity above BADL corresponds to the 5$^{th}$, 6$^{th}$, and 7$^{th}$ sublevels of Lawton's hierarchical model of behavioural competence [24, 25]. For exploring of more complicated activities on a higher level of functional capacity, 8

instrumental activities on IADL (Instrumental ADL) Scale such as: using the telephone, managing money/shopping, preparing a tea/meals, taking care of his own home, doing laundry, using vehicles/visiting the home of friends, taking medications, were used. ADL (activities of daily living) Scale includes 17 items related to walking, dressing, washing, toileting, continence, personal care, preparing meals, using objects, feeding.

**Table 1.** Global deterioration scale (GDS), adapted by Dr. Doug Drummond from [20].

| Stage | Deficits in cognition and function | Usual care setting |
|---|---|---|
| 1 | ***Subjectively and objectively normal*** | Independent |
| 2 | ***Subjective complaints of mild memory loss***.<br>Objectively normal on testing.<br>No functional deficit | Independent |
| 3 | ***Mild Cognitive Impairment (MCI)***<br>Earliest clear-cut deficits.<br>Functionally normal but co-workers may be aware of declining work performance.<br>Objective deficits on testing.<br>Denial may appear. | Independent |
| 4 | ***Early dementia***<br>Clear-cut deficits on careful clinical interview. Difficulty performing complex tasks, e.g. handling finances, travelling.<br>Denial is common. Withdrawal from challenging situations. | Might live independently – perhaps with assistance from family or caregivers. |
| 5 | ***Moderate dementia***<br>Can no longer survive without some assistance.<br>Unable to recall major relevant aspects of their current lives, e.g. an address or telephone number of many years, names of grandchildren, etc. Some disorientation to date, day of week, season, or to place. They require no assistance with toileting, eating, or dressing but may need help choosing appropriate clothing. | At home with live-in family member.<br>In seniors' residence with home support. Possibly in facility care, especially if behavioural problems or comorbid physical disabilities. |
| 6 | ***Moderately severe dementia***<br>May occasionally forget name of spouse.<br>Largely unaware of recent experiences and events in their lives.<br>Will require assistance with basic ADLs. May be incontinent of urine.<br>Behavioural and psychological symptoms of dementia (BPSD) are common, e.g. delusions, repetitive behaviours, agitation. | Most often in Complex Care facility. |
| 7 | ***Severe dementia***<br>Verbal abilities will be lost over the course of this stage.<br>Incontinent. Needs assistance with feeding.<br>Lose ability to walk. | Complex Care |

Reisberg GDS Scale was used to evaluate the stage of the impairment. Only participants that were functional dependent and indicated cognitive impairment on the neuropsychological tests were considered possible or probable to be diagnosed according to the criteria for neurodegenerative disorders. Denial was present in 19.42% (20 participants) in group A and only 15% (39 women) in the control group B. The participants were included in stage 3 Reisberg if they had manifestations in more than one of the following [20]:

a. participant may have gotten lost when travelling to an unfamiliar location;
b. co-workers became aware of participant's relatively poor performance;
c. word and/or name finding deficit become evident to intimates;
d. participant may read a passage or book and retain relatively little material;
e. participant may demonstrate decreased facility remembering names upon introduction to new people;
f. participant may have lost or misplaced an object of value;
g. concentration deficit may be evident on clinical testing.

At level of 3 Reisberg, denial was present in 34.29% (12 participants) in group A and 24.77% (25 participants) in the controls. They were included in stage 4 if their deficit manifested in the following areas:

a. decreased knowledge of current and recent events;
b. may exhibit some deficit in memory of one's personal history;
c. concentration deficit elicited on serial subtractions;
d. decreased ability to travel.

Denial was present in 80% (8 participants) in group A and 69.44% (25 participants) in the controls.

In the group A, at baseline, at a mean age of 76.68±4.83 neither of the participants did require assistance for the daily living due exclusively to memory impairment and $\geq$ stage 5 Reisberg. In the control group, with a mean age of 74.59±7.03 there was one person with a severe memory impairment corresponding to Reisberg 7.

