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The Prevalence of Cognitive Impairment in Famagusta-North Cyprus Residents Over 65 Years of Age

Burcu Elif Yüce[1], Emre Can Özçelik[1], Fadilah Oleree Saliu-Ahmed[1], İpek Fatoş Zorba[1], Ongun Alanlı[1], Rıfat İnce[1], Salih Canlar[1], Amber Eker[2]

[1]Eastern Mediterranean University - Marmara University International Joint Medicine Program, Famagusta, North Cyprus
[2]Department of Neurology, Eastern Mediterranean University Faculty of Medicine Famagusta, North Cyprus

Abstract

BACKGROUND/AIMS: Dementia is one of the major causes of disability and dependency among elderly and the fifth cause of death worldwide. With screening and identifying disease at early stages, new treatment plans and specific care in patients' lives overall benefit society in financial and social aspects. The main aim of this study is to detect prevalence of cognitive impairment (CI) among Famagusta residents in North Cyprus aged 65 and above, and also to identified its associate risk factors.

MATERIALS AND METHODS: This study is a population based, cross-sectional study. Simple random sampling was applied to the population. Sample size was calculated as 143. Along with demographics involving risk factors of dementia, CI was assessed by the Mini-Mental State Examination and Mini Cog Test scores. Daily life activity impairment was evaluated with Functional Activities Questionnaire and depression with Short Geriatric Depression Scale. SPSS was used for analysis and chi-square was used for hypothesis test ($p<0.05$).

RESULTS: In total,135 participants were included in analysis from 4 age groups (65-69/70-74/75-79/80+). The mean age of the participants was 73.17±6.421 and females comprised 70.4%. Overall, 40% of the whole population had CI and 20.7% had depression. It was observed to be more frequent among older age groups ($p<0.001$) and females ($p=0.007$). Lower education was found to be associated with CI and 60.8% of individuals with 6 or less years of education had CI ($p=0.011$).

CONCLUSION: This study has shown that prevalence of CI, including MCI and possible dementia cases are quite high. Considering the growing elderly population, cognitive screening tests and preventive measures of modifiable risk factors are required as public health measures.

Keywords: Cognitive impairment, dementia, Cyprus, epidemiology, prevalence

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ORCID IDs of the authors: B.E.Y. 0000-0002-2722-0551; E.C.Ö. 0000-0001-8580-9981; F.O.S.A. 0000-0002-4884-7855; İ.F.Z. 0000-0001-5810-4724; O.A. 0000-00002-7433-4375; R.İ. 0000-0002-7642-1077; S.C. 0000-0002-2265-0966; A.E. 0000-0001-9997-4662.

Address for Correspondence: Amber Eker
E-mail: amber.eker@emu.edu.tr
ORCID ID: orcid.org/0000-0001-9997-4662

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INTRODUCTION

Dementia is a chronic condition identified as a progressive decline in memory and other cognitive abilities, which are orientation, comprehension, calculation, language, and judgement.[1]

Dementia is one of the major causes of disability and dependency among the elderly worldwide.[2] It is associated with an increased risk of death and a decreased quality of life.[3]

There are various disorders and factors which lead to dementia, which results in an irreversible neuronal loss and a reduction of cognitive functioning. The most common type is Alzheimer's disease (AD). However, frontotemporal, Lewy body dementia and vascular dementia are also common types.[4]

Before dementia develops, there is a critical period which is known as "Mild Cognitive Impairment (MCI)". MCI is described as an "*intermediate stage of cognitive impairment that is often, but not always, a transitional phase to dementia*".[5] The main difference between dementia and MCI is that the former interferes with daily activities.[6] It is reported that 15% of all MCI cases turn into dementia.[7-9] It is important to detect MCI in order to slow down its progression to dementia.

