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THE RELATIONSHIP BETWEEN SMOKING AND PHYSICAL ACTIVITY WITH COGNITIVE IMPAIRMENT AMONG THE ELDERLY

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ABSTRACT
The rising number of elderly individuals presents challenges, especially concerning their health and well-being. Without proper intervention, these issues can escalate into more complex problems, including cognitive impairment. To minimize the risk of cognitive impairment that can lead to dementia, it's crucial to reduce risk factors like quitting smoking and engaging in regular physical activity. This study aimed to explore the relationship between smoking, physical activity, and cognitive impairment in the elderly. A retrospective research method was employed, utilizing simple random sampling. The study included 142 elderly participants who met the inclusion criteria. To assess cognitive levels, the Mini Mental State Examination (MMSE) was used. This instrument demonstrated strong validity and reliability, with a Cronbach's Alpha of α=0.827. For measuring physical activity, the Physical Activities Scale For the Elderly (PASE) instrument was utilized, also showing good validity and reliability with a Cronbach's Alpha of α=0.768. Data analysis was conducted using the chi-square statistical test, which revealed a significant relationship between smoking, physical activity, and cognitive impairment in the elderly ($p < 0.05$). The research findings indicated that the majority of respondents (57.04%) experienced mild cognitive impairment. Additionally, 54.23% of respondents had a history of smoking, and 65.49% exhibited poor physical activity.

Keywords: physical activity; smoking; cognitive function impairment

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INTRODUCTION

The phenomenon of aging is occurring in all countries, especially in developing nations such as Indonesia. Indonesia ranks fourth globally after the United States in having the highest elderly population (Study & Kim, 2022).The increasing number of elderly people presents issues, especially concerning health and well-being. Without proper intervention, these issues can develop into more complex problems, including cognitive impairment (Sa'diah et al., 2024). Cognitive impairment refers to a decline in memory and thinking abilities that interferes with daily activities, increasing the risk of dementia (Riasari et al., 2022). According to the World Health Organization (WHO, 2021), over 55 million people worldwide are affected by dementia. Data from Alzheimer Indonesia shows an increase in dementia prevalence from 7.9% in 2019 to 27.9% in 2022(Nichols et al., 2022).Studies have identified smoking and lack of physical activity as contributing factors to cognitive impairment and increased dementia risk (Dhana et al., 2020)(Mukadam et al., 2024)(Ranson et al., 2021)(Ward et al., 2022). Smoking is a significant risk factor, increasing the likelihood of cognitive decline by 2.11 times (Johnson, 2021)(Wijaya & Tadjudin, 2020). Prolonged smoking accelerates the aging of nerve cells, reduces brain volume, and increases dementia risk due to the nicotine and free radicals in smoke that cause oxidative stress, negatively affecting cognitive function (Sari & Hilmi, 2022).

Lack of physical activity increases the risk of cognitive impairment by 20-30%(Yamasaki, 2023). Reduced physical activity limits blood circulation to the brain, affecting vascular health and cognitive function, and increases the risk of cardiovascular issues such as hypertension and diabetes, which contribute to dementia-related neuropathology. Regular

physical activity helps maintain cognitive function and reduce dementia risk(Yoon et al., 2021).West Sumatra ranks seventh in Indonesia in terms of elderly population, with 10.67% or approximately 5.23 million elderly people. This increase has led to rising cognitive impairment cases, from 458 cases in 2022 to 770 in 2023 (Dinas Kesehatan Kota Padang, 2024). Based on the phenomena described above, the objective of this study is to investigate the relationship between smoking and physical activity with cognitive impairment in the elderly.

METHOD

This study used a quantitative approach with a retrospective design. Univariate analysis presented frequency distributions of cognitive impairment, physical activity, and smoking history among the elderly. Bivariate analysis used correlation tests to determine the strength and direction of the relationship between smoking, physical activity, and cognitive impairment among the elderly in Padang City. The population consisted of 188 elderly individuals from the working areas of Lubuk Kilangan, Lubuk Begalung, and Belimbing Health Centers. Sampling used probability sampling with a simple random technique, resulting in 142 participants. Cognitive function was assessed using the Mini Mental State Examination (MMSE) adopted from Widia et al.(Okvitasari et al., 2024) with Cronbach's Alpha of 0.827. Physical activity was measured using the Physical Activity Scale for the Elderly (PASE) adopted from Nofriani(Hubungan Aktivitas Fisik Dengan Risiko Demensia Pada Lansia Di Wilayah Kerja Puskesmas Rawang Kota Padang, 2024) with Cronbach's Alpha of 0.768. Data were analyzed using the Chi-square test to determine variable relationships. This research has received ethical approval with reference number No.490.layaketik/KEPKFKEPUNAND.

