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Factors Affecting Cognitive Function in Elderly

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Abstract

Background: The number of cognitive impairments in older people gradually increases yearly. Many factors could affect cognitive function, and previous researches were examined separately and stand-alone. This study combined many factors that affect cognitive function.

Objective: To determine factors affecting cognitive function in the elderly.

Methods: This study used an analytical observational study with a cross-sectional design. The population was all elderly people in Bandar Lor Village, Sukorame Public Health Center, Kediri. The sample size was 448 using the Slovin Formula and the Simple Random Sampling technique. Respondents completed the questionnaire developed by reviewing relevant literature and adapting the content from related studies, which was tested for validity and reliability with a Cronbach's alpha of 0.856. Bivariate data analysis used the chi-square test. Multivariate data analysis used a logistic regression test.

Results: age variable, last education, history of the disease, nutritional assessment, depression, living type, social activity, work history, physical activity, and marital status significantly affect cognitive function in the elderly with p-value <0.05.

Conclusion: Factors most affecting cognitive function in older people were depression, nutritional assessment, and physical activity.

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INTRODUCTION

The estimated number of older adults in Indonesia was 23.66 million in 2017, which will become 33.69 million in 2025. The increasing number of elderly can bring various impacts: a positive effect if older people are in good health and a negative impact if they have health problems that can cause an increase in personal health, growth in the cost of health services, increased disability, decreased income, decreased quality of life, decreased social support, and a hostile environment.[1]

One of the health problems in the elderly who have a negative impact is cognitive impairment. Cognitive impairment is one of the most significant causes of disability and has become the primary public health issue globally.[2] Cognitive impairment refers to abnormalities in advanced intelligence processing, including learning, memory, and critical thinking. The number of cognitive impairments in older people increases gradually every year.[3] Cognitive impairment can cause physical, psychological, and socio-economic burdens that affect not only older people but also their families and communities in their environment.[4]

Screening older people is a form of prevention activity to prevent the negative impact of increased cognitive impairment. According to the Regulation of the Indonesian Ministry of Health Number 43 of 2016, every Indonesian citizen aged 60 years and over must have health screening according to the standard. The scope of screening includes detection of hypertension by measuring blood pressure, detection of diabetes mellitus by checking blood sugar levels, detection of blood cholesterol levels, detection of mental-emotional disorders and behavior using Mini-Cog or Mini-Mental Status Examination (MMSE) or Abbreviated Mental Test and Geriatric Depression Scale (GDS).[5]

The elderly screened in Sukorame Public Health Center (PHC) is 1662 people (28.67%) with a target of 5796 people. It is low compared to Pesantren I PHC (79.35%) and Pesantren II PHC (37%) Kediri. From five villages in the working area of the Sukorame PHC, Bandar Lor has a lower percentage of elderly screened compared to the other four villages. It has screened 216 people (17%) with a target of 1532 people. It is due to people's low awareness to check their health at the PHC.[6]

Another way to prevent increased cognitive impairment is to identify what factors can affect cognitive function as a further form of promotive and preventive activity. Many previous researches showed that several factors could affect cognitive function. A study in Iran used age, education level, living type, depression symptoms, and smoking variables.[7] Another study about similar factors in China used gender variables,[8] and in Sri Lanka used marital status, physical activity, and social activity variables.[9] Another study in South Korea used occupation variables,[10] and in Indonesia, used variables of history of the disease, insomnia, and nutritional assesment.[11]

Based on the diversity of factors that can affect cognitive function in many previous studies were examined separately and stand-alone, the increasing number of elderly, the rising cognitive impairment, and low screening of elderly in Bandar Lor Village, Sukorame PHC, Kediri, the authors took the initiative to research by combining factors that affect the cognitive function of older people at Bandar Lor Village,

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Sukorame PHC, Kediri. It hopes that knowing several factors that affect cognitive function in older people can be a reference for promotive and preventive activities for the community to minimize the incidence of cognitive decline. It can also make older people and their families aware and encourage them to visit PHCs for screening their elderly. This suggestion can be applied to the other PHCs to increase screening for older people, and a target from the Indonesian Ministry of Health can be reached.