The risk factors for dementia can be divided into two groups as non-modifiable and modifiable. Older age is the main risk factor and being female is also among the non-modifiable risk factors for dementia. There are many reasons behind the higher likelihood of dementia in females. The most identifiable cause is the tendency of women to live longer than men and consequently, the risk of dementia increases with age.[10] Concerning modifiable risk factors, the vascular risk factors are hypertension, hyperlipidemia, diabetes mellitus, stoke history and coronary heart disease. The presence of multiple vascular risk factors, which means more than three, increases the probability of developing any type of dementia.[10] In addition, the education span of individuals is considered to be one of the main risk factors for dementia development. A systematic review states that lower education levels are associated with an increase in the development of dementia[11] and meta-analysis revealed that this risk can be reduced by 7% for each additional year in education.[12]

High income countries (HIC) and low-income countries (LIC) show different behaviors in terms of dementia prevalence. Even though the prevalence of dementia in LIC was double the prevalence in HIC in 2015, it was projected that LIC will experience a massive growth in dementia prevalence and it will reach a level of approximately 4 times higher than that of HIC prevalence by 2050.[13]

Every day, there is an increase in the number of people diagnosed with dementia all around the world. According to studies, it was seen that the incidence of dementia doubled with every 5.9-year increase in age, from 3.1/1,000 person years at age 60-64, to 175.0/1,000 person years at age 95+. Initially, researchers arrived at the conclusion that dementia was more common in HIC based on the data for 'diagnosed cases' alone. However, it was not until later that they realized that there seemed to be an underestimation in the figures for middle income counties (MIC) and LIC due to the vast majority of population with dementia being undiagnosed. 7.7 million new cases of dementia are anticipated each year worldwide, implying one new case every 4.1 seconds, which shows the scale of this issue/disease.[14]

According to World Health Organization, there are 50 million dementia sufferers and 60-70% of them are sub-classified as AD. Overall dementia is the fifth cause of death in the world and it is projected that there will be a further increase in the prevalence of dementia from 82 million to 152 million between the years 2030-2050. Raising awareness and early diagnostic criteria are seen to be effective in fighting the prevalence of this disease.

The importance of our study is that, currently, there are no official data about the situation in Cyprus. Alzheimer Europe estimated a total of 11,250 dementia patients in Cyprus in 2012, which represents 1.07% of the total population (1,047,311).[15] Our study is necessary to understand the trends in Cyprus regarding dementia and MCI. Further development on our research would lead to a better understanding of the problem around our country and could inform the structuring of government health policies aimed at the aged population. Additionally, early detection of cognitive impairment (CI) with screening tests could mitigate the condition and help slow progression and reduce mortality. Reversible causes of CI, which are potentially treatable can be identified and treated as well.[16] With screening and identifying this disease in its early stages, new treatment plans and specific care in patients' lives overall benefit society in both its financial and social aspects. Also, the significance of periodic check-ups and follow-ups for cognitive health of the elderly population must be emphasized as well as the importance of public health policies which can be shaped accordingly.

In light of the literature, the main aim of this study was to define the prevalence of CI, MCI and depression in Famagusta residents over 65, and also to identify the severity of CI and its associated risk factors. In addition, the goal was to offer follow-up and/or referral of individuals with scores lower than the threshold levels.

MATERIALS AND METHODS

A population based, cross sectional study was carried out among those residents of Famagusta who were aged ≥65 years between September, 2019 and June, 2020. This study was approved by the Health Subcommittee of Eastern Mediterranean University Research and Publication Ethics Board (approval number: ETK00-2020-0039).

According to the Turkish Republic of North Cyprus State Planning Organization from the 2011 population census, there were 3,170 people aged ≥65 years living in Famagusta and the distribution of the population according to the age groups of 65-69, 70-74, 75-79, 80+ were 36% (1,139), 25% (785), 19% (614) and 20% (632), respectively. The sample size of this study was calculated to be 143 with a 99% confidence level. The Delphi consensus was a study showing that the prevalence of dementia changes with different age ranges and regions of the world. Famagusta was found to be in the Euro A Region. Age standardized prevalence was calculated and applied as 6% using the information from the study.[17]

The residents aged ≥65 years were divided into 4 different age groups, 65-69, 70-74, 75-79, 80+ and the number of surveys required to collect data from each age group was calculated depending on the distribution of the population. By simple random sampling, the participants of this study were selected randomly from the population registries of the Municipality of Famagusta. If the selected participants refused to participate in this study, they were replaced by randomly

selected substitute participants. Participants with mental retardation, communication problems (i.e., aphasia) or perceptual problems (i.e., blindness or deafness) were excluded from this study.