RESULT

Table 1.
Demographic characteristics (n=142)

Characteristics of Elderly		f	%
Gender			
	Male	54	38,03
	Female	88	61,97
Marriage			
	Married	67	47,18
	Never Married	0	0,00
	Divorced	75	52,82
Health condition			
	Healthy	124	87,32
	Sick	18	12,68
Age			
	60 - 69 years	76	53,52
	$\geq$ 70 years	66	46,48

Based on the table, a descriptive analysis of the characteristics of the elderly can be observed. In terms of gender, the study found that the majority of respondents were female, totaling 88 individuals or 61.97%, while the remaining 54 respondents or 38.03% were maleRegarding mrriage, the study showed that the majority of respondents were divorced (either legally or widowed), totaling 75 individuals or 52.82%, while the remaining 67 respondents or 47.18% were married.In terms of health condition, most respondents were healthy, totaling 124 individuals or 87.32%, while 18 respondents or 12.68% were ill.In terms of age, most respondents were aged 60 to 69 years, totaling 76 individuals or 53.52%, while the remaining 66 respondents or 46.48% were aged 70 years or older.

Table 2.
Frequency Distribution of Descriptive Analysis of Research Variables

Research Variable	f	%
Smoking History		
Yes	77	54,23
No	65	45,77
Physical Activity		
Poor	93	65,49
Good	49	34,51
Cognitive Function Impairment in Elderly		
Mild	81	57,04
Moderate	45	31,69
Severe	16	11,27

For the smoking history variable, the majority of respondents smoke, totaling 77 or 54.23% of respondents. The rest are non-smokers, totaling 65 or 45.77%. For the physical activity variable, the majority of respondents have poor physical activity, totaling 93 or 65.49% of respondents. The rest are respondents with good physical activity, totaling 49 or 34.51% of respondents. And for the cognitive function impairment in elderly variable, the majority of respondents have mild cognitive function impairment, totaling 81 or 57.04% of respondents. Furthermore, 45 respondents or 31.69% have moderate cognitive function impairment. And the fewest respondents, 16 or 11.27%, have severe cognitive function impairment

Table 3.
Relationship between Smoking and Cognitive Function Impairment in Elderly

	Cognitive Function Impairment								
	Mild		Moderate		Severe		Amount		*P Value*
Smoking History	f	%	f	%	f	%	f	%	
No	39	50.6	21	27.3	0	0.0	65	100	
Yes	42	64.6	23	35.4	17	22.1	77	100	0.002

Based on Table 3, it can be seen that among elderly individuals with no smoking history, 39 people (50.6%) had mild cognitive function impairment and 21 people (27.3%) had moderate cognitive function impairment. Meanwhile, among elderly individuals with a smoking history, 42 people (54.6%) had mild cognitive function impairment, 23 people (35.4%) had moderate cognitive function impairment, and 17 people (22.1%) had severe cognitive function impairment. The results of the chi-square statistical test show that the p-value is 0.002 with a significance level (α) of 0.05, or in other words, $p<0.05$, so H0 is rejected, meaning there is a significant relationship between smoking history and cognitive function impairment in the elderly.

Table 4.
Relationship between Physical Activity and Cognitive Function Impairment in Elderly

	Cognitive Function Impairment								
Physical Activity	Mild		Moderate		Severe		Amount		*p*
	f	%	f	%	f	%	f	%	*Valuae*
Poor	39	41.9	38	40.9	16	17.2	93	100	
Good	42	85.7	6	12.2	1	2.0	49	100	0.000

Based on Table 4, it can be seen that among elderly individuals with poor physical activity, 39 people (41.9%) had mild cognitive function impairment, 38 people (40.9%) had moderate cognitive function impairment, and 16 people (17.2%) had severe cognitive function impairment. Meanwhile, among elderly individuals with good physical activity, 42 people (85.7%) had mild cognitive function impairment, 6 people (12.2%) had moderate cognitive function impairment, and 1 person (2.0%) had severe cognitive function impairment. The results of the chi-square statistical test show that the p-value is 0.000 with a significance level (α) of 0.05, or in other words, $p<0.05$, so H0 is rejected, meaning there is a significant relationship between physical activity in the elderly and cognitive function impairment in the elderly.