METHODS

This research was an analytical observational study with a cross-sectional design conducted in September 2019. The population of this study was all older people in Bandar Lor Village, Sukorame PHC, Kediri. The sample size was 448 using the Slovin Formula and the Simple Random Sampling technique. The inclusion criteria were elderly who were willing to be respondents, those aged 60 years and over,[5,7] elderly treated at Sukorame PHC, and elderly who were communicative, cooperative, and could read and write. The exclusion criteria were elderly with a history of Parkinson's, stroke, and mental disorders,[12,13] and elderly whose first-level health facility was not in Sukorame PHC. The ethical clearance number in this study is 503/0442/PENELITIAN419. 104/2019, obtained from the Kediri Health Office and Sukorame PHC Kediri.

The instruments in this study were a questionnaire developed by reviewing relevant literature and adapting the content from related studies, which was tested for validity and reliability with a Cronbach's alpha of 0.856. The questionnaire contained the following: 1). data names, age, gender, education level, marital status, physical activity, living type, social activities, medical history, occupation, smoking,[7,8,9,10] 2). Questionnaires Geriatric Depression Scale (GDS) to assess symptoms of depression,[7] 3). Questionnaires Mini Nutritional Assessment (MNA) to determine the risk of malnutrition and body mass index (BMI), 4). Questionnaire Insomnia Severity Index (ISI) to assess sleep patterns[14] and 5) questionnaire Mini-Mental State Exam (MMSE) to assess cognitive function. MMSE is a standard and simple test to evaluate cognitive function in older people.[14]

Data were analyzed univariately to determine the characteristics of data, and analyzed using SPSS for Windows version 23.. The bivariate test uses unpaired categorical comparative with a row x column table, called the Chi-square test, to determine the relationship between variables. Then, multivariate data analysis used a multiple logistic regression test to determine the most influential independent variable. The logistic regression equation is below:

$$p(x) = \frac{1}{(1 + exp^{-y})}$$

p= probability of the rate of decline in cognitive function in the respondent if the factors of mild depression, the risk of malnutrition, and moderate activity appear together.

RESULTS

Table 1 shows the results of univariate analyses that show the characteristics of the respondents, with the amount and percentage for each variable. The characteristics of respondents were used to determine the diversity of respondents based on age, gender, last education,

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living type, history of disease, social activity, depression, MNA, insomnia, work history, physical activity, smoking, and marital status. Based on the results, most respondents were 60-69 years (302; 67,4%), female (282; 62.9%), elementary school (197; 44%), living with family (391; 87,3%), had diabetes mellitus (157; 35%), had every week social activity (246; 54.9%), had no depression (355; 79.2%), had normal nutritional status (309; 87.5%), had no insomnia (392; 87.5%), had a work history (295; 65.8%), had medium physical activity (157; 35%), no smoking (276; 61.6%), and had married (397; 88.6%).

Table 1. Respondents' Characteristics

Variable	Category	Amount	Percentage
Age	60-69	302	67,4 %
	70-79	116	25,9 %
	≥ 80	30	6,7 %
Gender	Male	166	37,1 %
	Female	282	62,9 %
Last Education	Elementary School	197	44 %
	Junior High School	168	37,5 %
	Senior High School	72	16,1 %
	Higher Education	11	2,5 %
Living Type	Alone	57	12,7 %
	Family	391	87,3 %
History of Disease	Hypertension	134	29,9 %
	Diabetes Mellitus	157	35 %
	Vision Disorders	32	7,1 %
	No history of disease	125	27,9 %
Social Activity	Never	48	10,7 %
	Irregular	127	28,3 %
	Every Week	246	54,9 %
	Everyday	27	6 %
Depression	Normal	355	79,2 %
	Mild	88	19,6 %
	Medium	5	1,1 %
Mini Nutritional Assessment	Normal	309	87,5 %
	Risk of malnutrition	127	11,6%
	Malnutrition	12	0,9%
Insomnia	Not Insomnia	392	87,5 %
	Initial Insomnia	52	11,6%
	Moderate Clinical Insomnia	4	0,9%
Work History	Yes	295	65,8 %
	No	153	34,2 %
Physical Activity	High	39	8,7 %
	Medium	245	54,7 %
	Low	164	36,6 %
Smoking	No Smoking	276	61,6 %
	Have Smoking	42	9,4 %
	Former Smoker	49	10,9 %
	Smoking Until Now	81	18,1 %
Marital Status	Married	397	88,6
	Not Married	11	2,5
	Divorced/ Widow/ Separated	40	8,9

