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DETECTION OF FACTORS THAT AFFECT THE DECLINE IN COGNITIVE FUNCTION THAT CAUSES DEMENTIA IN THE ELDERLY

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ABSTRACT

Keywords: Detection, Cognitive Function, Dementia, Elderly

Kata Kunci:

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In general, the number of elderly people suffering from dementia is expected to increase. Dementia results in a decrease in the quality of life of sufferers so that it becomes a problem. This study aims to detect and identify factors that affect the decline in cognitive function that causes dementia in the elderly. This type of analytical research is conducted by the cross sectional research method. The population of this study is the elderly in Malang city, east Java, the sample size is 155 people with probability sampling technique using proportionate cluster random sampling. Data Collection for the identification of cognitive aspects using instruments MMSE (Mini Mental Status Exam) instruments, data analysis using the Bier Logistic Regression test with SPSS20 for Windows. The results of the analysis showed the relationship between health status factors and the cognitive function of the elderly (p value 0.05). The results that some respondents as many as 105 people or 67,7% had normal cognitive function, and 50 respondents or 32.3% fell into the category of probable cognitive impairment. Conclusion were obtained that the decline in cognitive function in the elderly was caused by high blood pressure, smoking, having experienced a blow to the head, a sad mood, lack of exercise, lack of activity in social activities, difficulty sleeping, and prolonged illness and illness. The suggestion from the results of this study is that the elderly manage and prevent risk factors so that cognitive function does not decline so that dementia can be prevented.

ABSTRAK

Secara umum, jumlah lansia yang menderita demensia diperkirakan akan meningkat. Demensia mengakibatkan penurunan kualitas hidup penderitanya sehingga menjadi masalah. Tujuan dari penelitian ini adalah mendeteksi dan mengidentifikasi faktor yang mempengaruhi penurunan fungsi kognitif yang menyebabkan demensia pada lansia. Jenis penelitian analitis dengan metode penelitian cross sectional. Populasi penelitian ini adalah lansia di kota Malang Jawa Timur, jumlah sampel 155 orang dengan teknik probability sampling menggunakan proportionate cluster random sampling. Pengumpulan data untuk identifikasi aspek kognitif menggunakan instrumen MMSE (Mini Mental Status Exam), Analisis data menggunakan uji Regresi Logistik Bier dengan SPSS 20 for Windows. Hasil analisis menunjukkan hubungan antara faktor status kesehatan dengan fungsi kognitif lansia (nilai p 0.05). Hasil penelitian terdapat 105 responden atau 67.7% fungsi kognitif normal dan 50 responden atau 32.3% mengalami penurunan fungsi kognitif. Kesimpulan didapatkan bahwa penurunan fungsi kognitif pada lansia disebabkan karena tekanan darah tinggi, merokok, pernah mengalami benturan di kepala, suasana hati yang sedih, kurang olah raga, kurang aktif dalam kegiatan sosial, kesulitan tidur, kondisi sakit dan sakit yang lama. Saran dari hasil penelitian ini agar lansia mengelola dan mencegah faktor risiko agar fungsi kognitif tidak menurun sehingga dapat mencegah terjadinya demensia.

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INTRODUCTION

In general, the number of elderly people with dementia is expected to increase. The number of elderly in Indonesia is estimated to be higher than the number of elderly in the world after 2100 (1). This shows that the number of elderly residents in the city of Malang for three consecutive years has increased. The percentage of the elderly population in Malang city in 2018 was 10.32%, in 2019: 10.68% and in 2020 reached 11.4% (13). To realize healthy, independent, quality and productive elderly people, health coaching must be carried out as early as possible during the human life cycle until entering the elderly phase, by paying attention to risk factors including degenerative diseases suffered by the elderly which can be the cause of dementia (2). Dementia is a neurocognitive disease characterized by deterioration in intellectual including memory, abilities learning, orientation, language, comprehension, and judgment (3).