The research team consisted of a neurologist as a supervisor, and seven third year medical students. A door-to-door survey was conducted. An informed voluntary consent form was filled out by all the participants.

A demographic questionnaire was prepared by the team to identified the age, sex, years of education, vascular risk factors, regular drugs and self-declaration of forgetfulness of the participants.

CI was assessed by the validated Turkish versions of the standardized Mini-Mental State Examination (sMMSE),[18] "*Clock drawing*",[19] daily life activities with Functional Activities Questionnaire (FAQ)[20] and depression with Short Geriatric Depression Scale.[21] In addition to this, a modified version of sMMSE (sMMSE-il) was used for illiterate participants.[22]

The MMSE cut-off score for CI was accepted as lower than or equal to a score of 24 out of 30. Scores were further classified; between 20 to 24 as mild, 13 to 19 as moderate and equal to or lower than 12 as severe CI.

In "*clock drawing*", the participants were awarded either 0 if they could not draw, or 2 if they could draw a clock. Also, "*clock drawing*" was a component of MiniCog score which is accepted as another cognitive screening score with a "*three-word recall*" score. The total score is calculated out of 5 by adding the score from the clock drawing test and the number of words recalled from the "*three-words recall*" test ranging from 0 to 3.

FAQ was used to assess the daily life activities of the participants. For those people aged 50-69, having equal or more than 5, and aged above 70 having equal or more than 9 points respectively indicates functional activities impairment.

The Short Geriatric Depression Scale was used to assess the occurrence and the severity of depression in the elderly. The severity categorization was carried out as follows; scores between 0 to 4 indicate no depression, 5 to 8 indicate mild, 9 to 11 indicate medium level, 12 to 15 indicate heavy depression.

Statistical Analysis

The IBM SPSS version 22.0 was used for data entry and analysis. The chi-square test was used as a hypothesis test for the data analysis which determined whether there was an association between two categorical variables and $p<0.05$ was considered significant.

RESULTS

After the exclusion criteria were checked in all the data collected, our research ended up with a total number of n=135, which corresponded to a 94.4% response rate.

70.4% (n=95) of the participants were female and 29.6% (n=40) of the participants were male. Their mean age was 73 years with a standard deviation of 6. The minimum age was 65 years and the maximum age was 97 years in our study population. The age groups were divided into 4 different groups as 65-69, 70-74, 75-79, and 80+. The ratios of the participants in each age group were 37.1% (n=50), 24.4% (n=33), 24.4% (n=33) and 14.1% (n=19), respectively.

8.4% (n=11) of the participants were illiterate, 44.3% (n=58) had been educated for 1-6 years which was the highest percentage, 35.6% (n=48) had been educated for 7-12 years and 10.7% (n=14) had received education of more than 12 years. Most of the population over 65 were living with their spouse with 51.9% (n=69) in Famagusta. The ratios of people living with their children or grandchildren, their spouse and children, or their spouse and caregiver were 15.8% (n=21), 15% (n=20), and 0.8% (n=1) respectively.

In diseases with vascular risk factors, the study population had a single risk factor percentage of 33.8% (n=44). This was followed by three or more risk factors with 29.2% (n=38), two risk factors with 26.2% (n=34), and none with 10.8% (n=14).

In this study, 40% (n=54) of the participants had CI. Analysis revealed that CI was associated with gender (p=0.007), age (p=0.000028) and education level (p=0.011). CI was more common among female participants than males, with 47.4% (n=45) of female participants having CI whereas only 22.5% (n=9) of the male participants had CI. As the number of years of education increased, CI decreased, with the lowest percentage of CI seen in the 12+ years of education group with a percentage of 5.9% (n=3). Regarding the association between age groups and CI, it was found that as age increased, CI became more common. It was found that there was no association between the number of vascular risk factors and CI.

In the group with CI, the influence on daily life activities determined by FAQ coincides exactly with their own declaration. Furthermore, of the 54 people with CI, 34 of them had no impairment in their daily life activities determined by FAQ. This group was the possible MCI group and constituted 25.2% of the total population.