Participants were included in stage 5 Reisberg, if they had deficiencies in the following areas:

a. decreased ability in completing daily activities due to the memory decline only (dressing, bathing);
b memory loss in aspects of the current life: not remembering their own address.

Participants were included in stage 6, if there was present:

a. more decreased autonomy in daily activity, including incontinence, due to the memory decline;
b. forgetting names of close family members;
c. little memory of recent events;
d. only some details of earlier life could have been remembered;
e. declined ability of speaking;
f. participant might have had delusions (believing something to be true that is not) and compulsions (repeating a simple behaviour as cleaning).

There was only one participant in group B included in stage 7, with almost no ability to speak or communicate or walk. The woman was totally dependent on help care for her daily activities.

The clinical judgment was made on the basis of Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM IV) [25], The International Statistical Classification of Mental and Behavioural Disorders (ICD - 10) [26] and National Institute of Neurological and Communicative Diseases and Stroke-Alzheimer's Disease and Related Disorders Association criteria (NINCDS-ADRDA) [18].

### *2.3. Other measurements*

Baseline data like age, age group, education level, history of other co-morbidities (Diabetes, Hypertension, Head trauma, Atrial Fibrillation, Myocardial Infarction, history of Stroke, Parkinson disease, Depression, Dyslipidemia), history of detention, dietary habits, hearing problems were used to describe the characteristics of the study participants.

Additionally we used: the values of routine *blood tests* (CBC-cell blood count, iron level, glucose, lipid panel, liver and renal function - cretonne, BUN, uric acid, SGOT and SGPT), *electrocardiography* in resting state and *CT scans.* The medical literature on this subject recommends that a patient with memory impairment should undertake a CT scan or MRI at least once during the evolution of the sickness [27]. The tests showed the presence of the additional pathology that is showed below. At the beginning of the study, each participant completed a questionnaire for depression. The presence of a major depressive or manic episode was investigated.

### *2.4. Procedure*

The participants were informed about the study's goal and protocol and their voluntary consent was recorded. In case of a frail participant who couldn't express her decision, the nearest relative was contacted and after receiving the appropriate information he/she consented to the study.

### *2.5. Statistical analysis*

The study was conducted as a prevalence one. All statistical procedures were performed using EpiInfo (TM) software (CDC Atlanta) version 3.5.3. The results were given as mean±SD for numeric variables; for qualitative variables total frequency and percentages were used. Assessment of the differences between groups was performed using Student t-test for continuous variables and $\chi^2$ test for categorical variables; for less than 5 subjects in range, Fisher exact test was used, in addition with Yates correction; statistical significance was defined as $p<0.05$, for a confidence interval (CI) of 95%.

Both unadjusted Odds ratio (OR) and multivariable adjustment (MOR) were calculated; for control of confounding variables as age, level of education, co-morbidities multivariate logistic regression was used.

The prevalence rate of memory disorder was calculated as the proportion of participants in the group having the disease at baseline. The age-adjusted prevalence rate for the memory disorder was calculated by dividing the age specific participants having the disorder by the total participant number in the specified age grouping.

## 3. Results

Persons in group A had a mean age of 76±4.83, and a mean education level of $6^{th}$ classes, both higher than in group B, where the mean age was 74.59±7.03, and the education level was mean $5^{th}$ level.

The scores on cognitive scales were better in global group A ($p = 0.000$) for MMSE and for clock test. Functional competence was lower in group B than in group A, but statistical significant only for IADL ($p = 0.006$). Hypertension, Depression and Dyslipidemia were statistical significantly ($p<0.005$) in group A than in B. Table 2 shows the characteristics of participants at baseline in the whole groups A and B.

The cognitive decline specific prevalence rate for age groups for DAT and MCI respectively, was calculated and is shown in Table 3. The mean age was significant higher in group A than in group B only in non demented participants ($p = 0.001$) and also in the whole group A ($p = 0.006$).

