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# Impaired cognitive function and its relationship with menopausal onset and exercise intensity of elderly women

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## ABSTRACT

**Background:** The success of development is the ideals of a nation that can be seen from the improvement in living standards and life expectancy. This also results in a shift in the composition of the population, which will increase the composition of the elderly population. Increased life expectancy must also be accompanied by a good quality of life. During this time the elderly are related with helplessness, dependence, with various health problems such as various cardiovascular diseases, osteoporosis, cognitive impairments such as dementia. This needs to be the concern of all parties. This study aims to determine: 1) the prevalence of elderly women who experience cognitive dysfunction in Buleleng Regency; 2) the relationship between cognitive impairment and the onset of menopause; and 3) and the relationship between cognitive impairment and the level of exercise activities of elderly women in Buleleng Regency.

**Methods:** This research is a descriptive correlational quantitative

observational study with a cross sectional study approach. The study sites were in 5 sub-districts in Buleleng Regency with a total sample of 73 people. To find out the relationship between cognitive impairment and the onset of menopause and the pattern of exercise activities in older women, data were analyzed by contingency coefficient correlation test.

**Results:** The results showed that 18.4% of elderly women experience definite cognitive impairment, 23% probable cognitive impairment, and 58.6% normal cognitive function. The relationship between cognitive impairment and the onset of menopause was obtained  $p$  value 0.296 which indicates that the correlation between the onset of menopause and cognitive function was not statistically significant. The relationship between cognitive impairment in elderly and level of exercise activity obtained a  $p$  value of 0,000 which indicates that the correlation between exercise activity and cognitive function is statistically significant.

**Keywords:** elderly women, cognitive, menopause, exercise activity

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## INTRODUCTION

Now on, Indonesia faces a triple burden health problem, which is still a high level of infectious diseases, an increase in non-communicable diseases, and re-emergence of diseases that should have been overcome. In the elderly group, Basic Health Research in 2013, showed that most diseases in the elderly were hypertension (57.6%), the rest were arthritis, stroke, and several other diseases such as cognitive impairment. Handling cases of the disease is not easy because the disease in the elderly is generally a degenerative, chronic, and multi-diagnosis. Thus, the process itself requires time and high costs, which will be a burden on the community and the government, including the National Health Insurance Program. Therefore, elderly health care should prioritize promotive and preventive support with quality curative and

rehabilitative services in health facilities.<sup>1</sup>

Decreased cognitive functions in the elderly can include various aspects, namely orientation, registration, attention, calculation, memory, and language. It can cause problems including long memory and information processing, in the long memory, the elderly will have difficulty in re-expressing stories or events that are not so interesting and new information or information about people. Decreased cognitive function in the elderly results in a decrease in the quality of life of the elderly. In elderly women, various health changes and decreased quality of life are very closely opposed along with menopause. According to WHO (2005), menopause means the cessation of the menstrual cycle forever for women who have experienced menstruation every month. During menopause, the production of the hormones estrogen and progesterone greatly decreases so that

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the levels in the blood are very small.<sup>2</sup>

Decreasing hormone estrogen which causes various clinical problems and health problems for menopausal women. Research conducted by the Women's Health Study Across the Nation (SWAN) shows that these stages are not age, which affects cognitive scores. Specifically, perimenopausal women showed an episodic speed of improvement and verbal memory less than 4 years compared to women in the premenopausal or postmenopausal period.<sup>3</sup> Other studies in early postmenopausal women showed better workability compared to women in late menopausal transition period.<sup>4</sup>

Lifestyle factors such as intellectual stimulation related to cognitive, social status, and exercise activities can reduce the risk of age-related disorders such as Alzheimer's disease and vascular dementia. Several studies explained that exercise activity has an influence on the cognitive function of the elderly and is also one of the efforts to prevent cognitive disorders. Research conducted by Sauliyusta and Rekawati, 2016 regarding exercise activities and cognitive functions in the elderly, it was reported that 45.2% of the elderly had impaired cognitive function and there was a significant relationship between the level of exercise activity and cognitive function in the elderly.<sup>5</sup> Research by Boer, et al. , 2018 concerning thinking-while-moving exercise in the elderly regarding cognitive function, it was reported that this exercise improves cognitive function in the elderly.<sup>6</sup>

Thus, increasing number of the elderly population and various health issues, this is definitely both responsibility between the government and the community to jointly improve the quality of life of the elderly so that it will help to decrease the burden. Therefore, various efforts need to be made to overcome various health problems in the elderly. In the beginning, it is necessary to conduct a research on the prevalence of elderly people who improve cognitive problems, map out health problems experienced by the elderly and map their previous lifestyles, so that data can be used to

develop elderly health development programs.