Source: Primary Data, 2019

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Based on Table 2 and Table 3, the Chi-Square bivariate test was used to determine the effects of intrinsic and extrinsic factors on cognitive function, showed that age variable (p= 0,000), last education (p= 0.041), history of disease (p= 0.035), nutritional status (p= 0.012), living together (p= 0.039), social activities (p= 0,000), work history (p= 0.000), physical activity (p= 0.000), and marital status (p= 0.000) affect on cognitive function because it have significant p-value <0.05. Meanwhile, gender variable (p= 0.208) and smoking (p= 0.441) do not affect cognitive function because p-value >0.05.

Table 2. Chi-Square Test Results for Intrinsic Factors for Cognitive Functions

Factor	Criteria	Normal	Impairment	Value p
Age	60-69	210 (69,5%)	92 (30,5%)	0,000
	70-79	58 (50%)	58 (50%)	
	≥ 80	4 (13,3%)	26 (86,7%)	
Gender	Male	94 (56,6 %)	72 (43,4 %)	0,208
	Female	178 (63,1 %)	104 (36,9 %)	
Last Education	Elementary School	112 (56,9 %)	85 (43,1%)	0,035
	Junior High School	99 (58,9 %)	69 (41,1 %)	
	Senior High School	55 (76,4%)	17 (23,6 %)	
	Higher Education	6 (54,5 %)	5 (45,5 %)	
History of Disease	HT	87 (64,9%)	47 (35,1 %)	0,035
	DM	94 (59,9%)	63 (40,1%)	
	Vision Disorders	12 (37,5%)	20 (62,5%)	
	No history of disease	79 (63,2 %)	46 (36,8 %)	
Nutritional Status	Normal	204 (66 %)	105 (34 %)	0,012
	Risk of malnutrition	58 (45,7%)	69 (54,3%)	
	Malnutrition	10 (83,3 %)	2 (16,7 %)	

Source: Primary Data, 2019

Table 3. Chi-Square Test Results for Extrinsic Factors for Cognitive Function

Factor	Criteria	Normal	Impairment	Value p
Living Type	Alone	27 (47,4 %)	30 (52,6 %)	0,039
	Family	245 (62,7 %)	146 (37,3 %)	
Social Activity	Never	21 (43,8%)	27 (56,3%)	0,000
	Irregular	65 (51,2%)	62 (48,8)	
	Every Week	169 (68,7 %)	77 (31,3 %)	
	Everyday	17 (63%)	10 (37%)	
Work History	Yes	197 (66,8%)	98 (33,2)	0,000
	No	75 (49%)	78 (51%)	
Physical Activity	High	21 (53,8%)	18 (46,2%)	0,000
	Medium	182 (74,3%)	63 (25,7%)	
	Low	69 (42,1%)	95 (57,9%)	
Smoking	No Smoking	172 (62,3%)	104 (37,7%)	0,441
	Have Smoking	25 (59,5%)	17 (40,5%)	
	Former Smoker	27 (55,1%)	22 (44,9%)	
	Smoking Until Now	48 (59,3%)	33 (40,7%)	
Marital Status	Married	251 (63,2%)	146 (36,8%)	0,000
	Not Married	8 (72,7%)	3 (27,3%)	
	Divorced/Widow/ Separated	13 (32,5%)	27 (67,5%)	