The characteristics of the subjects and associations with CI are summarized in Table 1.

In the age groups, both CI and depression ratios were compared with each other (Figure 1). In the first age group aged between 65-69 years, the CI ratio was 34.0% and the depression ratio was 14.0%. Between the ages 70-74 years, the CI ratio and depression ratio were 42.4% and 24.2% respectively. In the third group which consisted of a population aged between 75-79 years, it had a 33.3% CI ratio and a 21.2% depression ratio. Lastly, in the 80 years and older age group, both the CI proportion and the depression proportion were the highest among the three groups at 63.2% and 31.6%, respectively.

In our population, with respect to the scores found in MMSE, the CI severity levels were found to be proportionally present (Figure 2). 60.0% of the population had no CI, 31.9% had mild CI, 7.4% had moderate CI and 0.7% had severe CI.

DISCUSSION

Dementia is a worldwide problem. Dementia prevalence increases dramatically with age, especially for those over 65 years of age. In 2014, it was estimated that 5 million people were living with dementia and this is expected to be nearly 14 million by 2060.[23]

Dementia presents in LIC, MIC and also in HIC. However, the prevalence of dementia is variable. It is lower in HIC compared to the dementia prevalences of LIC and MIC. In addition to this, in 2015, the dementia prevalence was only 2 times higher in LIC compared to HIC. However,

by 2050, it is projected that the dementia prevalence will be four times higher in LIC and MIC.[13] Cyprus is an island in the Mediterranean Sea, divided into two parts, North and Southern Cyprus. North Cyprus is an MIC.[24] Therefore, North Cyprus is a high risk country for dementia.

Although dementia is a huge public health concern, no previous study was carried out in either North or Southern Cyprus. Due to this reason, this study was designed. This study only involved Famagusta city in North Cyprus, however, country-wide dementia prevalence data is also planned to be collected. Our study showed that nearly half of the Famagusta population who were over than 65 years old have CI.

In this study, one of the data collection tools was MMSE. This tool is the most commonly used screening test for the detection of CI in the elderly population. This test has both higher specificity and sensitivity compared to other tests. The cut-off point for the mini MMSE was set at 24 points. Scores below or equal to 24 points were grouped as mild, moderate or severe CI. These cut-off points were determined according to numerous studies in which it was reported that the cut-off points were 23/24 and 24/25. According to 14 studies, it was seen that the MMSE cut-off values of 23/24 or 24/25 had 88.3% sensitivity and 86.2% specificity.[25] It is evident that the MMSE test is a commonly used and reliable test for population surveys for CI. In addition to MMSE, the

Table 1. Demographics of the participants with respect to cognitive impairment

Characteristic of subjects	Total (n=135)	Cognitive impairment (n=54, 40%)	No cognitive impairment (n=81, 60%)	p-value
Gender, n (%)				0.007
Female	95 (70.4)	45 (83.3)	50 (61.7)	
Male	40 (29.6)	9 (16.7)	31 (38.3)	
Age groups, n (%)				0.000028
65-69	50 (37.1%)	17 (34.0)	33 (66.0)	
70-74	33 (24.4%)	14 (42.4)	19 (57.6)	
75-79	33 (24.4%)	11 (33.3)	22 (66.7)	
80+	19 (14.1%)	12 (63.2)	7 (36.8)	
Education groups, n (%)				0.011
Illiterate	11 (8.4)	5 (9.8)	6 (7.5)	
1-6 years	58 (44.3)	31 (60.8)	27 (33.8)	
7-12 years	48 (35.6)	12 (23.5)	36 (45.0)	
12+ years	14 (10.7)	3 (5.9)	11 (13.8)	
Total	131 (100.0)	51 (100.0)	80 (100.0)	
People living with, n (%)				
Alone	22 (16.5)	10 (18.9)	12 (15.0)	
Spouse	69 (51.9)	23 (43.4)	46 (57.5)	
His/her children or grandchildren	21 (15.8)	10 (18.9)	11 (13.8)	
Spouse and children	20 (15.0)	9 (17.0)	11 (13.8)	
Spouse and caregiver	1 (0.8)	1 (1.9)	0 (0.0)	
Total	133 (100.0)	53 (100.0)	80 (100.0)	
Diseases of vascular risk factors, n (%)				0.930
None	14 (10.8)	6 (11.5)	8 (10.3)	
One risk factor	44 (33.8)	18 (34.6)	26 (33.3)	
Two risk factors	34 (26.2)	12 (23.1)	22 (28.2)	
Three or more risk factors	38 (29.2)	16 (30.8)	22 (28.2)	
Total	130 (100.0)	52 (100.0)	78 (100.0)	
Declared forgetfulness by themselves or relatives, n (%)				
Yes	48 (35.6)	20 (37 .0)	28 (34 .6)	
No	87 (64 .4)	34 (63.0)	53 (65.4)	
Total	135 (100.0)	54 (100.0)	81 (100.0)	
Functional daily life impairment, n (%)				
Yes	28 (20.7)	20 (37.0)	8 (9.9)	
No	107 (79.3)	34 (63.0)	73 (90.1)	
Total	135 (100.0)	54 (100.0)	81 (100.0)	