## METHODS

This study is a descriptive correlational quantitative observational study with a cross-sectional approach. The study was conducted in Buleleng Regency in 5 districts, namely Buleleng, Busungbiu, Kubutambahan, Sawan, and Sukasada. The study was conducted from April to October 2019, with a total sample of 73 people. The instrument used to check cognitive functions is the Mini-Mental State Examination (MMSE). Analysis of the relationship of cognitive function disorders with the onset of menopause and exercise intensity in elderly women is by the contingency.

## RESULTS

### The prevalence of elderly women who experience cognitive dysfunction in Buleleng Regency.

Retrieval of data regarding the prevalence of elderly women who experience cognitive dysfunction in Buleleng Regency has been going well. Data was collected using the MMSE questionnaire. The prevalence of elderly women who experience cognitive dysfunction is presented in [Table 1](#).

[Table 1](#) shows 58.6% of normal cognitive function, 23% of cognitive problems, and 18.4% of certain cognitive impairments.

### The relationship between cognitive impairment and the onset of menopause in elderly women in Buleleng Regency.

The examination results of neurocognitive functions using the MMSE examination on the sample can be divided into 2 categories, namely normal and disturbed. Normal is MMSE results 24 through 30, while disturbed has MMSE results are less than 24. The age of menopause in the sample is different from 50 years and above and less than 50 years. MMSE inspection results are categorized into two, they are normal and canceled. Based on the results of the study obtained in samples with menopausal age less than 50 years, as many as 69% have a normal category MMSE value, while 31% have an MMSE value of the movable category. In samples with menopause age 50 years and over, 56.8% had MMSE values in the normal category and 43.2% in the affordable category. After contingency coefficient analysis was performed, a p-value of 0.296 was obtained which showed statistics between menopause and non-statistical cognitive functions. A conversion value of 0.121 indicates a positive interaction with weak strength and has no clinically significant relationship.

**Table 1. Prevalence of elderly women with impaired cognitive functions in Buleleng Regency.**

MMSE score	Number of people (N)	Percentage (%)	Category
24-30	43	58,9	Normal
17-23	17	23,3	Probably cognitive impairment
0-16	13	17,8	Definitely cognitive impairment
Total	73	100	

### **The relationship between cognitive impairment and exercise intensity of elderly women in Buleleng Regency.**

The exercise activities carried out by the sample in this study are categorized as active in exercise and not active in exercise. MMSE examination results are categorized into 2, normal, and disturbed. Based on the results of the study, it was found that 55.6% of the sample who did not exercise had a normal category MMSE value, while the remaining 52.8% had an impaired MMSE value. In the sample that was actively exercising, 100% had an MMSE value in the normal category. After contingency coefficient analysis was performed, a p-value of 0,000 was obtained which showed that the correlation between exercise activity and cognitive function was statistically significant. The correlation value of 0.436 shows a positive correlation with moderate and clinically significant correlation strengths.

## **DISCUSSION**

### **Impaired cognitive function in the elderly**

Cognitive function is the main function to solve problems. Cognitive functions consist of 5 modalities, namely attention, language, memory, visuospatial and executive functions.<sup>7</sup> The examination of cognitive functions is carried out using the MMSE questionnaire. Furthermore, a total score will be obtained for each examination. Categorizing cognitive functions based on the scores obtained, namely a score of 24-30 including the normal category, a score of 17-23 including the category of the possibility of cognitive impairment and a score of 0-16 including definite cognitive impairment. Based on the results of the study, 58.6% was obtained, including the category of normal cognitive function, 23% the category of the possibility of cognitive impairment, and the remaining 18.4% included the category of cognitive impairment according to MMSE examination.