The global DAT age prevalence rate was lower in group A (9.71%) than in control group B (18.46%); the differences were statistically significant at global level ($p = 0.04$, OR 0.47, CI: 0.23-0.97) and without significance in the age groups.

The nuns with DAT were diagnosed with early stage of DAT and $\geq$ Stage 4 Reisberg, while they had a moderate cognitive impairment (MMSE = 17-20) and associated a light functional deficit, consisting in: decreased knowledge of current and recent events (for ex. recent religious celebrations), difficulties in remembering their own history (not remembering quite good the history of their own monastery or when they joined the monastery), decreased ability to travel (visiting other holy places outside the monastery). For these, the orientation in time and place was sometimes good and they could recognize the other nuns. Denial appeared in 80% (8 participants). For early stage of DAT the highest proportion (50%) was recorded in group ‘over 90 years’; the lowest rate (4%) in group ‘70-74 years’.

The frequency of MCI was lower in group A than group B without statistical significance differences. ($p>0.05$, OR = 0.81, 95% CI: 0.5-1.09). There were diagnosed with MCI, no dementia, **35 (33.98%)** nuns who had a light cognitive impairment (MMSE = 21-24); their functional deficit was observed and reported by the neighbour nuns who worked or lived together with these; some of them (34.29% - 12 participants) manifested denial.

**Table 2.** Characteristics of participants in the two groups, *p*-value and Odds ratio.

| Characteristics of participants at baseline | Group A (n = 103) | Group B (n = 260) | $p^a$ | OR (95% CI) |
|---|---|---|---|---|
| Age (years), mean± SD | 76.68±4.83 | 74.59±7.03 | 0.006 | |
| Education (years), mean ± SD | 6.03±1.97 | 5.09±1.4 | Ns | |
| History of detention, *n* (%) | 57(55.33) | 0(0) | | |
| MMSE[b], mean ± SD | 24.51±3.16 | 22.57±4.59 | 0.000 | |
| clock test, mean ±SD | 8.76±1.41 | 7.53±1.50 | 0.000 | |
| ADL[c], mean ± SD | 18.62±3.18 | 19.43±4.66 | Ns | |
| BADL[d],mean ± SD | 5.69±0.78 | 5.62±0.77 | Ns | |
| IADL[e], mean± SD | 7.58±0.91 | 7.12±1.63 | 0.006 | |
| GDS[f], mean ± SD | 2.53±0.67 | 2.85±0.89 | 0.001 | |
| Yesavage depression score, mean ± SD | 5.94±2.8 | 8.68±5.33 | 0.003 | |
| Diabetes (presence), *n* (%) | 17 (16.5) | 29 (11.15) | Ns | 1.5(0.82-3) |
| Hypertension (presence), *n* (%) | 58 (56.31) | 205 (78.84) | 0.0003 | 0.34(0.21-0.56) |
| Head trauma (presence), *n* (%) | 4 (3.88) | 5 (1.92) | Ns | 2.06(0.54-7.83) |
| Atrial Fibrillation (presence), *n* (%) | 12 (11.65) | 20 (7.69) | Ns | 1.58(0.74-3.36) |
| Myocardial Infarction (presence), *n* (%) | 1 (0.97) | 17 (6.53) | Ns | 0.14(0.018-1.06) |
| Stroke (presence), *n* (%) | 6 (5.82) | 31 (11.92) | Ns | 0.45(0.18-1.1) |
| Parkinson disease (presence), *n* (%) | 2 (1.94) | 10 (3.84) | Ns | 0.49(0.1-2.2 |
| Depression (presence), *n* (%) | 16 (15.53) | 85 (32.69) | 0.0025 | 0.37 (0.2-0.68) |
| Dyslipidemia (presence), *n* (%) | 44 (42.71) | 185 (71.15) | <0.0001 | 0.3 (0.18-0.48) |

[a] $\chi 2$ tests for categorical variables and *t*-tests for continuous variables showed differences in baseline characteristics in the groups. $p<0.05$ showed the statistical significative differences. Ns = $p>0.05$.