Symptoms of dementia depend on the type of dementia. The most common types of dementia in older adults are AD, vascular dementia, mixed Alzheimer's or vascular dementia, Parkinson's dementia, retribution body dementia, and anterior temporal lobe dementia (4).Cognitive deterioration in dementia usually begins with deterioration of memory. Dementia can be characterized by an inability to remember people around and time, damage to the client's spatial abilities, and behavior of self-confinement or fear of meeting others. It is predicted to be an estimated 50 million people living with dementia in the world, and of them 60% live in developing countries. The estimated number of people with dementia for people over 60 years old in Indonesia, Thailand, and Sri Lanka in 2001 was 0.6% of the population, the number is estimated to increase in 2020 to 1.3% and to 2.7% by 2040 (5,6). The number of people with dementia is predicted to increase to 82 million by 2030 and 152 million by 2050. The WHO estimates that an aging population will cause the global prevalence of dementia to triple in the next 30 years, from 47 million in 2015 to 150 million by 2050. Similarly several modeling studies have investigated the effects of population aging on global and countryspecific prevalence and concluded that the prevalence of dementia will double every 20 years million by 2050 (7).

Meanwhile, the exact data on the number of dementia sufferers in Indonesia are still unknown. Prevalence in Indonesia remains scarce; it was estimated that there were about 1 million cases in 2011. Given the rising life expectancy in Indonesia, this number is likely to continue growing. There have been no reports of the incidence of dementia due to the lack of public understanding of dementia and its causative factors, making this case like an iceberg phenomenon. This situation leads to a significant decrease in the quality of life for individuals affected by dementia, posing a challenge for developing considerable countries that may lack the resources to manage the increasing number of patients requiring care (8).

The current challenge is to recognize individuals at high risk of dementia in the community, find individuals at risk of dementia, establish medical diagnoses, carry cross-professional therapy out with involvement and help the adaptation of patients and the surrounding community decreased memory and orientation of places and times at high risk of injury and threats to the daily safety of the elderly. Attention in the elderly averages on visible physical aspects, while psychological, emotional and memory aspects are not well-studied.

The decline in cognitive function is a risk factor that can inhibit neurotransmitter production, particularly affecting cholinergic and dopaminergic systems, which causes a small production of acetylcholine resulting in a deficit of cognitive function (9). If the elderly who experience the early signs of dementia do not immediately receive attention to prevention, especially the risk factors for dementia, it will result in an increase in elderly dementia and other cognitive disorders in the future, which if not controlled will have a huge impact on the economic, social, and political life of the nation (10).

Spouses and caregivers will also experience a greater caregiver burden, distress, increased levels of depression, and decreased sleep related to behavioral disorders, which have an impact on their health and well-being (11,12). One of the goals of national development is to treat dementia so that the elderly remain at a healthy and productive age (2). Initial data from this study can significantly contribute to addressing current global challenges related to the rising incidence of dementia among the elderly, supporting the implementation of early detection and holistic management as specified in the fourth action step of the national strategy. This study does not involve intervention or treatment of the independent variable in relation to the dependent variable. Instead, its primary aim is to identify factors associated with cognitive function decline that contribute to dementia risk in the elderly. The findings are intended to support government initiatives and programs aimed at improving dementia care and prevention.

METHODS

The design in this study is analytical with a cross-sectional method, which is a study that emphasizes the measurement time or observation of independent and bound variables that are carried out simultaneously. The focus of the research is on the elderly population to identify factors associated with the risk of dementia. The population is all elderly people aged 60 years and above who live in the city of Malang amounting to 98,124. Data collection for the identification of cognitive aspects uses MMSE (Mini Mental Status Exam) instruments. The MMSE instrument is the gold standard for assessing memory and has been tested by the Institute of Mental Health USA with a sensitivity level of 100% and a specificity of 90% so that researchers do not conduct validity and reliability tests anymore. Data analysis used Bier Logistic Regression test with SPSS 20 for Windows.

The sample in this study is the elderly who participate in activities at the integrated service center/ *pusat pelayanan terpadu* for the elderly in Malang city. The sample was measured using Lemeshow probability sampling technique using proportionate cluster random sampling and the sample size used an estimate to be proportional of 155 people. This became an independent variable in the study of dimensional risk in the elderly.