Mini-Cog Test was also carried out with the participants and the similar results of the Mini-Cog Test supported our MMSE results.

Depression can overlap and interfere with the results of cognitive tests. However, since the prevalence of depression was found to be low overall, this lends support to the impact of depression being non-significant and so the results of the cognitive tests can be more objectively evaluated as CI.

The only study about the epidemiology of dementia in Turkey was carried out in İstanbul, sharing a population with similar socioeconomic characteristics with our study and the validated Turkish MMSE was used as a screening tool. It was found that the prevalence of CI was 50% above 70 years of age in that population survey. With further diagnostic methods in clinics, it indicated that the prevalence of dementia was 20.0%.[26] Our population's educational status and our country's economic status are similar to that research. Also, our population's CI

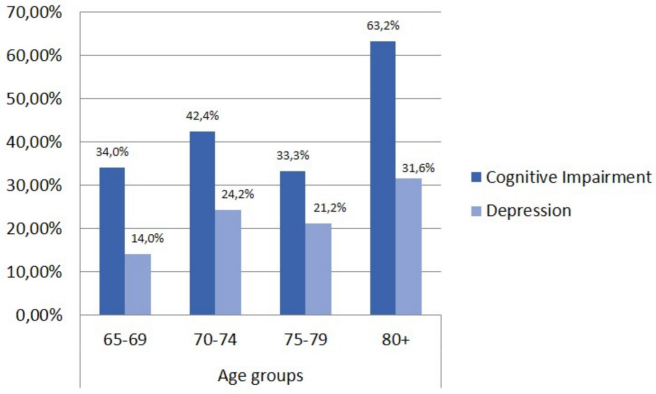

Figure 1. Cognitive impairment and depression frequency in age groups.

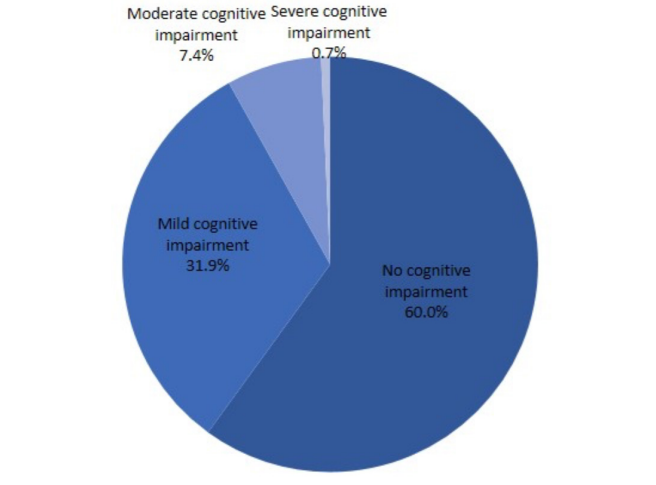

Figure 2. Cognitive impairment presence and severities in the study population.

prevalence was found to be 40% above 65 years old, which is quite similar with the other research. Highly variable prevalence rates have been reported for dementia, ranging from 8.5% to 59.4% around the world.[27] This high variability may be seen because of the different risk factor characteristics of participants and the different socioeconomic status of countries. Our prevalence was within this range.