Source: Primary Data, 2019

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Table4. Kruskal-Wallis Test Results Intrinsic Factors of Insomnia and Depression for Cognitive Function

Criteria		N	Asymp.Sig
Insomnia	Not Insomnia	392	0.212
	Initial Insomnia	52	
	Moderate Clinical Insomnia	4	
	Normal	355	
Depression	Mild	88	0,000
	Medium	5	

Source: Primary Data, 2019

Table 5. Results of Multivariate Logistic Regression for Cognitive Function

	B	Sig.	95% C.I.for EXP (B)	
			Lower	Upper
Depression (mild)	1.020	0.000	1.643	4.680
Depression (moderate)	21.689	0.999	0.000	31599
MNA (risk of malnutrition)	0.657	0.006	1.209	3.076
MNA (malnutrition)	-1.133	0.168	0.064	1.613
Physical Activity (Moderate)	-1.217	0.001	0.144	0.609
Physical Activity (low)	0.157	0.674	0.563	2.430
Constant	-0.278	0.395		

Source: Primary Data, 2019

Intrinsic factors of depression and insomnia do not fulfill the requirements of the Chi-Square Test because of the expected count value of >20%, so the test to be carried out is the Kruskal-Wallis test. Based on Table 4, the depression variable (p= 0,000) influences cognitive function because of the significance p-value <0.05, while the insomnia variable (p= 0.212) does not affect cognitive function because of p-value >0.05. From the bivariate test results, there are ten variables with a p-value <0.25. However, if all variables are included in the regression test, the results are only partially significant. So, in the regression test, only three variables that have significant value were physical activity, nutritional status, and depression.

From Table 5, the logistic regression equation obtained is as follows:

y = - 0.278 + 1,020 (mild depression) + 21,689 (moderate depression) + 0.657 (risk of malnutrition) - 1,133 (malnutrition) - 1,217 (moderate physical activity) + 0.157 (low physical activity)

Probability obtained based on the formula:

$$p(x) = \frac{1}{(1 + exp^{-y})}$$

Whereas:
p = probability of the rate of decline in cognitive function in the respondent if the factors of mild depression, the risk of malnutrition, and moderate activity appear together.

The formula is used to estimate the rate of decline in cognitive function based on depression, the risk of malnutrition, and physical activity.

$$p(x) = \frac{1}{(1 + e^{-(-0,278+1.020(1)+0,657(1)-1,217(1))})}$$

p=0,569056x100%=56,9%

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the probability of a decline in cognitive function is 56.9%.

DISCUSSION

In this study, variables that significantly influence cognitive function in the elderly (p <0.05) are age, last education, history of the disease, nutritional status, depression symptoms (as intrinsic factors), living type, social activities, work history, physical activity, and marital status (as extrinsic factors). Meanwhile, gender, insomnia symptoms, and smoking did not significantly affect cognitive function in the elderly (p >0.05). Based on logistic regression tests, the factors that most influence cognitive function in the elderly are depression, nutritional status, and physical activity.

Age significantly affects cognitive function (p= 0.000; p >0.05) because biological mechanisms of aging affect the decline in brain nerve function and motor function decline. The development of dementia will be faster and heavier with age.[15] It is in line with a previous study that cognitive function is highly related to an individual's perceptions, memory, and thinking ability, which worsens in the elderly.[16] It is also in line with another study, which proves that age is significantly related to cognitive decline due to the aging process.[10]

Gender did not affect cognitive function (p= 0.208; p >0.05). It is in line with another study that gender variables did not have a statistically significant effect on the development of dementia.[17] A previous study also supports this finding that gender does not affect cognitive function between mild and normal cognitive decline groups.[18,19]

The level of education significantly affects cognitive function (p= 0.035; p <0.05). It is in line with previous studies that the duration of education is a significant factor in cognitive function. Low education shows low scores on performing orders and reasoning functions.[10] The elderly with higher education levels have a better cognitive function. The affecting of education here is persistent, stable, and prominent in all cognitive domains, ranging from general mental status to perception and memory function.[20] A study in the Southern Province of Sri Lanka finds that elderly people with middle and higher education levels have significantly higher cognition levels than other groups.[9] Another study in Malaysia found that education is a sociodemographic factor that shows a significant relationship with cognitive function. This study found that the risk of cognitive impairment is three times higher in individuals with lower education than in middle or higher education levels.[8]