The results of this study are in line with the results of the study of Greta, et al. (2005) who found cognitive differences in 18.3% in the elderly group with MMSE with a score limit of 23/24 (95% confidence interval (CI) = 16.0–20.9) and cognitive impairment of 3.3% in the elderly group using MMSE with a score limit of 17/18 (95% CI = 2.8–4.0).<sup>8</sup> This is in accordance with the result of Shimada's study in 2013, who found the prevalence of mild cognitive impairment in the elderly population in Japan was 18.8%.<sup>9</sup> Along with increasing age, based on the elderly group, there will also be a process of brain aging which is one of the factors affecting cognitive function. Aspects of cognitive functions that contain various attention functions, attention, language, memory, visuospatial functions, and executive

functions are announced as follows.<sup>7,10</sup> Each year, the volume of each area in the brain decreases, and the frontal area decreases the most. This reduced volume causes a decrease in cognitive function.<sup>11</sup> In addition, tissue damage with the ability to repair itself, but the compilation of an imbalance between nerve damage and repair, then the ability of neural plasticity will be inhibited causing brain aging and dementia depends on various things.<sup>12</sup> Research by Rasmussen, et al. (2006) found risk factors for lifestyle, comorbid diseases, and genetic factors.

### **Impaired cognitive function and its relationship with menopause**

Cognitive disorders in the form of memory and attention disorders are complaints that are often made by women who experience a menopause transition. About 60% of menopausal women report memory disorders. Temporarily decreases the speed of information and verbal memory and returns to normal in the postmenopausal period, while working memory is not needed by the menopause transition. Some studies provided estrogen assistance in the form of estrogen / hormonal therapy to improve the domain of executive functioning and attention. However, several randomized controlled trials have stated that hormonal therapy does not significantly affect the domain.<sup>14</sup> Low estrogen levels after menopause increase the process of decreasing cognitive abilities that can support memory abilities, attention concentration, and speed in producing information.

The normal aging process will be followed by changes in the structure, function, and function of the brain. There is a significant difference between brain tissue in the hippocampus and parietal lobes more in women than in men. A study that measured research involved using Positron Emission Tomography (PET) and 18F-2-fluoro-2-deoxy-D-glucose (FDG), which showed an increase in research conducted on the female hippocampus. This gender difference has implications for neuropsychiatric disorders such as Alzheimer's Disease (AD) where the prevalence and severity of the disease from AD in women is greater than in men. This may be related to estrogen. Decreasing and fluctuation in estrogen during menopause is a change that underlies the disruption of executive function, attention, and memory. Areas of the brain that are rich in estrogen receptors perform cognitive processes including the hippocampus responsible for short-term responsibilities and the prefrontal cortex performs on executive functions such as planning, working memory, and coordinating the task of Estrogen increasing the ability of verbal fluency and articulation, in addition to perceptual

speed. Women prove the results of verbal fluency tests are better when there is a menstrual cycle which means the estrogen concentration is quite high. Imaging examination shows changes in cortical activity according to the menstrual cycle. This means there are changes in circulating estrogen levels in executive function and verbal.<sup>14</sup>

Some things that are considered to improve the health of the elderly include: (1) Health development is one that does not support the improvement of the human development index, therefore encouraging health development must be more supportive of the promotive aspects and prevent if related to rehabilitative curative aspects; (2) The implementation of a healthy community movement must start from the family, to realize healthy and independent elderly people can be achieved through healthy families; (3) Collaboration between programs and cross sectors is needed, academics, regional heads, protection efforts, community organizations, in building community understanding will support healthy living, and also lead a healthy life, and (4) Greater intensification in preparing pathways by their respective tasks so that healthy elderly people and self-reliant through healthy families.<sup>14</sup>

## CONCLUSION

The results showed that 18.4% of elderly women improved cognitive impairment, 23% had cognitive problems, and 58.6% had normal cognitive function. Health problems caused by the elderly are the most severe are bones and joints, where 70% of the sample in this study discusses high blood pressure (10%) and complaints due to other degenerative diseases such as diabetes, farsightedness, change in hearing acuity, also senile. The relationship between cognitive function and the onset of spending on menopause was obtained p-value of 0.296 which showed that the age of menopause and cognitive function was not in accordance with statistics. The relationship between cognitive function with elderly exercise obtained p-value 0,000, which means that between exercise activities and cognitive function with statistics. Based on the results of this study, exercise is related to cognitive function where the more active the lower the possibility of exercising to improve cognitive function. Related to exercise activities carried out according to age and based on exercise guidelines for health.

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## CONFLICT OF INTEREST

There is no competing interest regarding the manuscript.

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## AUTHOR CONTRIBUTION

All of the authors are equally contributed to the study from the conceptual framework, data gathering, data analysis, until reporting the results of study.

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