DISCUSSION

Cognitive impairment in the elderly

Based on the results of the study obtained from the MMSE (Mini-Mental State Examination) assessment, it was found that the majority of older adults experienced cognitive impairment in the mild category, totaling 81 individuals or 57.04% with scores ranging from 21–26. Furthermore, 45 older adults or 31.69% were categorized as having moderate cognitive impairment with scores of 11–20, and the fewest were in the severe category, with 16 individuals or 11.27% scoring 0–10. Cognitive function refers to the ability to process, store, and share information (Mardiana & Sugiharto, 2022). Cognitive function includes several aspects, such as thinking processes, memory ability, language ability, attention, calculation, and a person's perspective (Putri & Lumbantobing, 2024).The recap of respondents' answers on the variable of cognitive impairment in the elderly in this study showed that 63 people (44.37%) experienced a decline in orientation, nearly half of the elderly (53 people or 37.32%) experienced a decline in attention and calculation, and almost the same number (56 people or 39.44%) showed a decline in recall ability. Impairment in one or more cognitive functions among the elderly can lead to disturbances in social, occupational, and daily functioning. Therefore, assessing cognitive function is essential in evaluating elderly health. Many studies show that mental disorders are often unrecognized by health professionals because mental status testing is not routinely performed (Ambohamsah & Lady, 2020)

This study is in line with (Mardiana & Sugiharto, 2022), who found that the average total MMSE score was 20.9 (SD = 4.41), with 69 respondents (46%) classified as having mild cognitive impairment out of 151 respondents. This study is also supported by (Sopyanti et al., 2019), who found that among older adults, 55 respondents (49.1%) had mild cognitive impairment, 45 respondents (37.5%) had moderate impairment, and 15 respondents (13.4%) had severe impairment, based on a sample of 112 elderly respondents.The decline in cognitive function is caused by changes in the nervous system, specifically the atrophy of nerve fibers, which can result in a decrease in bodily coordination in older adults (Prahasasgita & Lestari, 2023).This process causes a decline in sensory perception and motor responses in the central nervous system, which can ultimately lead to a decrease in cognitive function (Ismuji et al., 2024).

Smoking History in the Elderly

The research results show that the majority of respondents, 77 individuals or 54.23%, were smokers. Meanwhile, non-smoking respondents totaled 65 individuals or 45.77%. This aligns with the study by (Jeong et al., 2023), which stated that smoking among the elderly largely consisted of heavy smokers (53.8%) who had smoked for more than 20 years. During a two-year monitoring period, 14.6% of respondents quit smoking, 21.9% reduced their cigarette consumption (either ≥50% or 20–50%), while 15.9% increased their cigarette consumption. This study found that elderly individuals who successfully quit smoking had a lower risk compared to those who maintained their smoking habits, whereas elderly individuals who only reduced or even increased their cigarette consumption experienced an increased risk of cognitive impairment.

Physical Activity in the Elderly

Based on data obtained using the PASE (Physical Activity Scale for the Elderly) questionnaire, the research results showed that the majority of elderly individuals had poor physical activity, totaling 93 respondents or 65.49%. In contrast, respondents with good physical activity accounted for 49 individuals or 34.51%. Therefore, the majority of physical activity in this study fell into the category of insufficient activity, specifically "poor activity," with a score of less than 15.This finding aligns with (Ariestya et al., 2021), where most physical activity was categorized as insufficient, involving 27 individuals (57.4%), while 20 individuals (42.6%) engaged in good activity. Furthermore, this study is supported by (Situmorang, 2020), who stated that the lack of physical activity in the elderly is often due to them rarely engaging in exercise activities like walking or aerobics. Instead, they tend to

spend more time sitting on the porch or at home, or lying down. Activities such as cooking or tidying beds are often performed by family members.

The Relationship Between Smoking and Cognitive Impairment in the Elderly

Based on the data processing of research findings conducted on the elderly in the working area of the Padang City Health Office using SPSS, there is a significant relationship between smoking and cognitive impairment, with a p-value less than alpha 5% (0.002 < 0.05).These research findings align with (astiti et al., 2024), who found a significant relationship between smoking habits and cognitive impairment in the elderly in 2024. This study is also consistent with (Rawis et al., 2019), who reported a significant relationship between smoking habits and cognitive function with a p-value of 0.001 ($p < 0.05$) in Tondegesan Village, Kawangkoan District in 2019.Cigarettes are rolled and wrapped tobacco products designed to be inhaled. Cigarettes contain nicotine, which is an addictive substance that can cause addiction. The nicotine content in cigarettes is a contributing factor to cognitive impairment, carrying a risk of Alzheimer's dementia. This occurs due to a decrease in Nitric Oxide (NO) formation, an increase in free radical formation, reduced blood flow in the brain, and an increase in Amyloid β. The increase in Amyloid β protein leads to reduced oxygen flow to the brain, resulting in impaired balance, decreased memory, and over time, these conditions worsen, leading to the risk of cognitive dysfunction (Sari & Hilmi, 2022).According to (Wijaya & Tadjudin, 2020), smoking not only affects physical health but also impacts brain function and psychological health. Throughout their lives, active smokers and former smokers have a significant risk factor for cognitive impairment. The more a person consumes cigarettes, the more frequently nicotinic acetylcholine receptors undergo desensitization, leading to receptor fatigue and disruption of cognitive function (Johnson, 2021).