Living with a family is significantly related to cognitive function (p= 0.039; p <0.05). It is in line with several studies that the elderly who lived alone had more cognitive impairment than those living with family.[7,20,21] The study in Iran indicates that social support negatively predicts cognitive impairment. Several hypotheses can explain the relationship between cognitive function and social support. First, social support is a stress-buffering for the elderly to protect against the negative consequences of psychological stress. Second, social support also increases the ability to deal with stressors through emotional and information support. When social support increases, some psychological conditions and psychological symptoms of a disease decrease.[7] The elderly who live with family can protect cognitive function.

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Older people who live alone have less emotional and cognitive stimuli and live isolated from social relationships.[20] Another study, the elderly who feel lonely have a higher prevalence of dementia or cognitive impairment.[22]

History of disease significantly affects cognitive function (p= 0.035; p <0.05). It is consistent with several studies that diabetes mellitus increases the risk of cognitive impairment.[12,23] Elderly with diabetes have decreased cerebral perfusion from the frontotemporal region, which plays an essential role in memory, judgment, attention, learning ability, and other functions. Cognitive impairment in patients with diabetes type 2 caused by interactions of metabolic disorders. It is associated with the disease of diabetes (hyperglycemia and hyperinsulinemia), diabetes complications (retinopathy, nephropathy, and neuropathy), and other diabetes-related disorders (ischemic heart disease, cerebrovascular disease, hypertension, low HDL cholesterol, central obesity, and depression).[24] Individuals with diabetes must carry out environmental, social, and individual adaptations that enable the elderly to carry out their daily activities and reduce the functional impact of their physical or cognitive deficits. It is also advisable to maintain daily activity due to functional decline and physical disability contributing to an increased incidence of diabetes.[25]

Hypertension significantly affects cognitive function. Hypertension affects the regulation of cerebral circulation, which might damage the structure and function of the brain. Abnormalities associated with aging impact brain circulation. It is reduced brain blood flow by the mechanism of brain dysfunction strengthened by arterial hypertension. The number of brain capillaries in the cortex decreases, and basement membranes become thickened and fibrotic. This change reduces cerebral blood flow, cerebrovascular attenuation, and dysfunction of the mechanisms that regulate brain circulation. Cognitive disorders may be related to the presence of focal ischemic lesions (infarction, lacunae) and chronic white matter ischemia due to small cerebral artery disease (arteriosclerosis and lipo-hyalinosis). White matter hyperintensity is associated with an increased risk of dementia in the general population. Changes in white matter generally occur in older people.[26] Arterial stiffness might explain the relationship between hypertension and cognitive impairment. Arterial hypertension is the most common risk factor for cardiovascular disease and affects 65% of individuals 70 years and above.[27]

Visual impairment factors significantly affect cognitive impairment. The pathogenic processes in dementia include deficiency of beta-amyloid and acetylcholine, which can affect refraction. Myopia has a double risk for cognitive decline rather than emmetropes and hypermetropic.[28] Based on the logistic regression test, diabetes mellitus increased the risk of cognitive decline in the elderly by one time compared to hypertension. At the same time, visual impairment increases the risk of cognitive decline two times compared with hypertension.