Concerning the association between age groups and CI, it was revealed that as age increases, CI becomes more common. In addition to that, CI was found to be more common among females than males. Furthermore, CI was seen more commonly in the low education groups, and a significant association between low levels of education was observed, which is similar to previous epidemiological studies.[10,28]

Data on the presence of vascular risk factors were dependent on the participants' own declarations. This might explain detecting no association between vascular risk factors and CI as some participants were not aware of their vascular risk factors or were underdiagnosed. Previous studies point out that vascular risk factors disrupt cognitive functions.[29]

Dementia estimates in North Cyprus ware calculated to be around 2,700 based on worldwide prevalence.[17] To the best of our knowledge, this is the first study ever, not only in North Cyprus but also in Cyprus as a whole to determine the prevalence of CI and MCI.

Overall, this study indicated that 40% of the study population had CI and 25.2% had possible MCI. It is of great importance to follow up those patients with possible MCI annually.

Interestingly, 63% of the individuals with CI determined by valid tests had no declaration of forgetfulness either from themselves and/or from their relatives. Therefore, it is important to screen this age group periodically. Most recently, the American Academy of Neurology has recommended physicians to carry out annual cognitive function assessments for memory problems on individuals aged 65 and older, because increasing age is the major risk factor for cognitive decline.[30] Patients may not realize their developing cognitive deficits or think they are a part of normal aging. Thus, routine checking is necessary.

Study Limitations

The limitations of this study can be mentioned as different external factors which may have affected cognitive tests at that time, such as the hour of the day, the previous night's sleep, vitamin deficiencies and/or metabolic status. Additionally, the participants of this study were selected randomly from the Municipality of Famagusta population registries from those residents aged ≥65 years. These registries include the majority of the residents aged ≥65 years in Famagusta but not all. Data collection between genders were biased towards females because of two reasons: The Municipality of Famagusta population registries contained more females than males, and also, as participation to our study depended on willingness, females tended to volunteer more to become participants in our study. Another limitation of our study was the fact that some data was based on the patients' own declarations.

CONCLUSION

To conclude, dementia is one of the major global health problems. This neuropsychiatric progressive disease becomes more prevalent with age. Consequently, it has become a global concern. Dementia impacts

not just the individual, but also the families and societies at large as it interferes with their daily activities and it reduces productivity.

40% of the participants surveyed in our research suffer from CI. Additionally, 25.2% of the study population had possible MCI and 20.7% suffered from depression.

Our study showed that CI is more common in women, the elderly and those who had received little or no education.

Future studies can be conducted in other cities to find out the general CI prevalence in North Cyprus.

MAIN POINTS

- Nearly half of the study population have cognitive impairment.
- Cognitive impairment has associations with older age, the female gender and lower education.
- Considering the growing elderly population, cognitive screening tests are required as public health measures.

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ETHICS

Ethics Committee Approval: This study was approved by the Health Subcommittee of Eastern Mediterranean University Research and Publication Ethics Board (approval number: ETK00-2020-0039).

Informed Consent: An informed voluntary consent form was filled out by all the participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: B.E.Y., E.C.Ö., F.O.S.A., İ.F.Z., O.A., R.İ., S.C., A.E., Design: E.C.Ö., B.E.Y., F.O.S.A., İ.F.Z., O.A., R.İ., S.C., A.E., Supervision: A.E., Materials: B.E.Y., E.C.Ö., F.O.S.A., F.O.S.A., İ.F.Z., O.A., R.İ., S.C., A.E., Data Collection and/or Processing: B.E.Y., E.C.Ö., F.O.S.A., İ.F.Z., O.A., R.İ., S.C., A.E., Analysis and/or Interpretation: B.E.Y., E.C.Ö., F.O.S.A., İ.F.Z., O.A., R.İ., S.C., A.E., Literature Search: B.E.Y., E.C.Ö., F.O.S.A., İ.F.Z., O.A., R.İ., S.C., A.E., Writing: B.E.Y., E.C.Ö., F.O.S.A., İ.F.Z., O.A., R.İ., S.C., A.E.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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