Meanwhile, the dependent variable is a factor that causes the cognitive function of the elderly to decline. Assessment of cognitive function utilized the Mini-Mental State Examination (MMSE) questionnaire with interpretation of results categorized as follows: scores of 24-30 indicate normal cognitive function, 17-23 suggest probable cognitive impairment, and 0-16 indicate definite cognitive impairment. The sample in this study was the elderly who were in the Health Center area of Malang city and data collection was carried out in 2023 and all data utilized in the study are primary with ethical clearance certificate number: 272/HRECC.FODM/III/2023.

Data analysis was performed using SPSS version 20 for Windows. In the univariate analysis, all variables were analyzed using descriptive analysis with the help of software to test independent variables, namely factors that affect the decline in cognitive function that causes dementia in the elderly which include: age, gender, marital status, education, occupation, which are analyzed and presented in the form of a frequency table where the existing scores are calculated and included in the table in the form of numbers (frequencies) and percentages. Meanwhile, the non-parametric statistical test used the Bier Logistic Regression test with SPSS 20 for Windows to test the dependent variable, namely cognitive function in the elderly.

RESULT

The results of this study show that the decline in cognitive function that can cause dementia in the elderly is due to high blood pressure, smoking, having experienced a blow to the head, sad mood, lack of exercise, lack of activities, difficulty sleeping, and prolonged illness

Most of the respondents are women (62.6%) totaling 97 people written in Table 1. The vast majority (40.6%) of the 63 had a junior high school education. The age of respondents is mostly (64.5%) amounting to 100 people aged 60-74 years. Most respondents (96.8%) amounted to 150 people of married status. The vast majority (54.9%) of the 85 people are retirees.

Characteristic	Sum (N)	Percentage (%)
Gender		
Male	58	37.4%
Female	97	62.6%
Education level		
No school	10	6.5%
Primary school	34	21.9%
Junior High School	63	40.6%
High School	42	27.1%
College	6	3.9%
Age group		
Age 45-59 years old	32	20.7%
Age 60-74 years old	100	64.5%
Age 75-90 years old	23	14.8%
Marital Status		
Married	150	96.8%
Unmarried	5	3.2%
Work		
Private	25	16.1%
Labor	20	12.9%
Pensioners	85	54.9%
Others	25	16.1%

Table 1. Characteristics of respondents

Source: Descriptive analysis of elderly variables in Malang city

Table 2. Frequency	distribution	variable of	f cognitive	function t	to independent	variables
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Variabla	Normal	Probable cognitive impairment	Total
v al lable	(n=105) %	(n=50) %	(n=155) %
Blood pressure			
Normal	77 (49.7%)	19 (23.0%)	96 (61.9%)
Abnormal	28 (18.1%)	31(20.0%)	59 (38.1%)
Ideal Body Weight			
Normal	75 (48.4%)	16 (10.3%)	91 (58.7%)
Overweight/Obesity	30 (19.4%)	34 (21.9%)	64 (41.3%)
Active in the community			
Active	99 (63.9%)	43 (27.7%)	142 (91.6%)
Inactive	6 (3.9%)	7 (4.5%)	13 (8.4%)
Smoke			
No	99 (63.9%)	46 (29.7%)	145 (93.5%)
Yes	6 (3.9%)	4 (2.6%)	10 (6.5%)
Head Impact			
No	97(62.6%)	36 (23.2%)	133 (85.8%)
Yes	8 (5.2%)	14 (9.0%)	22 (14.2%)
Still Grieving			
No	94 (60.6%)	40 (25.8%)	134 (86.5%)
Yes	11 (7.1%)	10 (6.5%)	21 (13.5%)

Variable	Normal	Probable cognitive impairment	Total
variable	(n=105) %	(n=50) %	(n=155) %
Difficulty Sleeping			
No	46 (29.7%)	15 (9.7%)	61 (39.4%)
Yes	59 (38.1%)	35 (22.6%)	94 (60.6%)
Activity			
Independent	99 (63.9%)	50 (32.3%)	149 (96.1%)
Not Independent	6 (3.9%)	0 (0.0%)	6 (3.9%)
Being Sick			
No	64 (41.3%)	22 (14.2%)	86 (55.5%)
Yes	41 (26.5%)	28 (18.1%)	69 (44.5%)
Long Illness			
< 1 year	84 (54.2%)	25 (16.1%)	109 (70.3%)
1-5 years	21 (13.5%)	25 (16.1%)	46 (29.7%)

Source: Descriptive analysis of elderly variables in Malang city

Some respondents, as many as 105 people or 67.7% (Table 2), had normal cognitive function, and 50 respondents or 32.3% fell into the category of probable cognitive impairment. There are two categories for the variable blood pressure, namely normal and abnormal.