Social activities significantly affect cognitive function (p= 0.000; p <0.05). It is in line with the previous study that participation in social activities positively impacts the cognitive function of the elderly. The elderly with extensive social networks have more opportunities to access various information related to health. In this case, the elderly must continue interacting

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with their social environment to regulate their social networks and maintain their health and cognitive functions.[29] Social activities can prevent the progression of dementia. Lack of social activities can reduce and limit the ability to communicate and impact the memory of the elderly. It can be an early symptom and predictor of decreased cognitive function in the elderly. A previous study in Vietnam showed that lack of social activities increased the risk of dementia by 3.3 times.[30]

Depression significantly affects cognitive function (p= 0,000; p <0.05). Depression in the elderly can be considered prodromal symptoms in mild cognitive problems. The occurrence of depressive symptoms with mild cognitive impairment can predict the development of dementia.[29] Depressive symptoms reflect the disturbance in the brain that causes atrophy of the cortex, limbic atrophy, and lesions of white matter in dementia slow onset depression.[7] Based on the logistic regression test, the more severe depressive symptoms increase the risk of cognitive decline two times more than those without depressive symptoms.

Nutritional assessment significantly affects cognitive function (p= 0.012; p <0.05). It is consistent with several studies that show that low body fat in the elderly can damage cognitive function through nutritional deficiencies. In contrast, people with body fat have proven to increase cerebral glucose metabolism to reduce the risk of cognitive impairment.[31,32]

Insomnia symptoms did not significantly affect cognitive function (p= 0.242; p >0.05). It aligns with previous studies in the Southern Province of Sri Lanka. However, it is hypothesized that sleep deprivation exacerbates the neuropathological process that leads to amyloid deposition and causes cognitive decline.[9]

Work history significantly affects cognitive function (p= 0,000; p <0.05). It aligns with several studies that show that work history affects cognitive function.[10,21,32,33] older people who work before 60 may have a longer duration of education. More comprehensive education improves cognitive function and work activities related to improving cognitive function.[10]

Physical activity factors significantly affect cognitive function (p= 0,000; p <0.05). It is in line with the previous study that brain structure and function are associated with physical function. Gait requires the coordination of complex visual sensors. It is associated with the frontoparietal medial region activation, including the primary sensory and motor areas, additional motor areas, lateral premotor cortex, cingulate cortex, superior parietal lobe, precuneus, and infratentorial areas, including the back region.[34] Another study found that physical activity can reduce amyloid deposition and improve brain function by reducing vascular risk factors, including obesity, hypertension, and diabetes.[35]

Smoking did not significantly affect cognitive function (p= 0.441; p >0.05). This is in line with a previous study in Indonesia.[11] The smoking variable is seen from the response of smoking or not and seen from the duration of smoking, the number of cigarettes daily, and the gap between smoking and not smoking.[30]

Marital status significantly affects cognitive function (p= 0,000; p <0.05). This is in line with several studies.[9,12,16] Elderly married have better mental conditions because they share their lives with their partners. The emotional

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stress on divorced or widowed people can influence their cognition.[9] Elderly unmarried or divorced people often have few communication opportunities and are less involved in social activities. Lower social involvement can result in a higher risk of cognitive impairment.[12]

The strengths of this study were that it combines several variables from many previous studies, uses a questionnaire developed by reviewing relevant literature, and adapts the content from related studies, which was tested for validity and reliability with a Cronbach's alpha. The limitation of this study is that it was only carried out in Bandarlor Village and was not compared to other areas. So, the suggestion from this research is to compare it with other places with broader coverage.

CONCLUSION

Factors affecting cognitive function in older people are age, education, living together, history of disease, social activity, depression, nutritional assessment, occupation, physical activity, and marital status. Factors most affecting cognitive function in older people were depression, nutritional assessment, and physical activity.