[b] MMSE (Folstein Mini Mental State Examination), recorded information related to: orientation, registration of information, attention and calculation, reproduction of the previously learned information and language.

[c] ADL (Activities of daily living) included 17 more complex activities related to: walking, dressing, washing, toileting, continence, personal care, preparing meals, using objects, feeding.

[d] BADL (Basic ADL) included 6 basic activities as: walking, eating, bathing, dressing, toileting, continence.

[e] IADL (Instrumental ADL) included 8 instrumental activities that require a higher level of functional capacity, such as: using the telephone, managing money/shopping, preparing a tea/meals, taking care of his own home, doing laundry, using vehicles/visiting the home of friends, taking medications.

[f] GDS (Global deterioration scale Reisberg) assessed the stage of the impairment.

The maximum score on MMSE is 30, on Clock drawing test scale 10 and on Yesavage 30.

**Table 3.** The age specific prevalence for DAT and MCI in the two groups.

| Age groups (years) | Group A (monastery) *n* = 103 | | | Group B (village) *n* = 260 | | |
|---|---|---|---|---|---|---|
| | Subjects n(%) | DAT[a] *n* = 10(%) | MCI *n* = 35(%) | Subjects n(%) | DAT *n* = 48(%) | MCI *n* = 109(%) |
| 65-69 | 7 (6.8) | 0 (0) | 1 (2.86) | 76 (29.23) | 9 (11.84) | 27 (35.53) |
| 70-74 | 25 (24.27) | 1 (4) | 6 (17.14) | 70 (26.9) | 9 (12.85) | 28 (40.0) |
| 75-79 | 43 (41.75) | 5 (11.62) | 15 (42.86) | 51 (19.62) | 9 (17.65) | 20 (39.22) |
| 80-84 | 25 (24.27) | 3 (12) | 12 (34.29) | 34 (13.08) | 9 (26.47) | 18 (52.94) |
| 85-89 | 1 (0.97) | 0 (0) | 1 (2.86) | 24 (9.23) | 9 (37.5) | 15 (62.5) |
| 90> | 2 (1.94) | 1 (50) | 0 (0) | 5 (1.92) | 3 (60) | 1 (33.33) |
| Total | 103 (100) | **10 (9.7)*** | 35 (33.98) | 260 (100) | **48 (18.46)** | 109 (41.92) |

**p*=0.0497 (<0.05), RR 0.5259, 95%CI: 0.2768 to 0.9993, Odds ratio: 0.4749.
[a] Diagnostic for DAT and MCI was made according to the DSM IV criteria.
RR (risk ratio), CI (confidence interval), DAT (dementia of Alzheimer type), MCI (mild cognitive impairment), n (number of persons).

56 (54.37%) had only a mild memory loss (MMSE = 25-30) with no functional deficit (Stage 2 on Reisberg Scale) and were considered as having benign forgetfulness or being normal. Participants included in this stage were aged between 65 and 84 years.

In group B, the results showed a prevalence rate of MCI of 41.92% (109 women). 103 persons (39.62%) were registered as having benign forgetfulness or as normal. Table 4 summarizes the age specific prevalence rates for different age groups.

The baseline characteristics of the persons diagnosed with DAT compared to those with no DAT, in both groups (i.e., age, education level, history of detention, present co-morbidities (Diabetes, Hypertension, Head trauma, Atrial Fibrillation, Myocardial Infarction, history of Stroke, Parkinson disease, Depression, Dyslipidemia) and cognitive level (MMSE, clock test), functional capacity dependence (BADL, ADL, IADL competence), global deterioration scale level; in demented and non-demented and in both two groups, are shown in Table 4.