The Results stated that 96 respondents were found in the normal group and 59 respondents in the abnormal group. There were 77 out of 96 normal respondents were with normal cognitive function and 19 were categorized as having probable cognitive impairment. While 28 out of 59 normal respondents has normal cognitive function and 31 were identified with probable cognitive impairment. The ideal weight variable has two categories, 91 respondents with normal weight and 64 respondents with overweight or obese. There were 75 respondents out of 91 normal group respondents had normal cognitive function and 16 were categorized as having probable cognitive impairment.

There were 30 out of 64 respondents from overweight/obese group had normal cognitive function and 34 were classified as having probable cognitive impairment. Variable activeness in the community had two categories, 142 respondents were active in social activities and 13 were not active in social activities in the community.

The variable "activeness in the community" is divided into two categories: 142 respondents in the active group and 13 respondents in the inactive group. There were

99 respondents among the active group exhibited normal cognitive function, while 43 were classified as having probable cognitive impairment. In the inactive group, six respondents demonstrated normal cognitive function, whereas seven were categorized as having probable cognitive impairment.

The smoking variable is categorized into two groups. There were 99 among 145 respondents in the nonsmoking group were exhibited normal cognitive function, while 46 were classified as having probable cognitive impairment.

There were 133 respondents in the group there were no head collision, 97 respondents with normal cognitive function and 36 respondents had cognitive function with a category of possible cognitive impairment. The variable still grieving had with two categories, of the 134 respondents of the no group, 94 respondents with normal cognitive function and 40 respondents who have cognitive function with a category of possible cognitive function with a category of possible cognitive function and 40 respondents who have cognitive function with a category of possible cognitive impairment.

There were 11 out of 21 respondents from the yes group had normal cognitive function and 10 respondents had cognitive function with a category of possible cognitive impairment. For the variable difficulty sleeping of the 61 respondents in the no group, 46 respondents had normal cognitive function and 15 respondents had cognitive function with a category of possible cognitive impairment. There were 59 out of 94 respondents from the yes group had normal cognitive function and 35 had cognitive function with a category of possible cognitive impairment. There were also 99 out of 149 respondents (activity) in the independent group had normal cognitive function and 50 had cognitive function with a category of possible cognitive impairment. There were 86 respondents (sickness) in the no group, 64 respondents had normal cognitive function and 22 respondents had cognitive function with a category of possible cognitive impairment.

There were 41 out of 69 respondents (being sick) had normal cognitive function and 28 were categorized as having probable cognitive impairment. The variable "length of illness" is divided into two categories, 109 respondents with an illness duration of less than one year, 84 exhibited normal cognitive function, while 25 were categorized as having probable cognitive impairment.

			Predictions				
Observation -		Co	gnitive function	_			
		Usual	Probable Cognitive Impairment	Percentage Correct			
C '''	Usual	105	0	100.0			
function	Probable Cognitive Impairment	50	0	0.0			
Overall Pere	centage			67.7			

Table 3.Prediction Accuracy (Block = 0)

Source: Logistic Regression analysis of elderly variables in Malang city

Table 4. Prediction Accuracy

		Predictions			
Observation		Cog	nitive function		
		Normal Probable Cognitive Impairment		Percentage Correct	
Cognitive	Normal	91	14	86.7	
function	Probable Cognitive Impairment	16	34	68.0	
Overall Per	centage			80.6	

Source: Prediction accuracy (block 1) analysis of elderly variables in Malang city

Table 3 shows the accuracy of predictions before the influence of independent variables or can be said to see Table 4 shows the model grouped respondents into two groups: Cognitive function: normal cognition and possibilities impairment. The overall Correct Percentage is 80.6%. This is better with a model that is only predictions of initial cognitive function variables. The accuracy of predictions without involving independent variables was 67.7%. the previous constant (in Table 4) with 67.7%. The accuracy of prediction of cognitive function variables in each category was 86.7% for the normal category and 68.0% for the probable cognitive impairment category.