REFERENCES

1. Indonesian Ministry of Health. Analysis of Indonesian Elderly. Jakarta Data and Information Center 2017.
2. Ma C, Yin Z, Zhu P, et al. Blood cholesterol in late-life and cognitive decline: A longitudinal study of the Chinese elderly. Mol Neurodegener 2017;12(1); doi: 10.1186/s13024-017-0167-y.
3. Ma L, Li Y. Cognitive function and insulin resistance in elderly patients with type 2 diabetes. Neurol Res 2017;39(3):259–263; doi: 10.1080/01616412.2017.1281199.
4. Lee SH, Kim YB. Which type of social activities may reduce cognitive decline in the elderly?: A longitudinal population-based study. BMC Geriatr 2016;16(1); doi: 10.1186/s12877-016-0343-x.
5. Peraturan Menteri Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 43 Tahun 2016 Tentang Standar Pelayanan Minimal Bidang Kesehatan. 2016. Available from: https://peraturan.bpk.go.id/Details/113091/permenkes-no-43-tahun-2016.
6. Sukorame Public Health Center. Sukorame Public Health Center Performance Assessment. Health Care Center Performance Assessment Data; 2019.
7. Faramarzi M, Zarin Kamar M, Kheirkhah F, et al. Psychosocial Predictors of Cognitive Impairment in the Elderly: A Cross-Sectional Study. Iran J Psychiatry 2018;13(3):207–214.
8. Wong Zan Mei J, Kumar Mallick K, Huay Yee C, et al. The Prevalence of Cognitive Disorder and its Associated Socio-demographic Factors in Elderly from Assisted Living Residences, KlangValley.Malaysia. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN 2016;15(4):109–114; doi: 10.9790/0853-150410109114.
9. Gamage MWK, Hewage C, Pathirana KD. Associated factors for cognition of physically independent elderly people living in residential care facilities for the aged in Sri Lanka 17 Psychology and Cognitive Sciences 1701 Psychology. BMC Psychiatry 2019;19(1); doi: 10.1186/s12888-018-2003-5.

e-ISSN 2774-2318
p-ISSN 2407-0505

10. Shim J, Kang S. Analyzing factors affecting cognitive function in the elderly using computerized neurocognitive tests. Journal of Korean Academy of Community Health Nursing 2017;28(2):107–117; doi: 10.12799/jkachn.2017.28.2.107.
11. Pengpid S, Peltzer K, Susilowati IH. Cognitive Functioning and Associated Factors in Older Adults: Results from the Indonesian Family Life Survey-5 (IFLS-5) in 2014-2015. Curr Gerontol Geriatr Res 2019;2019; doi: 10.1155/2019/4527647.
12. Ren L, Bai L, Wu Y, et al. Prevalence of and risk factors for cognitive impairment among elderly without cardio-and cerebrovascular diseases: A population-based study in rural China. Front Aging Neurosci 2018;10(MAR); doi: 10.3389/fnagi.2018.00062.
13. Alakus F, Helvaci SA, Temizel M, et al. A cross-sectional study to evaluate metabolic and demographic factors affecting cognitive function among low educated internal medicine outpatients. Neurosciences 2017;22(1):38–43; doi: 10.17712/nsj.2017.1.20160259.
14. Huang L, Yang L, Shen X, et al. Relationship between glycated hemoglobin A1c and cognitive function in nondemented elderly patients with type 2 diabetes. Metab Brain Dis 2016;31(2):347–353; doi: 10.1007/s11011-015-9756-z.
15. Bich NN, Dung NTT, Vu T, et al. Dementia and associated factors among the elderly in Vietnam: A cross-sectional study. Int J Ment Health Syst 2019;13(1); doi: 10.1186/s13033-019-0314-7.
16. Habte E, Tekle T. Cognitive Functioning among Elders with Symptoms of Depression: The Case of Two Selected Institutionalized Care Centers in Addis Ababa, Ethiopia. Health Science Journal 2018;12(03); doi: 10.21767/1791-809x.1000571.
17. Katarzyna T, Bożena M, Alicja Assessment K, et al. Assessment of the efficiency of cognitive function of people over 65. Journal of Education, Health and Sport 2017;2391–8306; doi: 10.5281/zenodo.1246825.
18. Wang F, Zhao M, Han Z, et al. Long-term subclinical hyperglycemia and hypoglycemia as independent risk factors for mild cognitive impairment in elderly people. Tohoku Journal of Experimental Medicine 2017;242(2):121–128; doi: 10.1620/tjem.242.121.
19. Li Y, Fang X, Zhao WG, et al. A risk factor analysis of cognitive impairment in elderly patients with chronic diseases in a Chinese population. Medical Science Monitor 2017;23:4549–4558; doi: 10.12659/MSM.904254.
20. Zhang W, Tang F, Chen Y, et al. Education, Activity Engagement, and Cognitive Function in US Chinese Older Adults. J Am Geriatr Soc 2019;67:S525–S531; doi: 10.1111/jgs.15560.
21. Kim H, Lee S, Ku BD, et al. Associated factors for cognitive impairment in the rural highly elderly. Brain Behav 2019;9(5); doi: 10.1002/brb3.1203.
22. Rafnsson SB, Orrell M, D'Orsi E, et al. Loneliness, Social Integration, and Incident Dementia over 6 Years: Prospective Findings from the English Longitudinal Study of Ageing. Journals of Gerontology - Series B Psychological Sciences and Social Sciences 2020;75(1):114–124; doi: 10.1093/geronb/gbx087.
23. Murata Y, Kadoya Y, Yamada S, et al. Cognitive impairment in elderly patients with type 2 diabetes mellitus: prevalence and related clinical factors. Diabetol Int