57 (55.34%) in group A had a history of detention. No significant correlation with the diagnosis of DAT was shown by detention. Only head trauma, acquired by group A mostly during prissoning showed positive statistical correlation with the presence of DAT ($p$ = 0.018) Anyway, this was also the case with the control group B with no history of detention, but with statistical correlation with head trauma ($p$ = 0.005). Referring to other co-morbidities (with the exception of Head trauma, as it is shown above), association with Depression in subjects diagnosed with DAT showed positive statistic correlation in both groups A and B. ($p$ = 0.051 in group A 95% CI: 1.23-25.6 and $p$ = 0.000 for group B 95% CI: 4.7-18.9). Only in group A Dyslipidemia was correlated with the presence of DAT. In group B stroke was more likely to be present in participants with DAT ($p$ = 0.014 95% CI: 1.17-6.9).

**Table 4.** Characteristics of the participants according to the presence of DAT (dementia of Alzheimer type) at baseline.

| | **Group A** | | **Group B** | |
|---|---|---|---|---|
| | **(monastery) *n* = 103** | | **(village) *n* = 260** | |
| | **DAT[a] *n* = 10[b]** | **no DAT *n* = 93** | **DAT *n* = 48** | **no DAT *n* = 212** |
| Age (years), mean ± SD | 78.9±5.32 | 76.44±4.75 | 77.6±8.03** | 73.9±6.61 |
| Gender (women), *n* (%) | 10 (9.71) | 93 (90.29) | 48 (18.46) | 212 (81.54) |
| Education (years), mean ± SD | 6.1±1.45 | 6.03±2.03 | 4.2±2.3 | 5.3±1.2 |
| History of detention, *n* (%) | 8 (80.0) | 49 (52.7) | 0 (0) | 0 (0) |
| MMSE, mean ± SD | 18.4±0.85*** | 25.22±2.56 | 14.94±2.78*** | 24.3±2.8 |
| clock test, mean ± SD | 6.1±1.73*** | 9.04±1.03 | 5.29±1.24*** | 8.03±1.01 |
| BADL[c], mean ± SD | 5.0±0.82** | 5.78±0.72 | 4.81±1.09*** | 5.86±0.43 |
| ADL[d], mean ± SD | 19.8±4.57* | 17.69±2.76 | 25.88±5.76*** | 18.2±3.23 |
| IADL[e], mean ± SD | 6.2±1.69*** | 7.82±0.55 | 4.21±1.47*** | 7.77±0.66 |
| GDS[f], mean ± SD | 4.0±0*** | 2.38±0.49 | 4.0±0*** | 2.51±0.50 |
| Diabetes (presence), *n* (%) | 1 (10) | 16 (17.2) | 8(16.7) | 21(9.9) |
| Hypertension (presence), *n* (%) | 3 (30) | 55 (59.14) | 33(68.8) | 172(81.1) |
| Head trauma (presence), *n* (%) | 2 (20)* | 2 (2.15) | 4(8.3)** | 1(0.5) |
| Atrial Fibrillation (presence), *n* (%) | 1 (10) | 11 (11.83) | 2(4.2) | 18(8.5) |
| Myocardial Infarction (presence), *n* (%) | 0 (0) | 1 (1.08) | 3(6.3) | 14(6.6) |
| Stroke (presence), *n* (%) | 1 (10) | 5 (5.38) | 11(22.9)* | 20(9.4) |
| Parkinson disease (presence), *n* (%) | 0 (0) | 2 (2.15) | 1(2.1) | 9(4.2) |
| Depression (presence), *n* (%) | 5 (50)*** | 9 (9.67) | 35(72.9)*** | 50(23.6) |
| Dyslipidemia (presence), *n* (%) | 1 (10)* | 43 (46.24) | 36(75) | 149(70.3) |

[a] Diagnostic for Dementia of Alzheimer Type (DAT) and no DAT was made according to the DSM IV criteria.

[b] $\chi 2$ tests for categorical variables and *t*-tests for continuous variables showed differences in baseline characteristics by DAT/no DAT in the two studied groups at $*p<0.05$, $**p<0.01$, and $***p<0.001$.

[c] BADL (basic ADL) included 6 basic activities as: walking, eating, bathing, dressing, toileting, continence.