Tał	ole	5	Odds	Ratio
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Variable		В	Forest	Say.	Exp(B)
Blood Pressure (1)	X1	2.625	13.902	0.000	13.805
Ideal Body Weight (1)	X1	3.069	20.252	0.000	21.518
Community Activity (1)	X2	2.490	5.584	0.018	12.066
Smoking (1)	X3	1.246	0.392	0.531	3.476

Variable		В	Forest	Say.	Exp(B)
Head Impact (1)	X4	2.507	7.939	0.005	12.274
Still Grieving (1)	X5	1.463	4.146	0.042	4.318
Trouble Sleeping (1)	X6	0.024	0.002	0.969	1.024
Independent Activity (1)	X7	-28.399	0.000	0.998	0.000
Being Sick (1)	X8	-0.882	1.699	0.192	0.414
Long Illness (1)	X9	1.195	083	0.024	3.304
Constant		-4.332	ə.823	0.000	0.013

Source: Hypothesis testing of partial influence of elderly variables in Malang city

Analysis of logistic regression in table 5, the results are obtained with the following equation:

$$Ln\left(\frac{p}{1-p}\right) = 2.625X1 + 3.069X2 + 2.490X3 + 1.246X4 + 2.507X5 + 1.463X6 + 0.024X7 - 28.399X8 - 0.882X9 + 1.195X10 - 4.332 + ei$$

The blood pressure variable had an influence on the cognitive function variable with a Wald value greater than the chi-square table (13.902 > 3.842) and α value greater than p (0.050 > 0.000). The positive regression coefficient (and exp B of 13,805) indicates that the category 1 (abnormal) blood pressure variable tends to the category 1 cognitive function variable (probable cognitive impairment).

The ideal weight variable had an influence on the cognitive function variable with a Wald value greater than the chi-square table (20,252> 3,842) and α value greater than p (0.050 > 0.000). Regression coefficient (and exp B of 21,518) shows that the ideal BB variable category 1 (overweight / obesity) tends to the variable cognitive function category 1 (probable cognitive impairment). The smoking variable had a positive and insignificant effect on cognitive function variables with Wald values smaller than the table's chi-square (0.392 < 3.842) and p-values greater than α (0.531 > 0.050). The positive regression coefficient (and exp B of 3,476) showed that the smoking variable category 1 (yes) tended to the variable cognitive function category 1 (probable cognitive impairment) but was not significant.

The head impact variable had an influence on the cognitive function variables with Wald values greater than the table's chisquare (20.252 > 3.842) and α value greater than p (0.050 > 0.000). The positive regression coefficient (and exp B of 12,274) shows that the category 1 head impact variable (yes) tends to the category 1 cognitive function variable (probable cognitive impairment). The still grieving variable had an influence on the cognitive function variable with a Wald value greater than the chi-square table (4.146> 3.842) and a α value greater than p (0.050 > 0.000). The regression coefficient (and exp B of 4.318) shows that the still grieving variable category 1 (yes) tends to the variable cognitive function category 1 (probable cognitive impairment).

The sleeplessness variable had a positive and insignificant effect on the cognitive function variable with Wald values smaller than the table's chi-square (0.002 <3.842) and p-value is greater than α (0.969 > 0.050). The positive regression coefficient (and exp B of 1,024) indicates that the variable sleeplessness category 1 (yes) tends to the variable cognitive function category 1 (probable cognitive impairment) but is not significant. The independent activity variable had a negative and insignificant effect on cognitive function variables with Wald values smaller than the table's chi-square (0.000 <3.842) and the p-value greater than α (0.998 > 0.050).