2017;8(2):193–198; doi: 10.1007/s13340-016-0292-9.

24. Malekian N, Hosseini SR, Moudi S, et al. Type 2 diabetes mellitus and cognitive function in the elderly. Iran J Psychiatry Behav Sci 2018;12(2); doi: 10.5812/ijpbs.9494.
25. Rodríguez-Sánchez E, Mora-Simón S, Patino-Alonso MC, et al. Cognitive impairment and dependence of patients with diabetes older than 65 years old in an urban area (DERIVA study) Neurology, stroke and cognition. BMC Geriatr 2016;16(1); doi: 10.1186/s12877-016-0208-3.
26. Fitri FI, Rambe AS. Correlation between Hypertension and Cognitive Function in Elderly. In: IOP Conference Series: Earth and Environmental Science Institute of Physics Publishing; 2018; doi: 10.1088/1755-1315/125/1/012177.
27. AAB M, LAP P, WA R. Cognitive, functional, social and health assessment in elderly of rural areas. MOJ Gerontology & Geriatrics 2019;4(3); doi: 10.15406/mojgg.2019.04.00187.
28. Spierer O, Fischer N, Barak A, et al. Correlation between vision and cognitive function in the elderly: A cross-sectional study. Medicine (United States) 2016;95(3); doi: 10.1097/MD.0000000000002423.
29. Fu C, Li Z, Mao Z. Association between social activities and cognitive function among the elderly in China: A cross-sectional study. Int J Environ Res Public Health 2018;15(2); doi: 10.3390/ijerph15020231.
30. Kim M, Park JM. Factors affecting cognitive function according to gender in community-dwelling elderly individuals. Epidemiol Health 2017;39:e2017054; doi: 10.4178/epih.e2017054.
31. An J, Li H, Tang Z, et al. Cognitive impairment and risk of all-cause and cardiovascular disease mortality over 20-year follow-up: Results from the BLSA. J Am Heart Assoc 2018;7(15); doi: 10.1161/JAHA.117.008252.
32. Lazo-Porras M, Pesantes MA, Miranda JJ, et al. Evaluation of cognitive impairment in elderly population with hypertension from a low-resource setting: Agreement and bias between screening tools. eNeurologicalSci 2016;5:35–40; doi: 10.1016/j.ensci.2016.11.012.
33. Darwish H, Farran N, Assaad S, et al. Cognitive reserve factors in a developing country: Education and occupational attainment lower the risk of dementia in a sample of lebanese older adults. Front Aging Neurosci 2018;10(SEP); doi: 10.3389/fnagi.2018.00277.
34. Ahn J-D, Kang H. Physical Fitness and Serum Vitamin D and Cognition in Elderly Koreans. 2015. http://www.jssm.org
35. Kimura N, Aso Y, Yabuuchi K, et al. Modifiable lifestyle factors and cognitive function in older people: A cross-sectional observational study. Front Neurol 2019;10(APR); doi: 10.3389/fneur.2019.00401.