[d] ADL (activities of daily living) included 17 more complex activities related to: walking, dressing, washing, toileting, continence, personal care, preparing meals, using objects, feeding.

[e] IADL (instrumental ADL) included 8 instrumental activities that require a higher level of functional capacity, such as: using the telephone, managing money/shopping, preparing a tea/meals, taking care of his own home, doing laundry, using vehicles/visiting the home of friends, taking medications.

[f] GDS (global deterioration scale Reisberg) assessed the stage of the impairment.

MMSE, Folstein Mini Mental State Examination test.

The maximum score on MMSE is 30 and on Clock drawing test scale 10.

**Table 5.** MMSE variation by age groups and time for the monastery group (Mean and Standard Deviation).

| Age Groups (years) | | MMSE baseline | MMSE 1 month | MMSE 3 months | MMSE 6 months | MMSE 12 months | MMSE 5 years |
|---|---|---|---|---|---|---|---|
| 65-69 | Mean | 26.71 | 26.71 | 26.71 | 26.71 | 26.71 | - |
| | Std. Deviation | 2.870 | 2.870 | 2.870 | 2.870 | 2.870 | - |
| | Minimum | 21 | 21 | 21 | 21 | 21 | - |
| | Maximum | 29 | 29 | 29 | 29 | 29 | - |
| 70-74 | Mean | 25.48 | 25.52 | 25.56 | 25.88 | 25.32 | 26.43 |
| | Std. Deviation | 2.648 | 2.551 | 2.468 | 2.369 | 2.940 | 2.070 |
| | Minimum | 19 | 20 | 20 | 20 | 16 | 22 |
| | Maximum | 29 | 29 | 29 | 29 | 29 | 28 |
| 75-79 | Mean | 24.23 | 24.49 | 24.63 | 24.37 | 24.07 | 23.94 |
| | Std. Deviation | 3.213 | 2.923 | 2.984 | 3.016 | 3.432 | 3.298 |
| | Minimum | 17 | 18 | 18 | 17 | 15 | 18 |
| | Maximum | 29 | 29 | 29 | 29 | 29 | 29 |
| 80-84 | Mean | 23.70 | 23.65 | 23.57 | 23.65 | 22.61 | 23.45 |
| | Std. Deviation | 3.225 | 3.284 | 3.409 | 3.284 | 4.120 | 3.465 |
| | Minimum | 18 | 18 | 18 | 18 | 16 | 16 |
| | Maximum | 29 | 29 | 29 | 29 | 30 | 30 |
| 85-89 | Mean | 22.00 | 22.00 | 22.00 | 22.00 | 16.00 | 20.64 |
| | Std. Deviation | - | - | - | - | - | 4.781 |
| | Minimum | | | | | | 11 |
| | Maximum | | | | | | 28 |
| >90 | Mean | 18.00 | 18.00 | 18.00 | 18.00 | 16.00 | - |
| | *p*-value[a] | 0.027 | 0.017 | 0.017 | 0.007 | 0.001 | 0.006 |
| Total | Mean | 24.51 | 24.62 | 24.67 | 24.66 | 24.07 | 23.32 |
| | Std. Deviation | 3.186 | 3.058 | 3.104 | 3.095 | 3.750 | 3.878 |
| | Minimum | 17 | 18 | 18 | 17 | 15 | 11 |
| | Maximum | 29 | 29 | 29 | 29 | 30 | 30 |

[a]$\chi 2$ tests was used to search statistical significance at $p<0.05$.
MMSE, Folstein Mini Mental State Examination test.
The maximum score on MMSE is 30.

Women diagnosed with DAT were more likely to have head trauma and depression as co-morbidities, were older, had a lower education level and a history of detention was present in their past.

Concerning the severity of the memory impairment, the average values of the MMSE test showed the presence of a moderate impairment (mean MMSE in group A was 24).