A negative regression coefficient(and exp B of 0.000) indicates that the category 1 self-activity variable (not independent) has a tendency toward category 0 (normal) cognitive function variables but is not significant. The variable moderately ill had an insignificant effect on cognitive function variables with Wald values less than the chi-square table (1.699 < 3.842) and p-values greater than α (0.192 > 0.050). The negative regression coefficient (and exp B of 0.414) indicates that the variable Moderate category 1 (yes) tends to the variable cognitive function category 0 (normal) but is not significant. The long illness variable had a positive and significant effect on cognitive function variables with Wald values greater than the chi-square table (5.083> 3.842) and p-values smaller than α (0.024< 0.050). The positive regression coefficient (and exp B of 3.304) shows that the variable Length of illness category 1 (1–5 years) tends to the variable cognitive function category 1 (probable cognitive impairment).

DISCUSSION

The initial stage in modeling to identify determinant factors involves the systematic identification of potential covariates. This is achieved through logistic regression analyses of any covariate in relation to the dependent variable. Covariates having a p-value of less than 0.05 are regarded as candidates for inclusion in the multivariate model. However, beyond the threshold established by the p-value, consideration of scientific rationale and substantive relevance is imperative.

Consequently, a covariate may still be retained in the model even if its p-value is greater than 0.05, provided it possesses theoretical or clinical significance. In this study ten logistic regression analyses were carried out for each variable of elderly health status that can be a risk factor for cognitive function decline, namely: Blood pressure test results, ideal weight results, aactiveness in the community, smoking habits, never experienced a blow to the head, sad mood, difficulty sleeping, activities, sick conditions and chronic diseases.

Results of the analysis in Table 5, it can be seen that the variables smoking, difficulty sleeping, and independent activity have a p-value of > 0.05. So that there are seven covariate variables that are included in the multivariate model, namely blood pressure, ideal weight, activeness in the community, whether you have experienced a blow to the head, sad mood, sick conditions and long illness which results in a positive and significant effect on cognitive function variables. The head impact variable had an influence on the cognitive function variables. Elderly who experience a decrease in cognitive function have a change in brain composition structures, adversely affecting overall brain function. Sleep duration greatly affects the risk of dementia in the elderly. During sleep, the and consolidates brain processes the information obtained, so sleep deprivation can difficulty remembering cause new information. Poor sleep quality can accelerate brain aging because of the accumulation of β amyloid, which is closely related to the development of Alzheimer's dementia disease (14).

Anxiety and prolonged frailty are significant factors contributing to depression in this population. Changes in the mood or mental status of the elderly can later lead to a depressive condition that will have an impact on cognitive function decline. Theoretical frameworks suggest that feelings of sadness and anxiety, particularly in the later stages of life, may elevate cortisol levels, thereby inhibiting neurotransmitter activity essential for the production of cholinergic and dopaminergic pathways. This inhibition results in reduced acetylcholine production, leading to cognitive deficits (9).

Furthermore, such stressors can inflict damage on brain regions responsible for memory and recall, specifically the hippocampus (15). The influence of physical activity on cognitive function in older adults is notably supported by intervention studies, which indicate that adults who engage in structured physical activity programs that yield significant improvements in cardiovascular and respiratory health, often show improved cognitive performance (16).

Mid-life obesity is closely related to the risk of developing dementia. Overweight and obesity have a strong association with the risk of dementia. Obesity is one of the biggest contributors to abnormal lipoprotein build-ups that aggregate brain nerves and affect acetylcholine production (15). Exercise prevents atrophy in the hypocampus which functions as a memory store, as well as reduces the amount of cortisol in the blood, which is useful for reducing stress (17).

CONCLUSION AND SUGGESTION

Conclusion

Factors that influence the decline in cognitive function that causes dementia in the

elderly is high blood pressure, smoking, having had a blow to the head, sad mood, lack of activity, activeness in the community, difficulty sleeping, sick conditions and long illness.

Suggestion

The elderly are expected to be able to maintain their health and avoid risk factors, especially blood pressure, weight is maintained to remain ideal, active in the community, strive not to get sick and stay healthy and maintain emotions to prevent cognitive function decline that causes dementia.

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