The Relationship Between Physical Activity and Cognitive Impairment in the Elderly

Based on the data processing of research findings conducted on the elderly in the working area of the Padang City Health Office using SPSS, it was found that there is a significant relationship between insufficient physical activity and cognitive impairment, with a p-value less than alpha 5% (0.000 < 0.05).These research findings align with (Situmorang, 2020), who reported a significant relationship with a p-value of 0.000 ($< \alpha = 0.05$), indicating a connection between insufficient physical activity and cognitive impairment in the elderly at the Gunting Saga Community Health Center, Kualuh Selatan District, North Labuhan Batu Regency in 2020. Furthermore, this study is also consistent with (Ramli & Masyita, 2022), which found that insufficient physical activity affects cognitive impairment in a study conducted at the Jumpandang Baru Community Health Center in Makassar City in 2020, with an alternative value ($p = 0.006 < 0.05$).

Physical activity is beneficial for cognitive function in the elderly. Its relevance lies in the element of movement. By moving, the brain is stimulated to learn optimally, leading to higher blood flow to the brain, which in turn improves nutrient supply. The brain requires nutrients in the form of oxygen and glucose. Insufficient nutrient supply to the brain can cause disorientation, confusion, fatigue, concentration difficulties, and a decline in cognitive function. Elderly individuals who engage in ample physical activity will have better cognitive function, thus avoiding cognitive impairment that carries a risk of dementia. Conversely, elderly individuals who already experience cognitive impairment mostly sit or sleep throughout the day, and their daily activities require assistance from others. This indicates that the higher the level of physical activity, the lower the cognitive impairment in the elderly(Afconneri et al., 2024)

The highest recapitulated answers from the physical activity variable among the elderly in this study showed that 81 individuals (57.04%) never did aerobics, almost half (79 individuals or 55.63%) never engaged in sports activities, almost half (81 individuals or 57.04%) never participated in community social activities, and almost half (62 individuals or 43.66%) never performed activities such as gardening around the house. Research indicates that individuals

with low levels of physical activity, including lack of exercise, household chores, and social interaction, tend to have a higher risk of experiencing cognitive impairment with a risk of dementia (Zhu et al., 2022)These research findings align with (Cahyaningrum, 2022), where an increase in hippocampus volume could be observed in the Magnetic Resonance Imaging (MRI) results of elderly individuals who engaged in physical activity for one year. The improvement of cognitive function in the elderly can be pursued through regular physical activity. According to (Ruttama et al., 2020), the functional cognitive performance of the elderly can be enhanced with short-term or long-term exercise or physical activity programs. If elderly individuals aged 60 and above have insufficient physical activity or exercise, it can potentially affect their cognitive impairment. Therefore, the role of family and caregivers is needed to assist with daily activities, build trust, and be open in efforts to prevent the risk of cognitive decline, thereby creating a sense of security for the elderly.

Based on the research findings, it was found that 93 individuals (65.49%) of the elderly had insufficient activity (poor activity), and 49 individuals (34.51%) performed activities (good activity). These data indicate that many elderly individuals do not engage in activities adequately. From the researcher's observations during the study, many elderly individuals merely sit and do not perform activities such as cooking or cleaning rooms, as their families no longer allow it due to the elderly's susceptibility to falls.The researcher assumes that elderly individuals with insufficient physical activity will experience cognitive impairment more rapidly. To reduce cognitive impairment in the elderly, they should engage more in routine household tasks such as washing and cleaning floors, which requires orientation (knowing where to clean) and memory. Walking outdoors also enhances orientation, language, and memory, as the elderly need to know where they are going when outside, meet people, greet them, and remember the people they encounter while walking. Furthermore, it includes aspects of orientation and memory in worship, knowing where they worship, and during prayer (especially for Muslims), they must remember and even memorize prayer movements and their respective surahs.

Research conducted by (Hasibuan RK, 2021)revealed that 29 elderly individuals (31.9%) with frequent reading intensity showed an increase in cognitive function scores because reading plays a role in stimulating brain cognitive function. Additionally, these research findings are consistent with (Kumar et al., 2022), which showed that elderly individuals who actively engage in physical activity well improved their cognitive function scores by 0.98 and 1.32 points in both men and women, compared to elderly individuals without physical activity.

CONCLUSION

Most elderly in Padang City had mild cognitive impairment (57.04%), a smoking history (54.23%), and poor physical activity (65.49%). Bivariate analysis found significant relationships between smoking, physical activity, and cognitive impairment. These findings suggest the importance of health programs promoting physical activity and smoking cessation to reduce cognitive impairment risk among the elderly.

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