Table 5 shows the evolution of MMSE test during 5 years of follow-up in group A, with evaluations at 1 month, 3 months, 6 months and 12 months and 5 years. The MMSE values show generally a moderate impairment during the 5year follow-up study (total average MMSE 24 with extreme values 17 and 29 at baseline and average 23 after 5 years of follow-up with extreme values of 11 and 30). The MMSE values decrease with age during the follow-up, mostly in the higher age groups and starting with 70 years of age. As all MMSE tests that

were made show, under the age of 70 years, MMSE values were over 20 points in group A.

## 4. Discussion

The present case-control study examined the longitudinal relationship between prevalence of cognitive impairment and dementia in the elderly and life in the monastery (monastic life) of a group of females aged 65 or older.

The objective of this study was to demonstrate the connection between spirituality, specifically Christian religious practices, and healthy aging and the onset of dementia.

Our findings indicated that prevalence of cognitive impairment was higher in lay women compared to the nuns, even after adjustment of potential confounders (including age, education level, chronic disease and dietary habits) strongly associated with memory decline: Multivariable Odds ratio (MOR) 3.093, 95% CI: 1.329-7.197. The study suggests that Christian religious practices and monastic life are a protective factor for developing memory decline and dementia at an old age.

Our findings are similar to the results of previous studies, showing a positive relationship between spirituality/religiosity and health (blood pressure, lipid profiles and immune functions) [7]. Our findings are similar to the studies showing the influence of spirituality on healthy aging and hence on the onset of dementia [28-30]. Dr. Snowdon [28, 30], who performed an autopsy on the brains of American members of School Sisters of Notre Dame, concluded that the well preserved cognitive and physical function in elderly can be possible, despite the presence of Alzheimer lesions in the brain. The reason for the lack of expression of the neurological lesions needs to be further investigated and the active lifestyle of the nuns could be a cause, states Dr. Snowdon.

Other studies report similar results regarding the association of depression and cognitive decline [31].The presence of co-morbidities, including depression, can influence the severity and progression of memory disorders.

A limitation of our study consists in the fact that it does not take into account all of the differences in lifestyle between the two study groups, differences which could also influence memory decline and could play an important role in the etiology of memory deficiencies. The lifestyle of the subjects in the community group had many dissimilarities with the lifestyle of the lay subjects, with the two groups having, for example, different stress factors (a history of imprisonment for the nuns compared to family/relationship stresses in the lay group), or a different diet (the nuns having a mostly organic, high in vegetable, diet with frequent fasting).

## 5. Conclusions

The present study demonstrates that a relationship exists between spirituality in a Christian Orthodox monastery and the decline of the risk of

Alzheimer disease in old age. It is the first time that geriatric and gerontologic aspects are studied in a Romanian monastery. Our study is among a few which highlight the relationship between Orthodox religiousness, specifically in a monastic setting, and memory decline.

Further exploration to confirm the causal relationship between Orthodox spirituality and the onset of Alzheimer's can highlight the importance of cultivating spiritual values in life, and it may also facilitate the development of efficient strategies to prevent the onset of memory diseases in older adults.

Our study suggests the importance of research on the relationships between religion, spirituality and health and the significance of encouraging a dialogue between researches, clinicians, theologians and clergy for the benefit of Science, Theology and community.

## References

[1] R. D'Souza and K. George, Australas Psychiatry, **14** (2006) 408-412.
[2] D.R. Williams and M.J. Sternthal, Med. J. Australia, **186** (2007) 49.
[3] A. Karner-Huțuleac, Eur. J. Sci. Theol., **8(3)** (2012) 135.
[4] H.G. Koenig, M.E. McCullough and D.B. Larson, *Handbook of religion and health*, Oxford University Press, New York, 2001, 11.
[5] H.G. Peach, Med. J. Australia **178** (2003) 86-88.
[6] H.G. Koenig, Med. J. Australia, **178** (2003) 51-52.
[7] T.E. Seeman, L.F. Dubin and M. Seeman, American Psychologist, **58** (2003) 60-61.
[8] T.W. Graham, B.H. Kaplan, J.C. Cornoni-Huntley, S.A.Q. James, C. Becker, C.G. Hames and S. Heyden, Journal of Behavioral Medicine, **1** (1978) 37–43.
[9] K.A. Hixson, H.W. Gruchow and D.W. Morgan, Prev. Med., **27** (1998) 545–552.
[10] H.G. Koenig, L.K. George, J.C. Hays, D.B. Larson, H.J. Cohen and D.G. Blazer, Int. J. Psychiat. Med., **28** (1998) 189–213.
[11] D.B. Larson, H.G. Koenig, B.H. Kaplan, R.S. Greenberg, E. Logue and H.A. Tyroler, Journal of Religion and Health, **28** (1989) 265–278.
[12] I.L. Livingston, D.M. Levine and R.D. Moore, Ethnicity and Disease, **1** (1991) 135–149.
[13] N.A. Scotch, Am. J. Public Health, **8** (1963) 1205–1213.
[14] P.R. Steffen, A.L. Hinderliter, J.A. Blumenthal and A. Sherwood, Psychosom. Med., **63** (2001) 523–530.
[15] A. Walsh, Behav. Med., **24** (1998) 122–130.
[16] M. Timio, G. Lippi, S. Venanzi, S. Gentili, G. Quintaliani, C. Verdura, C. Monarca, P. Saronio and F. Timio, Blood Pressure, **6** (1997) 81–87.
[17] S.L. Tyas, D.A. Snowdon, M.F. Desrosiers, K.P. Riley and W.R. Markesbery, Age Ageing, **36** (2007) 650.
[18] G. McKhann, D. Drachman, M. Folstein, R. Katzman, D. Price and E. Stadian, Neurology, **34** (1984) 939-44.
[19] L.K. Bowker, J.D. Price and S.C. Smith, *Oxford Handbook of Geriatric Medicine*, Oxford University Press, New York, 2006, 220.
[20] B. Reisberg, S.H. Ferris, M.J. Leon and T. Crook, Am. J. Psychiat., **139** (1982) 1136.
[21] M.F. Folstein, S.E. Folstein and P.R. McHugh, J. Psychiat. Res., **12** (1975) 189.
[22] H. Brodaty and C.M. Moore, Int. J. Geriatr. Psych., **12** (1997) 619.

[23] H. Iwasa, Y. Gondo, Y. Yoshida, J. Kwon, H. Inagaki, C. Kawaai, Y. Masui, H. Kim, H. Yoshida and T. Suzuki, Arch. Gerontol. Geriat., **47** (2008) 139.
[24] M.P. Lawton, *Assessing the competence of older people*, in *Research, Planning and Action for Elderly: the Power and Potential of Social Science*, D.P. Kent, R. Kastenbaum & S. Sherwood (eds.), Behavioral Publications, New York, 1972, 122.
[25] ***, *Diagnostic and Statistical Manual of Mental Disorders,* 4th edn., American Psychiatric Association, Washington, 1994, 21-25.
[26] ***, *The International Statistical Classification of Mental and Behavioral Disorders: diagnostic criteria for research*, World Health Organisation, Geneva, 1993, 46-47.
[27] D.S. Knopman S.T. De Kosky, J.L. Cummings, H. Chui, J. Corey-Bloom, N. Relkin, G.W. Small, B. Miller and J.C. Stevens, Neurology, **56** (2001) 1143.
[28] D.A. Snowdon, Ann. Intern. Med., **139** (2003) 450.
[29] M. Tsolaki, Ch. Pantazi, F. Stiliu, M. Aminta, P. Diudi, S. Karasoulas, A. Kazis and D. Pollen, Brain Aging Journal, **3** (2003) 13.
[30] S.L. Tyas, D.A. Snowdon, M.F. Desrosiers, K.P. Riley and W.R. Markesbery, Age and Ageing, **36** (2007) 650.
[31] M. Ganguli, Y. Du, H.H. Dodge, G.G. Ratcliff and C.C. Chang, Arch. Gen. Psychiat., **63** (2006) 153.